

ZAMFARA INTERNATIONAL JOURNAL OF EDUCATION (ZIJE)



Volume 6 Number 4, June, 2026



pISSN(Hard Copy): 2814-1377 eISSN (Online Copy): 2814-1369

Volume 6 Number 4, June, 2026

The Official Journal of The Faculty of Education
Federal University Gusau, Zamfara State

<https://doi.org/10.64348/zije.2026511>
www.foefugusau.com.ng



Published By:
Faculty of Education
Federal University Gusau, Zamfara State

PRINTED BY: MABRUQ GLOBAL LINK
08039366532



ZAMFARA INTERNATIONAL JOURNAL OF EDUCATION (ZIJE)



A PUBLICATION OF THE FACULTY OF EDUCATION,
FEDERAL UNIVERSITY GUSAU, ZAMFARA STATE, NIGERIA
VOLUME 6, NUMBER 4, JUNE, 2026
pISSN: 2814-1377, eISSN: 2814-1369

INDEXED IN:

OpenAIRE

The Official Indexing Partner of the European Commission (EU),

Google Scholar

https: <https://doi.org/10.64348/zije.2026511>

Website: www.foefugusau.com.ng,

E-mail: zije@foefugusau.com



EDITORIAL BOARD MEMBERS

Editor-In-Chief/chairman	Dr. Umar Sodangi
Editorial Board	Dean, Faculty of Education, Federal University Gusau
Associate Editor	Prof. Bashir Suleiman
	Department of Science Education, Federal University Gusau
Publication Editor	Prof. Abubakar Sadiq Haruna
	Department of Educational Foundations, Federal University Gusau
Assistant Publication Editor	Dr. Yakubu A. Abdullahi
	Department of Science Education, Federal University Gusau
Editor	Professor Amos Shaibu
	Department of Science Education, Federal University Gusau
Editor	Professor Abubakar A. Bagudo
	Department of Education & Extension Services, Usmanu Danfodiyo University, Sokoto
Editor	Dr. Sheu Adaramaja Lukman
	Department of Educational Foundations, Federal University Gusau
Editor	Dr. Abbas Sani Dahiru
	Department of Educational Foundations, Federal University Gusau
Editor	Dr. Nuhu Ishaq Lawal
	Department of Science Education, Federal University Gusau
Secretary, Editorial Board	Yahaya Abdulkadir
	Faculty Officer, Faculty of Education, Federal University Gusau

CONSULTING EDITORS

Professor A. A. Salawu	Usmanu Danfodiyo University, Sokoto
Professor Victor O. Awonusi	University of Lagos, Lagos State
Professor A. K. Tukur	Usmanu Danfodiyo University, Sokoto
Professor A. M. Atadoga	Ahmadu Bello University, Zaria, Kaduna State
Professor K. O. Usman	University of Nigeria, Nsukka, Enugu State
Professor Henry Owolabi	University of Ilorin, Ilorin Kwara State
Professor Muhammad Abdullahi	Bayero University Kano
Professor Yusuf A. Maigida	University of Port Harcourt
Professor Auwal M. Lawal	Bayero University Kano
Professor Sani Ibrahim	Ahmadu Bello University, Zaria, Kaduna State
Professor M. S. Magaji	Maryam Abacha American University of Nigeria, Maradi



EDITORIAL NOTE

Zamfara International Journal of Education (ZIJE) is the official Journal of the Faculty of Education, Federal University Gusau Zamfara State, Nigeria. The Journal publishes articles of diverse fields of interest in Education. Papers reporting original research and extended version of already established conference and journal articles are welcomed. Papers for publication are selected through peer review process to ensure originality, relevance and readability.

The aim and scope of the journal is to provide an academic medium and an important reference for the advancement and dissemination of information that supports high level learning, teaching and research in the fields of Education.

This edition, Volume 6, Number 4, June, 2026 is poised to present research reports in the following fields of education: Educational Foundations, Science Education, Educational Psychology, Curriculum & Instructional Technology, Guidance & Counselling, Philosophy & History of Education, Sociology of Education, Entrepreneurship education, Special and inclusive Education, Physical & Health Education Religious Education, Gender Studies, Peace & Security Education among Others. The articles in this volume are academic and professional discourse written by reputable scholars in their areas of specialization.

The Board wish to also acknowledge the efforts of the editorial members, for their ceaseless support towards successful publication of the journal. In the same vein, we acknowledge quite sincerely the assistance and support of our esteemed consulting editors for ensuring the credibility of this edition. Also, worthy of appreciation are the Authors and their immense contributions to this publication.

Dr. Umar Sodangi

Editor-in-Chief/ Chairman Editorial Board
Dean, Faculty of Education, Federal University Gusau



CALL FOR ARTICLES

The Zamfara International Journal of Education (ZIJE) calls for scholarly articles for review and possible publication in its next edition (Volume 6, Number 5, August, 2026), ZIJE publishes articles that emphasizes on research development and application within the fields of Education. All manuscripts are reviewed by editorial review committee. Contributions must be original, not previously or simultaneously published elsewhere, and are critically reviewed before they are published. Papers, which must be written in English language, should have good grammar and proper terminologies. Hence, prospective articles are subjected to plagiarism assessment test to estimate the percentage of originality of the papers. Hence, Plagiarism threshold of $\leq 20\%$ is recommended.

EDITORIAL GUIDELINES

1. Manuscripts including references, appendices, tables and diagrams should be double-spaced and single coded on A4 paper with generous margins (at least 1.5cm).
2. Title should be explicit and not more than 19 words.
3. Title page should be arranged as follows: Title, Author (s) full name, affiliation, full addresses, email addresses and phone numbers.
4. Abstract should be single line and not more than 250 words.
5. For conceptual papers, the body should have appropriate headings were necessary
6. For empirical papers, it should be presented in the following order; Introduction, Objectives of the study, Research questions and/or Hypothesis, Methodology, Results, Discussion of Findings, Conclusion and Recommendations.
7. Acknowledgement (if any)
8. Quotations of more than 40 words should be indented and typed single spacing with indication of the pages where the quotes were lifted
9. In-text citations should follow APA 7th edition format
10. References should be in range with 7th edition of APA style
11. Each table and figures should be presented within the manuscripts, with a brief and self-explanatory title
12. All text within the table should be clearly eligible, and all graphics and legends should be easily distinguished when printed in black and white
13. Tables should be in in horizontal line only, with only blank space to separate column
14. Tables and figures that may be included in the main text of the paper should be numbered separately, in the sequence that they are mentioned in the text.
15. Figures should be saved in a neutral data format such as JPEG, TIFF OR EPS.

SUBMISSION OF MANUSCRIPTS & ASSESSMENT FEE

Manuscripts for Volume, 6. Number, 5. with an evidence of a non-refundable assessment fee of five thousand Naira (N5000:00) only per manuscript should be forwarded electronically to the Editor-In-Chief or Publication Editor via; zijefugusau@gmail.com on or before August 20th, 2026. Furthermore, upon acceptance of manuscript for publication a non-refundable publication fee of Thirty Thousand Naira (N30,000:00) will be required for online (e-Book) version only, while Forty Thousand Naira (40,000:00) only for both online (e-Book) and hard copy versions per manuscripts submission, respectively.

Professor Abubakar Sadiq Haruna
Publication Editor



TABLE OF CONTENTS

S/N	Authors, Paper Title and DOI Index	Pages
1	ZANKAN, Jaafar Adamu., DANBABA, Ali Ameh & DARGAK, Paul Peter (2026): Adaptive Strategies on the Impacts of Artisanal Mining among Rural Households in Kaduna State, Nigeria https://doi.org/10.64348/zije.2026452	1-11
2	GOM, Joseph Wase., ORTSA, Gabriel Mhenbee & PINGA, Mahmud (2026): Impact of Quality Assurance Practices on Provision of Funds, Infrastructural Facilities and Maintenance of Discipline among Public Secondary Schools in Benue State, Nigeria https://doi.org/10.64348/zije.2026453	12-21
3	MUKHTAR, Muhammad Sani & UMAR, Aminu (2026): Leveraging Intelligent-Tutoring-System Instructional Strategy for effective Teaching of Islamic Ethics and Morality among Students at Tertiary Level of Education in Nigeria https://doi.org/10.64348/zije.2026454	22-31
4	EGUAGIE, Osagie (2026): Influence of Citizenship Education on Development of Civic Values among Public University Social Studies Students in Edo and Delta States of Nigeria https://doi.org/10.64348/zije.2026455	32-38
5	LAWRENCE-AKAH, Nneka Chinenye (2026): Comparative Assessment of Intonational Variations between Igbo-English and Ibibio-English Bilingual Speech among higher institution graduates in Nigeria https://doi.org/10.64348/zije.2026456	39-45
6	OLOGELE, Ibrahim., ONIYANGI, Shuaib Olanrewaju., ABDULRAHEEM, Adijat Mojisola., JIDDA, Kafayah Adeola., JAMIU, Abdulqudus Tosin., ABDULRASAQ, Qazeem Onaolapo., SULAIMAN, Faoziyat Adenike., BELLO, Olamilekan Kabir & UTHMAN, Kamalud-deen Adekunle (2026): Effect of Health Education Intervention on Attitude Towards Solid Waste Management among Undergraduate Students in University of Ilorin, Kwara State, Nigeria https://doi.org/10.64348/zije.2026457	46-53
7	SADOH, Faith., SHUAIBU, Garba & ILIYASU, Hauwa'u (2026): Effects of Sequence-Chart Strategy on Retention in Nutrient-Cycling in Nature and Pollution among Secondary School Students in Nassarawa Education Zone, Kano-State, Nigeria https://doi.org/10.64348/zije.2026458	54-61
8	AGU, Joshua Denen & PINGA, Mahmud (2026): Influence of Leadership Style and Security-Related factors On Teachers' Attrition among Public Secondary Schools in North-East Senatorial District of Benue State, Nigeria https://doi.org/10.64348/zije.2026459	62-69
9	OJO, Olusoji Isaiah & OKEKUNLE, Aderemi Omolara (2026): Qualitative Study on Problems and Solutions associated with Effective Writing Skills among Learners: An Overview https://doi.org/10.64348/zije.2026460	70-74
10	AGASHUA, Mercy Ngukeren., AHUA, Caroline Nguyiman & PINGA, Mahmud (2026): Impact of Teachers' Classroom Setting Rules on Academic Performance among Upper Basic Education Students in Makurdi Education Zone of Benue State, Nigeria https://doi.org/10.64348/zije.2026461	75-80
11	ABBAS, Halimatu Dogara (2026): Leveraging Hausa Language Teaching and Learning Using Constructivists Approach Among Students at Tertiary Level of Education in Nigeria: A Review https://doi.org/10.64348/zije.2026462	81-84
12	ONYEKPE, Stephen Jacob & EHIEDE, Clara (2026): Evaluation of Digital Technology Device and utilization on Effective Teaching and Learning of Social Studies among Secondary School Students in Delta State, Nigeria	85-91



	https://doi.org/10.64348/zije.2026463	
13	MUSA, Ibrahim Yanware & ABUBAKAR, Kabiru Mohammed (2026): Correlation Between Teachers' Workload and Training on Instructional Delivery among Public Primary Schools in Talata Mafara Education Zone, Zamfara State, Nigeria https://doi.org/10.64348/zije.2026464	92-99
14	ESEGBUE, Edith & ONYEKPE, Stephen Jacob (2026): Impacts of Concept Mapping Strategy on Achievement and Attitude in Social Studies among Secondary School Students in Delta State, Nigeria https://doi.org/10.64348/zije.2026465	100-110
15	ADIKA, Lawrence Olagoke (2026): Psychosocial Perceptions of Female Students' Leadership Roles in Emmanuel Alayande University of Education, Oyo State, Nigeria https://doi.org/10.64348/zije.2026466	111-116
16	SALIHU, Imam Shittu (2026): Qualitative Study on Historical Development of Islam and Challenges of Da'wah in Igala land of Kogi State, Nigeria https://doi.org/10.64348/zije.2026467	117-122
17	ANKELI, Victor Odeh (2026): Effect of Learning Activity Package on Retention in Biology Concepts among Senior Secondary School Students in Otukpo, Benue State, Nigeria https://doi.org/10.64348/zije.2026468	123-129
18	AUGUSTINE, Walakan Shede (2026): Qualitative Study on an Inclusive Education Curriculum in Nigeria: Interrogating Policy, Confronting Practice and Constructing a Transformative Framework https://doi.org/10.64348/zije.2026469	130-144
19	AUGUSTINE, Walakan Shede (2026): Leveraging Artificial Intelligence Technology for an effective Curriculum at Secondary School Level of Education in Nigeria: Applications, Challenges and Policy Imperatives https://doi.org/10.64348/zije.2026470	145-155
20	EKPENYONG, Emmanuel Sunday (2026): Awareness and Application of Novel Pedagogical Strategies among Senior Secondary School Science Teachers in Suleja Local Government Area, Niger State, Nigeria https://doi.org/10.64348/zije.2026471	156-162
21	ENU, Evelyn Nwene (2026): Qualitative Study on Harnessing Language and Literature Studies for Sustainable National Development in Nigeria: A Strategic Approach https://doi.org/10.64348/zije.2026472	163-167
22	ENEMARIE, Veronica., TAANGAHAR, Benjamin Akura & TARTENGER, Timothy Terengwa (2026): Effects of Video-Clip Instructional Strategy on Performance and Retention in Basic Science Concept among Upper Basic Students in Makurdi, Benue State, Nigeria https://doi.org/10.64348/zije.2026473	168-176
23	ABAYOMI, C. Y., ADEYEYE, F. M. & ADEWUNMI, C. M. (2026): Reliability Test for Internal Consistency in Psychological Assessment Instruments: A Pilot Study with Feeder Team Athletes of Bendel Insurance Football Club of Nigeria https://doi.org/10.64348/zije.2026474	177-183
24	YAKUBU, Rhoda Dallatu & DANJUMA, Sunday (2026): Effects of Mnemo-Tech on Performance in Plant Physiology Concepts among Secondary School Biology Slow Learners in Zaria Education Zone, Kaduna State, Nigeria https://doi.org/10.64348/zije.2026475	184-192
25	GABI, Samson Suleiman., DANJUMA, Christopher Musa & AZIGE, Godfrey Daniel (2026): Effect of Round-Robin Instructional Strategy on Achievement in Circle Geometry Concept among Secondary School Mathematics Students in Keffi, Nasarawa State, Nigeria https://doi.org/10.64348/zije.2026476	193-199



26	EZEAGHASI, Ngozi Eucharika., OMONIWA, Oluwatope Olubunmi & BODEWA, Sulaiman Ahmad (2026): Assessment of Students' Knowledge and Practices of Microbial Water Contamination in Federal University of Education, Zaria https://doi.org/10.64348/zije.2026477	200-207
27	INUSA, Auwalu., WAZIRI, Sulaiman Musa & UBA, Halima Umar (2026): Effect of Phonemic Transcription-Based Strategy on Oral English Performance of L2 Learners among Senior Secondary Schools in Bida Education Zone of Niger State, Nigeria https://doi.org/10.64348/zije.2026478	208-213
28	NWAKAMMA, Angela Amaechi (2026): Effects of Scaffolding and Concept Mapping Strategies on Achievement and Retention in Biology among Secondary School Students in Obio/Akpor LGA, Rivers State, Nigeria https://doi.org/10.64348/zije.2026479	214-219
29	OLIKIABO, Samuel Osaretin & AIDEYAN, Daniel Osarenmwanta (2026): Influence of Artificial Intelligence Technology Integration on Occupational Health and Safety among workplaces in Nigeria https://doi.org/10.64348/zije.2026480	220-225
30	CHUKWUEMEKA, Emeka Joshua., AGBO, Eunice Oada & OHIARE-UDEBU, Maryanne Fatima (2026): Impact of COVID-19 Pandemic on Students' Engagement and Integration of Technology-Mediated Instructional Modifications in Social Studies Education in University of Abuja, Nigeria https://doi.org/10.64348/zije.2026481	226-236
31	BABAGANA, Mohammed., BULAMA, Kaumi & MODU, Mohammed Abba (2026): Effects of 8-Week Health Education Intervention on Handwashing and Oral Hygiene Practices among Primary School Pupils in Bama LGA, Borno State, Nigeria https://doi.org/10.64348/zije.2026482	237-242
32	LUWOYE, Akindeyi., SALMAN, Medinat Folorunsho & ABDULGAIYU, Abdulmujeeb Ololade (2026): Perceptions of Using Mother-Tongue on Mathematics Teaching among Primary School Teachers in Ilorin, Kwara State, Nigeria https://doi.org/10.64348/zije.2026483	243-253
33	GURJIYA, Abubakar Uba & DANLADI, Idris Isa (2026): Influence of Emotional Intelligence on Academic Achievement among Geography Pre-Service Teachers in Colleges of Education, North-West, Nigeria https://doi.org/10.64348/zije.2026484	254-259
34	AYUA, Geoffrey Aondolumun., KWAGH, Terstea Caleb., OKANCHE, Samuel., OBONGA, Idoma Jairus., OBU, Reuben Oibe & TVERSHIMA, Ushahemba Assher (2026): Perceived Influence of Artificial Intelligence Chatbots on Self-Efficacy and Attitude in Science Education Research among Undergraduate Students in Makurdi, Benue State, Nigeria https://doi.org/10.64348/zije.2026485	260-266
35	PROMISE, Aworo Okorie., OLOSASA, Taofeek Adebayo & OLAWIPO, Saheed Adesina (2026): Assessment of High-Tech Skills Competency among Librarians in Some Selected Universities in South-South, Nigeria https://doi.org/10.64348/zije.2026486	267-274
36	AKISSANI, Ishaku., AMINU, Naziru & RABE, Hanafi (2026): Qualitative Study in Mathematics Education Reforms and Pedagogical Innovations in Nigeria: Addressing Challenges in Secondary School Classrooms https://doi.org/10.64348/zije.2026487	275-284
37	LAWAL, Yahaya & ROSLI, Mohammad Shafie (2026): Correlation Between Learning Styles and Online Interaction among Postgraduate Students in Universiti Teknologi Malaysia, Malaysia https://doi.org/10.64348/zije.2026488	285-291



38	ELIJAH, Akaninyene Monday., AKPAN, Inobong Fred, & ATABANG, Atim Anietie (2026): Effects of Educational Games, Drills and Practice Strategies on Academic Achievement in Biology Concepts among Secondary School Students in Abak LGA, Akwa Ibom State, Nigeria https://doi.org/10.64348/zije.2026489	292-301
39	AYUA, Geoffrey Aondolumun., OJOKO, Augusta Ndidi., TERHEMBA, Wisdom Kwaghfan., EMMA-IWUOZO, Ogechukwu Uzoamaka., OKANCHE, Samuel & OBIABO, Isaac Otache (2026): Leveraging Creativity in Science Education: Inclusive Special Education's Pathway to Self-Sufficiency among Basic School Learners in Nigeria https://doi.org/10.64348/zije.2026490	302-309
40	OGBOUMA, S., ABAYOMI, C. Y. & ATUMA, U. (2026): Effects of 8-Weeks Combat Sports Skills Training on Social Inclusion and Functionality among Adolescents with Mild Intellectual Disabilities in Benin City, Nigeria https://doi.org/10.64348/zije.2026491	310-317
41	SANI, Jamlilu., INUSA, Auwalu., LAWAL, Hamisu., AUWALU, Kabiru., KABIRU, Nura & LAWAN, Asma'u (2026): Effects of Multimodal Instruction on Self-Efficacy in English Speaking Skills among Colleges of Education Students in North-West, Nigeria https://doi.org/10.64348/zije.2026492	318-324
42	OLIKIABO, Samuel Osaretin & AIDEYAN, Daniel Osarenmwanta (2026): Influence of Artificial Intelligence Technology Integration on Occupational Health and Safety among workplaces in Nigeria https://doi.org/10.64348/zije.2026493	325-330
43	GOMA, Bala Bawa & GELE, Nasiru Dantani (2026): Qualitative Study on Hausa Language Teaching Using E-Learning Instructional Strategy at Tertiary Level of Education in Nigeria: Challenges and Way Forward https://doi.org/10.64348/zije.2026494	331-336
44	GBADAMOSI, Islamiat Ayomide., ABDULWAHAB, Rafiu & KURANGA, Yunus Adebayo (2026): Teachers' Perceived Impact of Continuous Quality Assurance Practices on Standard of Public Primary Schools in Ilorin Metropolis, Kwara State, Nigeria https://doi.org/10.64348/zije.2026495	337-342
45	OBOHO, Daniel E., ATABANG, Atim A., AKPAN, Anyanime O. (2026): Effects of Science-Text-Cards and Crossword Puzzle Instructional Materials On Academic Performance in Biology among Secondary School Students in Oron LGA, Akwa Ibom State, Nigeria https://doi.org/10.64348/zije.2026496	343-351
46	RINGIM, Auwalu Sabo., LAWAL, Halima Mohammed & DAURA, Ramlat Jibir (2026): Effect of Continuous Assessment Feedback on Performance in Letter Writing Concept among Junior Secondary School Students in Jigawa State, Nigeria https://doi.org/10.64348/zije.2026497	352-359
47	ALABI, Jimoh Adeniyi., ONIYE, Masud Ibrahim & ZUBAIR, Oladimeji Mansur (2026): Assessment on Integration of Indigenous Education in Nigeria Secondary School Curriculum and Student's Self-Reliance in Kwara State, Nigeria https://doi.org/10.64348/zije.2026498	360-366
48	AKPAN, Anyanime Okopide (2026): Assessment of Tech-Infused Pedagogical Innovations on Integrated Science Teaching and Learning among Tertiary Institution Pre-Service Teachers in Akwa Ibom State, Nigeria https://doi.org/10.64348/zije.2026499	367-374
49	BAKO, Lois Sunday Paul (2026): Effects of Experiential Learning Models on Academic Performance and Science Process Skills in Plant Physiology Among Secondary School Biology Students in Zaria, Kaduna State, Nigeria https://doi.org/10.64348/zije.2026500	375-381



50	ADEOYE, Kayode Funminiye., MAIGARI, Mohammed Audu., ALKAMU, Fateh David., WAJE, Esther & MSHELIA, Alheri Markus (2026): Qualitative Assessment on Digitalization of Instructional Pedagogy among Higher Institutions of Learning in Bauchi State, Nigeria https://doi.org/10.64348/zije.2026501	382-387
51	SANI, Mukhtar Muhammad., SANI, Muhammad Abdurrahman., BAYARO, Aliyu & UCHIRI, Abdulazeez Muhammad Tanko (2026): Leveraging on Pedagogical Potential of Scriptwriting in Mathematics Classroom among Prospective Teachers in Waziri Umaru Federal Polytechnic, Birnin Kebbi, Nigeria https://doi.org/10.64348/zije.2026502	388-395
52	ISHOLA, Adebayo Monsur & AKOREDE, Olufunbi Jimoh ((2026): Utilisation of Web 2.0 Technologies for Collaborative Learning among University Undergraduate Students in Lagos State, Nigeria https://doi.org/10.64348/zije.2026503	396-402
53	ALWAJUD-ADEWUSI, Mariam Bukola., OBALOLA, Moriam Olayemi., MAGAJI-YUSUF, Khadija & ARIYO, Nafisat O. (2026): Assessment of Problems associated with the Use of Family Planning Pills among Married Adults in Ibadan, Oyo State, Nigeria https://doi.org/10.64348/zije.2026504	403-410
54	ISHOLA, Adebayo Monsur & OLALEYE, Emmanuel Olumuyiwa (2026): Assessment of Undergraduate Student's Perception on Social Media Devices as a Learning Tool among Public Universities in Ogun State, Nigeria https://doi.org/10.64348/zije.2026505	411-417
55	MACCIDO, Hurera Mouktar., ISIAQ, Abdulmuhit Temitope & AYABIOGBE, Chrsisty I. (2026): Effect of Health Education Intervention on Utilisation of Healthcare Services among Federal Colleges of Education Students in North-West, Nigeria https://doi.org/10.64348/zije.2026506	418-424
56	SANI, Murtala., SALISU, Yahaya & USMAN, Sanusi Shehu (2026): Effects of Connectivism-Based Jigsaw IV Strategy on Attitude and Performance in Geometry Concept among Secondary School Mathematics Students in Katsina State, Nigeria https://doi.org/10.64348/zije.2026507	425-430
57	KANKIA, Aminu Dalhat & SABO Abubakar (2026): Effect of Microsoft PowerPoint Instructional Strategy on Performance in Mensuration Concept among Senior Secondary School Mathematics Students in Katsina State, Nigeria https://doi.org/10.64348/zije.2026508	431-437
58	OKEKEOKOSISI, JohnBosco O. C. & DAMBAI, Mohammed Suleiman (2026): Effect of Blockchain-Technology Strategy on Achievement in Computer Studies Concept among Secondary School Students in Awka-South Local Government Area, Anambra State, Nigeria https://doi.org/10.64348/zije.2026509	438-441



Adaptive Strategies on the Impacts of Artisanal Mining among Rural Households in Kaduna State, Nigeria

ZANKAN, Jaafar Adamu Abdul¹

zankanabdul@gmail.com

08124285498

DANBABA, Ali Ameh¹

DARGAK, Paul Peter²

08034658740

¹Department of Environmental Management, Kaduna State University, Nigeria

²Department of Health Education, Federal University of Education, Pankshin, Plateau State, Nigeria

Abstract

Mining serves as a source of livelihood for many rural communities worldwide. However, it also poses environmental risks that can negatively impact household livelihoods, such as harming farmland and contaminating water supplies. This study explores how households in rural areas of Kaduna State, Nigeria, adapt to the impacts of artisanal mining. Data were collected through Focus Group Discussions, in-depth interviews, and on-site observations. The findings were analysed using descriptive statistics with the aid of Nvivo Version 11.0 software. The study reveals that households employ a range of adaptive measures to mitigate the effects of artisanal mining. These include clearing new land for farming, acquiring or leasing land for cultivation, planting non-native tree species for timber and palm oil, filling mining pits and ponds for agricultural use, and using manure and fertilisers to boost crop yields. Other strategies involve relocating herders and their livestock, securing land specifically for grazing, confining livestock, purchasing animal feed, avoiding polluted water sources, treating water through heating and filtration, digging wells, and using chemicals or treated sachet water for drinking. The study recommends that both households and the government engage in reclaiming degraded land and underground mine areas for agricultural use, as a sustainable measure to combat food insecurity.

Keywords: Artisanal Mining, Adaptation Strategies, Households and Livelihood Vulnerability

Introduction

Artisanal mining remains vital yet environmentally problematic livelihood strategy in the rural communities. It contributes positively to the economy, particularly in rural areas, it also leads to severe geo-environmental consequences such as soil erosion, mercury contamination, water pollution, deforestation, and biodiversity loss, thereby impacting the quality of life of the population [1]. Additionally, health risks, including respiratory issues and HIV prevalence, and socio-economic challenges, including child labor and high school dropout rates, are prevalent in mining regions [2]. Artisanal mining in sub-Saharan Africa serves as both a livelihood lifeline and an environmental stressor for rural households. Frequently driven by agricultural decline and poverty, families increasingly turn to artisanal mining as a "distress-push" strategy to supplement income and secure essentials like fertiliser and food inputs [3]. Thereby increasing inequality among rural households [4]. In Ghana, for instance, rural households faced deteriorating food security, water quality, and land access due to artisanal mining, but over 75% adopted coping strategies influenced by factors like education, off-farm work, and cooperative involvement [5]. In Nigeria, artisanal mining contributes substantially to livelihoods but often operates informally, resulting in land degradation, deforestation, contaminated water, and weakened regulatory oversight [6][7]. Artisanal mining remains a significant livelihood activity across rural communities in Nigeria, particularly in Kaduna State, where it supports local economies despite considerable environmental and socio-economic trade-offs. These extractive practices degrade arable land, reduce vegetation cover, contaminate water sources, and diminish grazing areas, inflicting serious consequences on household food security and livelihoods [8]. Similarly, the environmental impacts of artisanal mining, such as soil erosion, biodiversity loss, and the depletion of grazing land have exacerbated rural vulnerability and poverty, thereby compelling households to adopt various coping strategies [9] [10] [11] [12]. Households coping strategies include livelihood diversification, adjusted planting schedules, and use of organic inputs, land reclamation, and resettlement in other communities [13] [14]. Likewise, community-based adaptation frameworks in Nigerian settings show how integrating traditional knowledge, agroforestry, and local engagement improves resilience to environmental shocks [15].

However, research specifically examining how rural households in Kaduna State adapt to the multifaceted impacts of artisanal mining remains scant. Understanding such responses is crucial for informing sustainable land reclamation, food

Adaptive Strategy on the impacts of Artisanal Mining among ... Zankan, J. A. A., Et. al. (2026)

security, and rural resilience policies. This study thus explores the adaptive strategies employed by affected households, uncovering how they navigate environmental degradation and resource scarcity in artisanal mining zones.

Materials and Methods

Study Area

Kaduna State is situated in North Central Nigeria, within West Africa. It is one of the 36 states comprising the Federal Republic of Nigeria. Geographically, it lies between latitudes 9°03'N and 11°32'N, and longitudes 6°05'E and 8°38'E, east of the Greenwich Meridian. Covering approximately 46,053 km² about 5% of Nigeria's total land area. Kaduna State shares boundaries with Kano, Katsina, and Zamfara States to the north; Bauchi and Plateau States to the east; Niger State to the west; and both the Federal Capital Territory (FCT) and Nasarawa State to the South. Administratively, the state is divided into 23 local government areas, as illustrated in Figure 1.

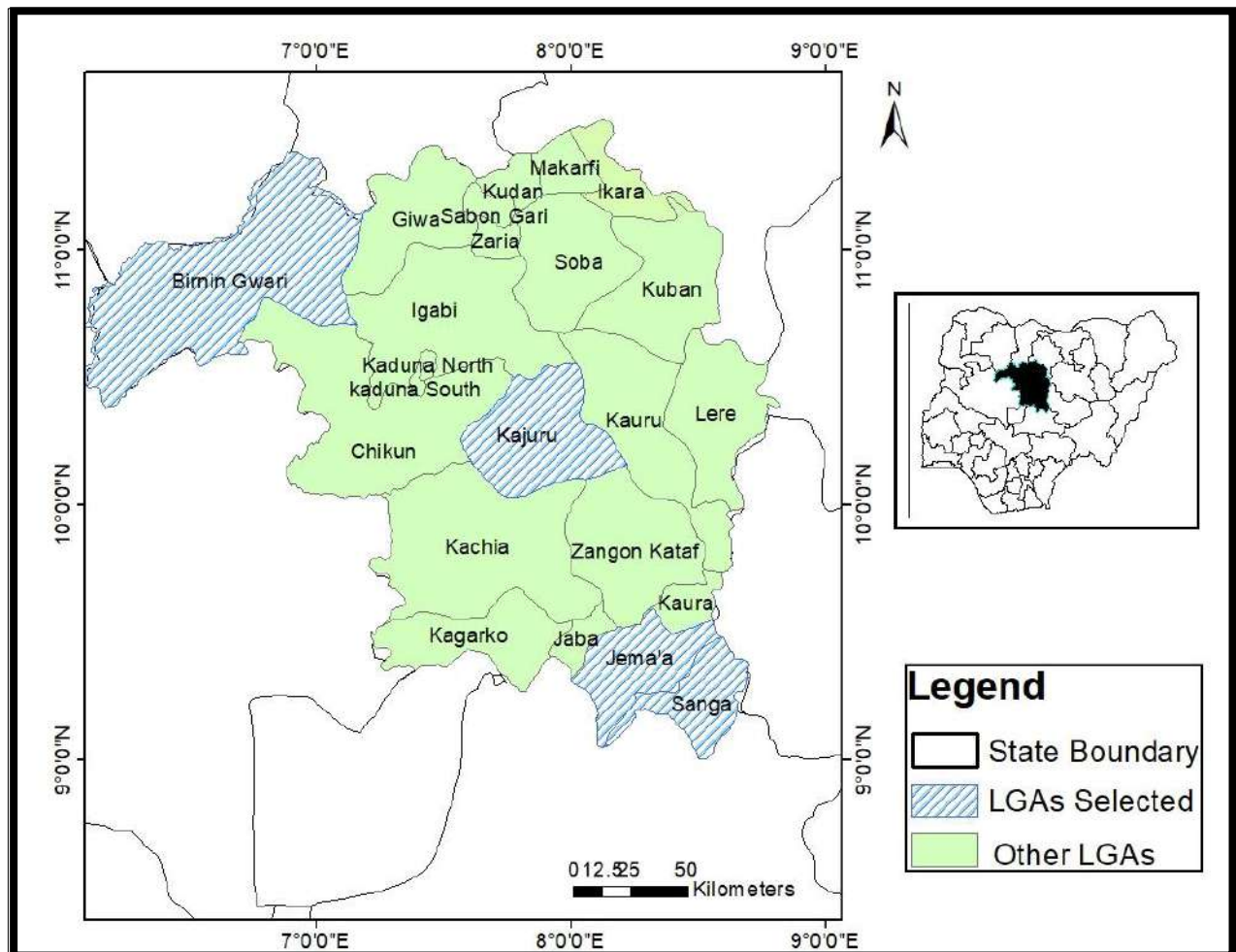


Figure 1: Map of Kaduna State showing the local government Areas selected for the study

Source: GIS Lab, Department of Geography BUK

Kaduna State falls under the AW climate classification according to Köppen, characterized by two distinct seasons: wet and dry. The wet season is longer in the southern part of the state, particularly around Kafanchan and Kagoro, where it typically begins in April and ends in October. In contrast, the northern areas such as Zaria and Makarfi experience a shorter rainy season, similar to that of the Kano region, lasting from mid-May to September [16]. Rainfall generally peaks once annually, usually in August or September. The seasonal patterns are primarily influenced by the interaction between tropical maritime and tropical continental air masses. Annual rainfall in the State shows a decreasing gradient from South to North, with approximately 1,659.44 mm recorded in Kafanchan (south), 1,245.97 mm in Kaduna (central), and 1,016.66 mm in Zaria (north) [16]. On average, the entire State receives about 1,307.36 mm of rainfall annually, with a mean relative humidity of 56.64%. Average minimum and maximum temperatures are 15.1°C and 35.18°C, respectively. Additionally,



Adaptive Strategy on the impacts of Artisanal Mining among ... Zankan, J. A. A., Et. al. (2026)

the orographic influence of the Jos Plateau and Kagoro Hills contributes positively to the climate of the Southern region, enhancing rainfall, moderating temperatures, and increasing relative humidity [17].

The study area is located within Nigeria's Guinea Savanna zone, characterized by relatively high rainfall and limited exposure to frequent bushfires [18]. Geologically, the region is underlain by Pre-Cambrian basement complex rocks, primarily composed of granite, gneiss, migmatite, and quartzite, which support the presence and exploitation of various mineral resources [19]. The dominant economic activities in the area include farming, mining, commerce, animal husbandry, and hunting. The population is culturally diverse, with notable variations in ethnicity, traditions, and social norms. The northern part of the State is predominantly inhabited by Hausa Muslims, while the Southern region is home to a mix of ethnic groups, largely Christian, each with distinct cultural identities.

Data Collection

Data for this study were collected through Focus Group Discussions (FGDs), in-depth interviews, and direct field observations. Households in mining communities were purposively selected, as they are directly impacted by artisanal mining activities and are therefore well-positioned to provide relevant insights and express their concerns. Participants aged 18 and above were included, as individuals at this age are generally considered capable of making independent decisions and participating in both local and national decision-making processes. Four local government areas - Sanga, Jema'a, Kajuru, and Birnin Gwari were purposively selected based on the presence of active artisanal mining operations. Within these areas, participants for the FGDs and in-depth interviews were also purposively chosen from among the local population to ensure relevant and experience-based responses. In each of the four selected local government areas, one Focus Group Discussion (FGD) was conducted with households. Each group consisted of 6 to 10 participants who gathered at a designated location to discuss specific issues and questions relevant to the study. A trained moderator facilitated the discussions, while a note-taker documented participants' responses and operated a voice recorder to ensure accuracy. Additionally, four individual officials associated with local mining activities were purposively selected for in-depth interviews, one from each local government area. These interviews were conducted face-to-face and focused on key topics outlined in the study. Furthermore, the researcher conducted direct field observations to assess the coping strategies adopted by households in response to the impacts of artisanal mining, identify the types of minerals extracted, and observe other related activities within the study area.

Data Analysis

Data for the study were analysed using descriptive statistics with the aid of NVivo Version 11.0, a software tool designed for qualitative and mixed-methods research. NVivo is particularly effective for analysing unstructured data such as text, audio, video, and images. It enables the organisation and condensation of large volumes of qualitative data such as those obtained from interviews, focus group discussions (FGDs), in-depth interviews, and participatory rural appraisals into manageable textual formats. The software allows for efficient transcription, coding, and categorisation of data based on participants' opinions and perceptions, reducing extensive qualitative input into concise, meaningful insights. The results of the analysis were presented in tabular format for clarity and ease of interpretation.

Presentation of Results

Adaptation Strategies to Cope With Shortage of Farmlands due to Mining in Kaduna State

Households in Kaduna State adopt various strategies to boost agriculture on mining-damaged lands, including land clearing, renting farmland, surface mining, planting exotic trees, refilling pits for cultivation, and using fertiliser and animal manure to improve soil fertility (Table 1).

Clearing of abandoned lands for Crop Production

The study found that households in mining communities clear long-abandoned fallow lands for crop production, as their original farmlands have been degraded by mining pits and ponds. This supports findings by [20] and [21], which show that households use non-mined lands to sustain agriculture. These fallow lands, having regained soil nutrients over time, require minimal fertiliser application to enhance crop yields, making them suitable for cultivation and helping households adapt to the impacts of artisanal mining. This is what one of the FGD participants has to say:

“Our farmlands are now mining pits, so we returned to previously abandoned, low-fertility lands. After years of rest, the soil

Adaptive Strategy on the impacts of Artisanal Mining among ... Zankan, J. A. A., Et. al. (2026)

regained nutrients. We cleared and cultivated them, which has greatly helped us feed our families.”

Households now travel long distances to cultivate crops, often relocating to hilly areas, as seen in Gidan Waya and Godo-Godo, due to mining damage to flat lands. This aligns with [22], who observed farmland resettlement into marginal areas. However, hilly terrains experience high surface flow, leading to rapid nutrient loss, reduced soil fertility, and negative impacts on vegetation and wildlife. Additionally, daily removal of watershed areas lowers the water table and increases land exposure to intense sunlight, accelerating evapotranspiration. These environmental changes pose serious challenges to sustainable agriculture in the affected communities.

Table 1: Adaptation Strategies to cope with the effect of Artisanal Mining in the Study area

Strategies to cope with shortage of farmlands	Strategies to cope with shortage of grazing land	Strategies to cope with shortage of water for domestic uses
➤ Clearing of abandoned land for crop production, ➤ Acquisition/renting of land for crop production, ➤ Adoption of surface mining, ➤ Planting of exotic tree species, ➤ Filling up of mining pits and ponds for crop production and ➤ application of fertiliser and animal dropping to improve crop yield	➤ Relocation of herders to new areas, ➤ Filling up of mining pits and ponds, ➤ Acquisition of land mainly for grazing, ➤ Caging livestock, and acquisition of feed for the livestock and ➤ Avoidance of contaminated and polluted water	➤ Heating and filtering of water, ➤ Avoiding polluted and contaminated water, ➤ Provision of wells, and ➤ Treatment of water with chemicals

Source: Field Survey, July, 2021

Table 1 shows different adaptation strategies to cope with the effect of artisanal mining in the mining communities of Kaduna State. *Acquisition/renting of Land for Crop Production*

Many participants noted that households in mining communities often rent or acquire land in non-mining areas for crop production, especially those who have completely lost their farmlands. Some also secure land from neighbours whose land remains unaffected. In certain cases, miners with income from mining activities invest in farming by renting land either within or outside their communities. To cope with the impact of mining, households engage in farming, trading, and labour supply, with mining proceeds often supporting small-scale agriculture [23] [24]. However, mining disrupts agriculture, increasing household vulnerability to hunger and malnutrition due to land loss. Acquiring farmland in distant communities also raises transportation costs. Additionally, some of the land accessed in non-mining areas has poor soil fertility, forcing households to spend more on farm inputs such as fertilisers to improve crop yield, further straining their resources and resilience.

Adoption of Surface Mining

The study participants revealed that in some areas, surface mining is adopted as a strategy to cope with limited agricultural land. This method allows farmers to return to the land after a few years, once soil nutrients are restored. Surface mining involves extracting minerals from the land's surface without digging deep pits, ensuring future agricultural use is not hindered. Prior to mining, agreements are made with miners to avoid creating holes that would obstruct farming. This approach enables landowners to resume crop production after the land recovers. A notable example is in Igboh Ngat, Zankan-Nindem, where surface mining was practiced, and after some years, residents returned to cultivate the land. The method has become a viable option for many households, balancing short-term economic benefits from mining with long-term agricultural use. Surface mining has a lower impact on agricultural lands than underground mining because it avoids creating deep pits that hinder farming. This allows households to continue cultivating their land, enhancing crop production for both personal benefit and the country's food supply. The findings of this study support [25], who highlighted that surface mining can serve as a short-term land use that, with proper reclamation, can be converted back into productive farmland. Surface mining is commonly practiced in hilly, rough terrains where underground mining is not feasible.

Adaptive Strategy on the impacts of Artisanal Mining among ... Zankan, J. A. A., Et. al. (2026)

Planting of Exotic Tree Species

The study found that households in Kaduna State mining communities planted exotic tree species such as *Elaeis guineensis*, *Pterocarpus mildbraedii* (Ameme), *Gmelina arborea*, and *Tectona grandis* to restore soil nutrients, especially in areas affected by surface mining (see plate 1). These trees also serve as income sources for families. For example, *Elaeis guineensis* produces fruits that can be consumed or sold. Additionally, *Gmelina arborea* and *Tectona grandis* yield timber and electric poles, which are harvested and sold to generate income. As one participant explained:

“Sometimes we plant trees like palm, Ameme, Gmelina, and Teak on damaged land to restore it and generate income by selling timber, electric poles, leaves, and oil. These areas then provide us with oil for cooking and timber for roofing our homes.”

In Nisama and Kanufi communities, residents planted trees like *Elaeis guineensis*, *Gmelina arborea*, and *Tectona grandis* on land affected by mining to reclaim the soil and generate income. These plantations now provide significant earnings and oil for the owners. This aligns with [26], who noted that farmers diversify into non-farm and off-farm activities to sustain income in mining areas. Although mining land may no longer be suitable for traditional farming, the trees serve as a long-term resource for future generations. They provide income, timber, and materials to build homes, benefiting even those yet to be born.



Plate 1: Exotic Tree Species Planted in Mining-Affected Areas for Land Reclamation and Income Generation in Kaduna State

Source: Field Survey, January, 2022

Filling up of Mining Pits and Ponds for Crop Production

Some FGD participants observed that in certain mining communities in Kaduna State, households reclaim mined lands by filling pits and ponds for crop production once the soil regains its nutrients. This aligns with [22], who noted that households often restore degraded land post-mining for agricultural use. In areas like Godo-Godo and Gidan Waya, where mining is intensive, farmers and miners sometimes agree beforehand that the pits will be refilled after extraction. Compensation is occasionally paid to farmers, who then hire workers to fill the pits, or miners do it themselves. However, some miners prefer paying others to handle reclamation, as filling pits may delay access to new mining sites. This view was well illustrated by one of the discussants:

“Agriculture sustains humanity, so when mining occurs on our farmlands, we agree with miners to either refill the pits they create or pay us to hire labourers. This ensures the land is reclaimed for farming and other productive uses after mineral extraction”.

To restore land for future crop production, many households in Godo-Godo and Nisama refill mined areas, allowing soil nutrients to recover. This supports [25], who noted that reclaiming degraded mine lands boosts agricultural productivity, narrows crop yield gaps, and promotes food import substitution, especially for staples like rice and wheat.



Adaptive Strategy on the impacts of Artisanal Mining among ... Zankan, J. A. A., Et. al. (2026)

Application of Fertiliser and Animal Dropping

The study found that households in Kaduna State's mining communities apply fertiliser and animal droppings (cow and poultry manure) to boost crop yields. Many of these farmlands have been cultivated for generations and have lost essential nutrients over time. To restore soil fertility, farmers supplement with organic and chemical inputs. This aligns with findings by [27] and the [28], which show that fertilisation and organic inputs improve soil properties, including available phosphorus levels, thereby increasing crop productivity. These efforts have helped households grow more food and cash crops, contributing to food security and supporting their livelihoods. Some individuals used their earnings from mining to purchase farm inputs, such as fertilisers, to enhance crop production in the study area. Additionally, some farmers invited herders to settle their livestock on their farms, allowing animal waste to naturally enrich the soil, thereby improving fertility and supporting increased agricultural output. As noted by a discussant: Due to land shortage and poor soil fertility, I improved crop yield by applying fertilizer, cow and poultry manure, or allowing a herder to graze livestock on my farm temporarily. These methods have significantly enhanced the productivity of the land I cultivate.

Adaptation Strategies to Cope with Shortage of Grazing Land due to Mining in Kaduna State

Households adopted various adaptation and coping strategies to address the shortage of grazing land for livestock. These included relocating herders to new areas, refilling mining pits and ponds, acquiring land specifically for grazing, caging livestock, purchasing animal feed, and avoiding the use of contaminated or polluted water sources.

Relocation of Herders to New Areas

The study shows that livestock owners, especially herders in Kaduna State's mining communities, relocate to areas free of mining pits to protect their animals. In places like Godogodo, Gidan Waya, and Bakin Kogi Kaninkong, mining pits and ponds block livestock movement, forcing herders to migrate. This relocation helps prevent livestock losses and allows animals to graze freely in unaffected areas. As a result, herders can sustain their livestock in safer environments, ensuring continued production of meat and milk, which are important protein sources for the country.

Herders move to areas with abundant vegetation to feed their livestock. This study supports findings by the [29] and [9], linking mining impacts on herder livelihoods to their relocation away from mining pits. Although relocation can lead to competition and conflict over resources in crowded new areas, it allows herders to protect their livestock by moving to safer grazing grounds. One of the participants shared the following insight:

"Because of mining pits, we relocate our livestock to safer areas without wells or ponds to prevent accidents. These new grazing lands have abundant grass, allowing our animals to feed well and move freely, helping us maintain a healthy livestock population".

Filling up of Mining Pits and Ponds

The study revealed that many livestock owners, especially herders in mining communities, fill mining pits and ponds to create more grazing land. Often working through unions like Miyetti Allah or hiring others, they restore these areas to ensure free movement for their livestock. This reclamation effort has required significant financial investment across the study area. In some mining communities, households near mining sites refill pits to prevent losing livestock like pigs, goats, and chickens. Refilling allows their animals to move freely and safely. Livestock provide both income and food, so protecting them is essential. This finding aligns with [9] which noted herders refill mining pits to expand grazing areas and support their livelihoods.

Acquisition of Land mainly for Grazing

The study reveals that some households in Kaduna State's mining communities acquire land specifically for livestock grazing to prevent mining activities in these areas. This strategy helps avoid irregular surfaces caused by mining, ensuring free movement of livestock and reducing the risk of animals falling into pits. Mainly herders with large cattle and sheep herds adopt this practice, as maintaining safe and accessible grazing land is essential for sustaining their livelihoods [30]. For example, Fulani settlements in Bayya and Tafaan Gidan Waya have secured land where mining is prohibited, allowing livestock to graze safely. Grazing is their primary livelihood, so they actively protect these areas from encroachment by mining activities. Such adaptive land-use strategies have been observed in other parts of northern Nigeria, where pastoralists respond to environmental and human-induced land degradation by securing alternative grazing spaces to ensure



Adaptive Strategy on the impacts of Artisanal Mining among ... Zankan, J. A. A., Et. al. (2026)

herd survival [31]. While this helps maintain their herds, herders sometimes still face challenges when moving livestock through mining-affected lands with uneven terrain, risking injury or loss of animals. This highlights the broader impact of artisanal and small-scale mining on pastoral systems, as land degradation and surface instability continue to pose risks to livestock mobility and safety [32].

Caging Livestock

The study shows that households in Kaduna State's mining communities cage their livestock to prevent accidents in mining pits that could cause injury or death. This finding highlights how local herders respond to environmental risks introduced by mining through practical and protective measures. Herders use iron nets or barbed wire to confine animals at night, protecting them from falling into pits and from cattle rustlers, while some also tie the animals' legs to keep them from escaping. These strategies reflect a deliberate effort to minimize both physical and economic losses, enabling herders to continue operating within mining areas with reduced vulnerability and greater confidence in the safety of their livestock [33]. This practice allows herders to stay in mining areas without fear of losing livestock, demonstrating its importance as a livelihood-sustaining mechanism. Additionally, many households build pigpens to cage pigs, further indicating a broader adaptation toward controlled livestock management in hazardous environments. Overall, caging helps families maintain larger herds safely, ensuring their livestock's protection and supporting their livelihoods despite the challenges posed by mining activities. Such adaptive practices underscore the resilience of rural households and their capacity to adjust traditional livestock systems to changing environmental conditions [34].

Acquisition of Feed for the Livestock

The study reveals that rural households in Kaduna State acquire livestock feed to prevent animals from wandering into mining areas. They often purchase maize or cowpea chaff (crop residues) to keep animals like chickens, goats, pigs, and sheep safely at home. Herders also adopt this practice, especially during the dry season when bushfires destroy grasses. To manage this, they store feed from the harvest period for use during food scarcity. This aligns with [35], who noted that crop residues are a key feed source for smallholder livestock farmers. Without stored feed, livestock may roam into abandoned mining sites in search of grazing, risking injury or death from falling into pits. By providing feed, households reduce such risks and better manage their animals, ensuring both safety and productivity despite environmental challenges caused by mining. The practice of acquiring livestock feed is common even in non-mining communities, especially during periods of scarcity. Rural households buy or gather feed to keep animals confined and safe, as free roaming can lead to theft, poisoning, or accidents, including falling into pits. To cope with feed shortages, farmers adopt various strategies such as switching feed types based on availability and cost, bulk purchasing, using crop or food waste, harvesting naturally growing forage, and reducing herd size [36]. These measures help protect livestock and sustain production during challenging times.

Avoiding Contaminated and Polluted Water

The study reveals that rural households in Kaduna State's mining communities avoid letting their livestock drink polluted water from rivers and streams, which may contain harmful chemicals like mercury used in mining. To protect their animals' health, herders take precautions, as livestock are vital to their livelihood. If animals accidentally drink contaminated water, they are given medical treatment upon return. Some herders also provide potash to aid digestion and maintain livestock health. These practices help reduce disease and death among animals, allowing households to sustain their herds with fewer challenges despite the environmental risks posed by mining activities. This was further emphasised by one of the participants: "We avoid polluted or contaminated water to keep our livestock healthy. If they happen to drink such water, we provide immediate treatment once they return from the field. Additionally, we use potash to aid their digestion and ensure their overall well-being."

Adaptation Strategies to Cope with Shortage of Water for Domestic Uses in Kaduna State

Water pollution affects rural households relying on natural sources like rivers and streams. In Kaduna State's mining communities, households adapt by heating and filtering water, avoiding polluted sources, digging wells, and using chemical treatments to ensure safe water for domestic use despite contamination and scarcity.

Adaptive Strategy on the impacts of Artisanal Mining among ... Zankan, J. A. A., Et. al. (2026)

Heating and Filtering of Water

The study shows that rural households in Kaduna State's mining communities heat and filter water from rivers and streams for drinking and cooking due to pollution caused by mining. As most communities lack access to clean, potable water, residents rely on traditional methods like boiling and filtering to ensure water safety and protect their health. Many households walk long distances to fetch water, highlighting the scarcity of safe water sources. This finding aligns with [37], who reported that traditional hygiene practices remain common in rural areas with limited access to improved water supply systems. Many households collect water from streams and rivers but often dig shallow holes beside the stream channels to reduce contamination risk. However, during flooding, the streams overflow, contaminating these sources. Heating and filtering remain effective water treatment methods, helping households access safer water for drinking and other domestic needs. One discussant clearly illustrated this point, stating: Since mining has contaminated most of our water sources and alternatives are lacking, we heat and filter the water before use to prevent illness. Without doing so, we risk contracting diseases from consuming untreated water.

Avoiding Polluted and Contaminated Water

The study reveals that households in Kaduna State's mining communities often avoid using contaminated river and stream water by sourcing cleaner water elsewhere. Instead of spending time boiling polluted water, many prefer collecting water from nearby communities with open wells or boreholes. This approach helps save time and reduces health risks. Some households, especially those with motorcycles or vehicles, transport water back home for drinking, cooking, and washing. During the dry season, they also dig shallow pits near cleaner stream channels to collect water. This finding aligns with [38], who observed that women adopt coping strategies such as sourcing water from safer neighboring communities, differentiating water use for specific purposes, and harvesting rainwater. These efforts highlight how households adapt to water contamination challenges by finding safer and more practical alternatives to meet their domestic water needs.

Provision of Wells

The study shows that households in Kaduna State's mining communities cope with water shortages by providing wells and boreholes for domestic use. In communities like Godo-Godo, residents collectively taxed themselves to fund borehole installation. Others locate nearby areas with underground water to dig open wells for communal use. Some households also dig wells on their farms to access water for consumption and for spraying herbicides and insecticides. These efforts reduce reliance on polluted water sources. Additionally, boreholes provided by politicians during election campaigns have improved water access in some areas, easing the struggle for safe domestic water. This finding reflects the broader situation in rural Nigeria, where communities rely heavily on self-help and local adaptation strategies to address water scarcity and pollution, especially in mining-affected areas [39]. The collective effort seen in Godo-Godo highlights the importance of community participation in providing basic infrastructure where government support is limited. Moreover, the dependence on wells and boreholes shows a shift away from contaminated surface water sources, which are often affected by mining activities. However, the use of farm wells for both domestic and agricultural purposes may pose risks of contamination from chemicals and mining pollutants. Studies have shown that mining activities in Kaduna State contribute significantly to water pollution, thereby forcing households to seek safer alternatives such as groundwater sources [8]. The role of politicians in providing boreholes during election campaigns also suggests that access to water infrastructure can be influenced by political factors rather than sustainable planning. While such interventions improve access in the short term, they do not fully address the long-term challenges of water supply in these communities. Overall, the strategies identified in the study demonstrate resilience among households but also reveal ongoing challenges in achieving sustainable and safe water access.

Treatment of Water with Chemicals

Some FGD participants reported that households in Kaduna State's mining communities treat water with chemicals like alum to improve its quality before consumption. Pollution and water shortages have forced them to adopt this method to remove impurities and reduce harmful germs, lowering the risk of diseases such as typhoid and cholera. The use of water treatment appliances supports improved water supply [37]. However, the amount of chemicals used is often unregulated



Adaptive Strategy on the impacts of Artisanal Mining among ... Zankan, J. A. A., Et. al. (2026)

due to a lack of proper treatment facilities, posing potential health risks. Additionally, some households skip water treatment because they cannot afford the chemicals, increasing their vulnerability to waterborne illnesses.

Conclusion

Artisanal mining significantly impacts various aspects of household life, compelling many families to seek alternative sources of livelihood. These activities pose serious threats, including the loss of agricultural land and domestic water sources, destruction of vegetation, and increased risk of injuries or fatalities. Social consequences such as school dropouts, early pregnancies, and child marriages are also prevalent. In response, households in affected communities have adopted a range of coping strategies. These include saving money, starting small businesses, building houses for personal use or rental income, and cultivating economically valuable trees such as *Elaeis guineensis*, *Gmelina arborea*, and *Tectona grandis* for future benefit. Additional strategies involve avoiding polluted water sources by using sachet or treated water, relocating herders, reclaiming mining pits and ponds, and steering clear of underground mining during the rainy season. These adaptive measures have enabled many households in mining communities of Kaduna State to endure the adverse effects of artisanal mining. The study recommends that both households and government authorities actively engage in land reclamation and the rehabilitation of underground mining sites for agricultural purposes as a long-term strategy to enhance food security and ensure environmental sustainability.

References

1. Huamaní, J.C. Palomino Aroni, C.J. Calderon Vilca, H.D. León Vicencio, J.L. Suvo Cruz, G. Pinto Pagaza, D.A. Mamani Huillca, B.O. Orós Torres, W. Pinto Boda, S.R. Contreras Salas, L. (2026). Environmental impact of mining and its social responsibilities on rural communities. *Global J. Environ. Sci. Manage.* 12(1): 207-228, Winter 2026
2. Teku, D. (2025). Geo-environmental and socio-economic impacts of artisanal and small-scale mining in Ethiopia: challenges, opportunities, and sustainable solutions. *Front. Environ. Sci.*, 28 (2025), Sec. Environmental Policy and Governance. Volume 13 - 2025 <https://doi.org/10.3389/fenvs.2025.1505202>
3. Ofosu, G. Dittam, A. Sarpong, G and Botchie, G. (2020). Socio-economic and environmental implications of Artisanal and Small-scale Mining (ASM) on agriculture and livelihoods. *Environmental Science & Policy* 106(4):210-220, DOI: [10.1016/j.envsci.2020.02.005](https://doi.org/10.1016/j.envsci.2020.02.005)
4. Shiquan, D. Amuakwa-Mensah, F. Deyi, X. Yue, C and Yue, C. (2022). The impact of mineral resource extraction on communities: How the vulnerable are harmed. *The extractive Industries and Society*. Volume 10 June 2022, 101090
5. Seiba, I and Franklin, NM. (2022). Artisanal small scale mining: Farm household welfare and coping strategies in Asutifi North district of Ghana. *African Journal of Rural Development*. Vol. 7, Issue 3(2022)361-381.
6. United Nation Development Program. (UNDP, 2023). Beaming the Light on a Hidden Sector: Artisanal and Small-scale Mining (ASM) as a vital sector for sustainable development in Nigeria. UNDP Nigeria
7. Goji, RA and Bala, TP. (2019). Effects of Artisanal Mining on Land Degradation in Zamfara North-West, Nigeria. *ALSY4*(6):882-894, DOI: [10.58578/alsys.v4i6.4093](https://doi.org/10.58578/alsys.v4i6.4093)
8. Zankan, JAA; Abubakar, MY; Zankan, HP; Yusuf, JA. (2025). "Impact of Artisanal Mining on Environmental Sustainability and Resource Management in Kaduna State, Nigeria". *Asian Journal of Environment & Ecology* 24 (4):75-88. <https://doi.org/10.9734/ajee/2025/v24i4681>.
9. Zankan, J. A. A., Abdul, I., Mande, A. J., and Abdul, H. A. (2022). Livelihood implication of artisanal mining on herders in Jema'a and Sanga Local Government Areas of Kaduna State, Nigeria. *African Journal of Social Sciences and Humanities Research*, 5(5), 27–47. <https://doi.org/10.52589/AJSSHRF4SHZ0HD>
10. Oshim, FO. Ijeh, EC. Amaefule, WA. Ayajuru, NC. Amaefule, EO. Anumaka, CC. (2024). Socioeconomic and Environmental Impacts of Quarrying in Nigeria: A Comprehensive Review of Sustainable Quarrying Practices and Innovative Technologies. *Economics*. DOI: <https://doi.org/10.51244/IJRSI.2024.1106026>
11. Fagariba, C. J, Sumani, J. B.B and Mohammed, A. S. (2024). Artisanal and Small-Scale Gold Mining Impact on Soil and Agriculture: Evidence from Upper Denkyira East Municipality, Ghana. *European Journal of Environment and Earth Sciences Vol 5, Issue 3, May 2024*
12. Donkor, A.K.; Ghoveisi, H. Bonzongo, J.C.J. (2024). Use of Metallic Mercury in Artisanal Gold Mining by Amalgamation: A Review of Temporal and Spatial Trends and Environmental Pollution. *Minerals* 2024, 14, 555. <https://doi.org/10.3390/min14060555>
13. Hassan, B.A and Knight, J. (2023). Adaptation to Climate Change and Variability by Farming Households in North-Central Nigeria. *Sustainability* 2023, 15(23), 16309; <https://doi.org/10.3390/su152316309>

Adaptive Strategy on the impacts of Artisanal Mining among ... Zankan, J. A. A., Et. al. (2026)

14. Mabe, FN, Issifu, S, Wongnaa, CA. (2024). Farmers' coping strategies to artisanal small-scale mining activities: welfare improvement or deterioration in Asutifi North District of Ghana?. *Journal of Economics and Development*, Vol. 26 No. 1, 2024
15. Akinkuolie T.A, Ogunbode T.O and Adekiya A.O (2025). Resilience to climate-induced food insecurity in Nigeria: a systematic review of the role of adaptation strategies in flood and drought mitigation. *Front. Sustain. Food Syst.* 8:1490133. doi: 10.3389/fsufs.2024.1490133
16. Abaje, I. B, Achiebo, P. J and Matazu, M. B. (2018). Spatio-Temporal Analysis of Rainfall Distribution in Kaduna State, Nigeria. *Ghana Journal of Geography* Vol. 10(1): 1–21
17. Ishaya, S. and Abaje, I. B. (2008). Indigenous People's Perception on Climate Change and Adaptation Strategies in Jema'a LGA, Kaduna State, Nigeria: *Journal of Geography and Regional Planning*, Vol. 1(8) 138-144
18. Buba, T. (2015). Impact of Different Species of Different Sizes on Spatial Distribution of Hebeaceous Plants in the Nigeria Guinea Savanna Ecological Zone. *Journal of Sceintifica Research* Vol 2015
19. Nigeria Mining and Metal Sector. (NMMS, 2017). Investment Promotion Brochure October 2017. Ministry of Steel and Development
20. Gadzama, I. U. (2015). Effect of Participation in Artisanal and Small-Scale Mining on the Output, Income and Standard of Living of Farmers in Kaduna State, Nigeria: An Unpublished Ph. D Thesis Submitted to the School of Postgraduate Studies Ahmadu Bello University, Zaria, Kaduna State, Nigeria
21. Bargoria, F. K, Barasa, F, Chebet. P. S. (2020). Adaptive Livelihood Strategies among Households after the Closure of Fluorspar Mining Company in Keiyo South Sub-County, Elgeyo Marakwet County, Kenya. *Sociology and Anthropology* 8(6): 178-186, 2020. DOI: 10.13189/sa.2020.080602
22. Ontoyi, J and Agyemang, I. (2014). Environmental and Rural Livelihoods Implication of Small-scale Gold Minng in Talensi-Nabdam District of Northern Ghana. *Journal of Geography and Regional Planning*, Vol. 7, 8(2014) 150-159
23. Mabe, FN, Owusu-Sekyere, E and Adeosun, O. (2021). Livelihood coping strategies among displaced small scale miners in Ghana. *Resources Policy* 74(20):102291, [DOI:10.1016/j.resourpol.2021.102291](https://doi.org/10.1016/j.resourpol.2021.102291)
24. Baddianaah, I, Tuu, G. N, and Baatuuwie, B. N. (2021). Livelihood implications of artisanal gold mining in farming communities: insight from the Wa East District, Ghana. *Ghana Journal of Geography* Vol. 13 Issue 3(2021) 85-120
25. Gilbert, G and Albert, O. (2016). Illegal Small-Scale Gold Mining in Ghana: A Threat to Food Security. *Journal of Food Security*, 2016, Vol. 4, No. 5, 112-119
26. Danquah, I. B. Fialor, S. C and Aidoo, R. (2017a). Vulnerability of Rural Livelihoods to the Effects of Mining: a case study of Amansie West District of Ghana. *International Journal of Economics, Commerce and Management United Kingdom* Vol. 5, Issue 3(2017)29-55
27. Cao, Y, Zhou, B. Wang, X. Meng, H. Zhang, J. Li, L and Hong, J. (2020). Different fertilization treatments in coal mining-affected soils change bacterial populations and enable soil reclamation. *Annals of Microbiology* (2020) 70:47 <https://doi.org/10.1186/s13213-020-01589-2>
28. United Nation. (2019). Improved soil carbon, soil health and soil fertility under grassland and cropland as well as integrated systems, including water management. Workshop report by the secretariat
29. World Bank. (2009). Potential Social Impacts of Mining Development in Southern Mongolia, World Bank, Washington, DC.siteresources.worldbank.org
30. Kardam, MS Babayo, A and Abubakar, A. (2022). Geospatial-based approach to siting suitable cattle ranch in Bauchi state, Nigeria. *International Journal of Science and Research Archive*, 2022, 07(01), 098–114
31. Ibrahim, SS, Ozdeser, H and Cavusoglu, B. (2019). Vulnerability to recurrent shocks and disparities in gendered livelihood diversification in remote areas of Nigeria. *Environ Sci Pollut Res Int.* 2019 Jan;26(3):2939-2949. doi: 10.1007/s11356-018-3854-5.
32. Mussa, M. Hashim, H and Teha, M. (2016). Rangeland Degradation: Extent, Impacts, and Alternative Restoration Techniques in the Rangelands of Ethiopia. *Tropical and Subtropical Agroecosystems*, 19 (2016): 305 - 318
33. Abdullahi, S., & Musa, I. (2025). *Livelihood adaptation strategies in mining-affected communities in Northern Nigeria*. *Journal of Rural Development Studies*, 18(2), 45–59.
34. Olatunji, R., Bello, A., & Yakubu, M. (2026). *Environmental risks and livestock management practices in artisanal mining regions of Nigeria*. *African Journal of Agricultural Sustainability*, 11(1), 72–88.
35. Ayantunde A.A., Fernández-Rivera S. and McCrabb G. (eds). 2005. Coping with feed scarcity in smallholder livestock systems in developing countries. Animal Sciences Group, Wageningen UR, Wageningen, The Netherlands, University of Reading, Reading, UK, ETH (Swiss Federal Institute of Technology), Zurich, Switzerland, and ILRI (International Livestock Research Institute), Nairobi, Kenya. 306 pp.



Adaptive Strategy on the impacts of Artisanal Mining among ... Zankan, J. A. A., Et. al. (2026)

36. Katongole, C. B. Nambi-Kasozi, J. Lumu, R. Bareeba, F. Presto, M. Ivarsson, E and Lindberg, E. K. (2012). *Strategies for coping with feed scarcity among urban and pen-urban livestock farmers in Kampala, Uganda. Journal of Agriculture and Rural Development in the tropics and Subtropics* 113(2):165-174
37. [Fan L, Liu G, Wang F, Geissen V, Ritsema C. J. \(2013\). Factors Affecting Domestic Water Consumption in Rural Households upon Access to Improved Water Supply: Insights from the Wei River Basin, China. PLoS ONE 8\(8\): e71977. <https://doi.org/10.1371/journal.pone.0071977>](#)
38. Makwerere, D. Chinzete, G. T and Massimo, C. (2018). Accessing Good Quality Water in Hazardous Mining Environments: Coping Mechanisms for Young Women in Selected Districts of Mashonaland Central, Zimbabwe. *Global Journal of Pure and Applied Sciences* Vol. 24, 2018: 181-189
39. Zankan, J. A. A., Yusuf, J. A. and Dargak P. P. (2025b). Miners Adaptation Strategies on Impact of Artisanal Mining Activities Among Rural Communities in Kaduna State, Nigeria. *Zamfara International Journal of Sci. Tech. Educ. & Mathematics*. Volume 2, Number 3S(2025) 117-127



Impact of Quality Assurance Practices on Provision of ... Gom. J. W., Et. al. (2026)

Impact of Quality Assurance Practices on Provision of Funds, Infrastructural Facilities and Maintenance of Discipline among Public Secondary Schools in Benue State, Nigeria

GOM, Joseph Wase¹

ORTSA, Gabriel Mhenbee¹

PINGA, Mahmud¹

+2347038651067; +2349068215944

mpinga@bsum.edu.ng; mahmudpinga@gmail.com

¹Department of Educational Foundations, Faculty of Education, Rev. Fr. Moses Orshio Adasu University, Makurdi

Abstract

This study investigated the impact of quality assurance practices on management of public secondary schools in Benue State, Nigeria. The purpose of the study was to investigate the impact of quality assurance on management of public secondary schools. Three research questions guided the study and three null hypotheses were formulated and tested at 0.05 level of significance. The study adopted a descriptive survey research design. The study population consisted of 6,001 teachers from 226 public secondary schools. A sample of 600 respondents was taken from 23 public secondary schools using multi-stage sampling procedure. Quality Assurance Questionnaire (QAQ) was validated by three experts and a trial test was conducted using Cronbach's Alpha, with a reliability coefficient of 0.88. Mean and standard deviation were used to answer the research questions. Chi-Square test of goodness-of-fit was used to test the hypotheses at 0.05 level of significance. The result showed that quality assurance practices has significant positive impact on the provision of funds, infrastructural facilities and maintenance of discipline in public secondary schools in Benue State. The study concluded that quality assurance practices is vital to the effective management of public secondary schools in Benue State, significantly influencing the provision of funds, infrastructure and maintenance of discipline. Without deliberate improvement efforts, educational standards may decline, leading to systemic failure and jeopardizing students' futures. Based on the study's findings, it was recommended, among other things, that government and education stakeholders enhance quality assurance practices to promote transparency and performance-based funding in public secondary schools. Education authorities should make more efforts to implement regular quality assurance practices assessments to guide the equitable and need-based allocation of infrastructural resources. This will ensure that facilities are not only provided but also meet safety, accessibility and learning-conducive standards across all public secondary schools.

Keywords: *Quality Assurance practices, Management, Funds, Infrastructural Facilities & Maintenance of Discipline*

Introduction

The management of secondary schools remains a critical factor in achieving educational success because it shapes students' academic outcomes and the overall effectiveness of school operations. Effective management largely depends on key administrative responsibilities, including providing funds, infrastructural facilities, maintaining discipline and effective communication, all of which contribute to creating a stable and supportive environment for teaching and learning (Johnson, 2022). However, the situation has become increasingly worrisome across many parts of the world as these fundamental elements of school management continue to face serious challenges. For instance, in the United States, several public schools struggle with disparities in school funding, aging infrastructure and inconsistent supervision of instructional activities, particularly in underserved districts. Similarly, schools in the United Kingdom have faced persistent concerns related to funding constraints, overcrowded facilities and increasing disciplinary issues among students, which have placed significant pressure on school administrators (Thompson & Lee, 2024). The challenge is also evident in developing countries such as India, where many schools continue to experience inadequate infrastructural facilities, limited financial resources, weak communication structures and insufficient supervision of teaching activities, especially in rural and government-owned schools (Kingdon, 2017; ASER Centre, 2022). In Africa, countries like Ghana and Cameroon appear to be facing increasingly challenging situations as administrators struggle to effectively coordinate critical aspects of school management for achieving educational goals. These challenges are often intensified by rapidly growing student populations, limited financial resources and prevailing socio-economic instability across many African countries, thereby placing significant pressure on school management systems (Adams & Osei, 2023). As governments attempt to expand access to secondary education, many schools are forced to operate with inadequate funding, insufficient classrooms and learning facilities and weak communication channels among stakeholders, all of which undermine effective school

Impact of Quality Assurance Practices on Provision of ... Gom. J. W., Et. al. (2026)

administration (Kumar & Yeboah, 2023). This situation is particularly evident in Nigeria, where irregular provision of funds, persistent infrastructural deficits and poor maintenance of discipline continue to create serious obstacles for the effective management of secondary schools (Bello & Aliyu, 2024). These problems are further aggravated by diverse and often under-resourced school environments that make it difficult for administrators to sustain quality management practices and achieve desired educational outcomes (Okonkwo & Ibrahim, 2024). Management refers to the process of planning, organizing, directing, coordinating and controlling an organization's human, financial and material resources to achieve stated goals effectively and efficiently (Pinga, Okpe & Ajoji, 2021). It involves the systematic coordination of activities and resources to ensure that organizational objectives are realized in a structured and productive manner. In the school system, management involves responsibilities such as developing academic programmes, allocating and utilizing funds, providing instructional materials and facilities, maintaining discipline, fostering communication with relevant stakeholders and supervising instructional activities to ensure a conducive learning environment. Effective management, therefore, requires strategic vision, sound organizational skills and strong leadership abilities to align all components of an institution toward the attainment of common goals (Kotter, 2022). It also involves the implementation of policies and procedures that guide daily operations, address emerging challenges and enhance institutional effectiveness. According to Daft and Marcic (2024), management further includes monitoring performance, making informed decisions based on available data and adjusting strategies to meet changing demands and expectations. For example, a school principal may apply management skills to improve declining student performance by analyzing academic records, reallocating resources and introducing improved teaching strategies. This dynamic process enables schools to respond effectively to both internal and external changes while promoting productivity and educational effectiveness (Northouse, 2023). Consequently, educational managers are expected to establish and maintain internal mechanisms that ensure instructional and administrative practices conform to acceptable standards and educational goals. Such mechanisms aimed at maintaining and improving standards in education are commonly referred to as quality assurance.

Generally, quality assurance practices are the process of ensuring that products, services, or processes consistently meet specified standards and satisfy customer or stakeholder requirements (Evans, 2018). Quality assurance practices in education refers to the systematic and continuous process of ensuring that educational inputs, processes and outcomes meet established standards and contribute to the attainment of educational goals. It involves monitoring, evaluating and improving various components of the school system such as the provision of funds, infrastructural facilities, discipline, communication, teaching and learning processes and supervision in order to maintain acceptable standards (Amzua, 2020). According to Okebukola (2018), quality assurance is a proactive process of maintaining and improving educational standards through effective supervision, monitoring and adherence to established guidelines in the education system. Similarly, Babalola (2018) describes quality assurance practices as the systematic management and evaluation of educational resources and processes to ensure efficiency and improved learning outcomes in schools. In the Nigerian context, Asiyai (2015) explains that quality assurance practices involve the use of policies, monitoring mechanisms and supervisory practices designed to ensure that schools maintain acceptable standards in infrastructure, teaching, discipline and administration. These perspectives indicate that quality assurance practices are essential for promoting accountability, improving school management practices and ensuring that educational institutions consistently deliver quality education. Quality assurance (QA) plays a critical role in enhancing school management by introducing systematic processes for evaluating and refining educational practices. Quality assurance practices frameworks facilitate regular assessments and audits that provide valuable insights into school performance and areas needing improvement (Lee & Chen, 2023). These assessments help school managers identify gaps in service delivery, streamline operations and implement evidence-based improvements. This means that QA mechanisms such as performance reviews and stakeholder feedback can guide administrators in adjusting curricula, optimizing resource use and improving teaching strategies, thus supporting the overall effectiveness of school management (Smith, 2024). By integrating QA practices, schools can create a culture of continuous improvement, ensuring that management practices are consistently evaluated and enhanced to meet educational goals (Johnson & Williams, 2023). In school settings, quality assurance practices are crucial for fostering an environment of continuous improvement and accountability. It involves systematic reviews and audits to identify strengths and weaknesses in teaching and learning processes (Morris & Green, 2024). When effectively implemented, quality assurance enables school management and authorities to ensure that all essential elements for the efficient administration of schools are adequately provided. According to Lee (2023), areas of school administration that can be positively influenced by quality

Impact of Quality Assurance Practices on Provision of ... Gom. J. W., Et. al. (2026)

assurance practices include the provision of funds, infrastructural facilities, instructional materials, teacher recruitment and training, communication and discipline maintenance. However, for this study, the focus is on key variables such as the provision of funds, infrastructural facilities and maintenance of discipline, as these may enhance the overall management of secondary schools.

Provision of funds refers to the allocation and disbursement of financial resources by an organization or authority to support specific activities, projects, or operational needs (World Bank, 2017). Adequate provision of funds enables schools to invest in essential infrastructure, instructional materials and teacher training, all of which are necessary for delivering quality education. According to Adewale (2020), without sufficient funding, schools are unable to meet the benchmarks set by quality assurance practices frameworks, leading to compromised educational outcomes and a decline in the overall learning environment. Moreover, Nwankwo (2018) highlights that schools with consistent funding are better positioned to implement policies that support effective teaching and learning, ensuring that standards are maintained across the board. However, Nwankwo (2018) notes that insufficient funding often leads to a lack of essential infrastructure and other educational materials, which significantly impedes schools' ability to meet quality assurance benchmarks. Without adequate financial resources, schools struggle to maintain facilities, provide up-to-date learning materials and support necessary teacher training, all of which are vital for sustaining educational standards. Conversely, Adewale (2020) argues that even when funds are not enough, strategic resource allocation and effective financial management can enable schools to achieve quality assurance goals, though these efforts are often accompanied by certain limitations. Meanwhile, Olatunji (2019) highlights that in developing countries, such as Nigeria, with particular reference to Benue State, funding gaps remain a major challenge to quality assurance. These financial constraints result in poorly maintained facilities and inadequate teacher training programmes, further exacerbating the difficulties in meeting quality assurance standards. The provision of funds is crucial, but its effectiveness in supporting quality assurance practices depends on how well it is used, especially in providing adequate infrastructural facilities for conducive learning.

Provision of infrastructural facilities refers to the planning and development of physical and organizational structures, such as buildings, classrooms and utilities, necessary to support effective operations and service delivery (Okebukola, 2018). Provision of adequate infrastructural facilities, such as classrooms, staff offices, laboratories, libraries, student hotels and staff quarters, may directly impact the quality of teaching and learning, thereby improving the standard of education. According to Eze (2020), schools that are adequately equipped with and supported by well-maintained infrastructure are more likely to achieve improved educational performance, as conducive learning environments enhance both teaching effectiveness and student learning processes. Conversely, Oduh (2019) argues that poor or inadequate infrastructure often results from weak quality assurance mechanisms, where inadequate monitoring and evaluation contribute to the deterioration of school facilities. Additionally, Adams and Bello (2021) emphasize that in developing continents such as Africa, where Nigeria is located, inadequate infrastructural development severely impedes the implementation of quality assurance practices, as schools struggle to meet basic standards of safety, functionality and effective learning conditions. Ogundipe (2020) reports that while infrastructural facilities are important, their effective use determines the success of quality assurance practices, which must also be reinforced through the maintenance of school discipline.

Maintenance of discipline refers to the enforcement of rules and regulations guiding students' and staff behaviour to ensure an orderly and conducive environment for an effective teaching and learning process (Torundu, 2020). In this framework, discipline is regarded as a key requirement for achieving educational objectives, as orderly conduct enhances instructional delivery and student learning process. Johnson (2021) reports that quality assurance practices such as regular supervision, clear operational guidelines and continuous monitoring of school activities help to strengthen discipline among students and teachers, thereby fostering a structured academic environment. Supporting this view, some scholars such as Awua (2020) and Adagbe (2023) argue that when quality assurance mechanisms are effectively implemented, schools are better able to minimize lateness, truancy, absenteeism and other forms of misconduct, including examination malpractice, as expectations are clearly defined and consistently enforced. However, Adeola (2020) contends that where quality assurance systems are weak or poorly implemented, disciplinary standards tend to decline, often leading to absenteeism, indiscipline and general disorganization in schools. Mukherjee (2019) further adds that although quality assurance frameworks provide standards for acceptable behaviour, their effectiveness depends largely on the commitment and consistency of school administrators in enforcing such rules and regulations in secondary schools.

Impact of Quality Assurance Practices on Provision of ... Gom. J. W., Et. al. (2026)

The management of public secondary schools in Benue State, Nigeria, appears to be facing a series of interconnected challenges that may have been undermining educational standards and the implementation of quality assurance practices. Today, insufficient funding seems to remain a persistent barrier, limiting schools' ability to maintain adequate infrastructure and procure essential resources for the effective teaching and learning process (Nwankwo, 2018). Even though strategic allocation of resources may help alleviate some of these constraints (Adewale, 2020), many schools continue to operate under conditions that hinder the delivery of high-quality education, thereby perpetuating a cycle of neglect and substandard performance. Compounding these financial and infrastructural challenges are weaknesses in maintaining discipline in schools, where students and teachers often fail to adhere to established rules with minimal discipline (Adeyemi, 2019). Such lapses in discipline can further contribute to persistent gaps in school performance and overall institutional effectiveness. The convergence of these factors appears to have created a worrisome educational situation in which students are deprived of the quality of education they deserve and schools struggle to meet national standards. It is against this background that these researchers investigated the impact of quality assurance practices on management of public secondary schools in Benue State, Nigeria, focusing on the critical areas of provision of funds, provision of infrastructural facilities and maintenance of discipline.

Statement of the Problem

Ideally, public secondary schools in Benue State are expected to provide a well-resourced, orderly and supportive learning environment, where adequate funding, modern infrastructure and effective discipline work together to uphold educational standards and ensure the quality of education. However, observations from stakeholders and preliminary assessments reveal a deeply worrying reality. Academic performance among learners appears to be declining, students' moral behavior is increasingly questionable and the management of secondary schools appears to address these issues effectively. This failure not only prevents schools from meeting expected educational standards but also allows conditions to deteriorate further, creating a troubling cycle of declining discipline, poor learning outcomes and weakened institutional effectiveness. All these may have been caused by inadequate funding, which severely limited schools' ability to maintain essential infrastructure, offer competitive teacher salaries and provide ongoing professional development, resulting in outdated classrooms, neglected laboratories and poorly equipped libraries that undermine the teaching and learning process. The poor state of infrastructure further exacerbates this problem, as many schools operate with dilapidated buildings and insufficient amenities, making it exceedingly difficult to implement quality assurance measures effectively. In addition, weak maintenance of discipline appears to have created chaotic learning environments characterized by absenteeism, outdated teaching practices and general mismanagement. The interplay of these challenges, insufficient funds, substandard facilities and poor discipline highlights a serious management crisis that threatens the realization of quality education. In view of these concerning conditions, it has become imperative for the researchers to investigate the impact of quality assurance on management of public secondary schools in Benue State, focusing specifically on the provision of funds, provision of infrastructural facilities and maintenance of discipline to identify strategies for improving educational standards and outcomes.

Purpose of the Study

The purpose of the study was to investigate the impact of quality assurance practices on the management of public secondary schools in Benue State, Nigeria. Specifically, the study sought to:

1. find out the impact of quality assurance practices on the provision of funds in public secondary schools in Benue State.
2. determine the impact of quality assurance practices on the provision of infrastructural facilities in public secondary schools in Benue State.
3. examine the impact of quality assurance practices on the maintenance of discipline in public secondary schools in Benue State.

Research Questions

The following research questions were raised to guide the study:

1. What is the impact of quality assurance practices on the provision of funds in public secondary schools in Benue State?
2. What impact does quality assurance practices have on the provision of infrastructural facilities in public secondary schools in Benue State?



Impact of Quality Assurance Practices on Provision of ... Gom. J. W., Et. al. (2026)

3. What is the impact of quality assurance practices on the maintenance of discipline in public secondary schools in Benue State?

Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance:

1. Quality assurance practices has no significant positive impact on the provision of funds in public secondary schools in Benue State.
2. Quality assurance has no significant positive impact on the provision of infrastructural facilities in public secondary schools in Benue State.
3. Quality assurance has no significant positive impact on the maintenance of discipline in public secondary schools in Benue State.

Research Methodology

This study was carried out in public secondary schools in Benue State, Nigeria, and adopted a descriptive survey research design. The study population consisted of 6,001 teachers from 226 public secondary schools. A sample of 600 teachers was taken from 23 public secondary schools, using a multi-stage sampling procedure (purposive sampling, proportionate stratified sampling and simple random sampling techniques). Quality Assurance Questionnaire (QAQ) was used for data collection. The instrument was divided into two sections: A and B. Section A included items on respondents' personal data. Section B was split into three clusters: Cluster I (Items 1-5) focused on the impact of quality assurance on the provision of funds in public secondary schools. Cluster II (Items 6-10) concentrates on the impact of quality assurance practices on the provision of infrastructural facilities in public secondary schools, while Cluster III (Items 11-15) addresses the impact of quality assurance practices on the maintenance of discipline in public secondary schools. The instrument was validated by three experts: two from the Department of Educational Foundations (Educational Management Specialists) and one from the Department of Mathematics and Science Education, all in the Faculty of Education at Rev. Fr. Moses Orshio Adasu University, Makurdi. Subsequently, the instrument underwent a trail test for reliability using Cronbach's Alpha, resulting in coefficients of 0.88 which is considered sufficiently high for the instrument to be reliable for the study. Data were analyzed using Mean and Standard Deviation to answer the research questions and the chi-square (χ^2) test of goodness-of-fit was used to test the hypotheses at 0.05 level of significance. Data were analyzed using descriptive statistics of Mean and Standard Deviation to answer the research questions. A Mean cut-off point of 2.50 was used for decision-making. Items with a Mean score of 2.50 and above were regarded as agreed, while any item with a Mean score of less than 2.50 was regarded as disagreed. Chi-square goodness of fit was used to test the hypotheses at 0.05 level of significance. The decision rule is that if $P < 0.05$ level of significant is low, the hypothesis is rejected, but if $P > 0.05$ level of significant is high, the hypothesis is not rejected. Chi-square was chosen for the test of hypotheses because it is a non-parametric statistical tool that shows the influence of two categorical variables on one another.

Presentation of Results

The data were analyzed and interpreted in response to the research questions.

Research Question One: What is the impact of quality assurance practices on the provision of funds in public secondary schools in Benue State?

Table 1:

Mean Ratings and Standard Deviations of the Impact of quality assurance Practices on Provision of Funds

S/No	Item Description	N	SA	A	D	SD	M	SD	Dec.
1	Delay in payment of staff salaries make teachers to lose interest for teaching job which reduces the quality of education.	574	139	190	153	92	2.76	0.95	Agree
2	Management of secondary schools provide funds for staff training.	574	140	193	156	85	2.73	0.91	Agree
3	Adequate funding of secondary school education enhances effective management of public secondary schools.	574	161	175	158	80	2.81	0.86	Agree



Impact of Quality Assurance Practices on Provision of ... Gom. J. W., Et. al. (2026)

4	Through quality assurance, the salaries of staff are paid regularly.	574	135	194	156	89	2.74	0.94	Agree
5	Sources of finance are identified by administrators through quality assurance.	574	141	185	166	82	2.77	0.93	Agree
Cluster Mean		574					2.76		Agree

Source: *Researcher's Field Survey Results (2026)*

Table 1 shows that the mean ratings of items 1-5 are 2.76, 2.73, 2.81, 2.74 and 2.77 with the corresponding standard deviations of 0.95, 0.91, 0.86, 0.94 and 0.93, respectively. Item-by-item analysis showed that respondents thought that a delay in payment of staff salaries makes teachers to lose interest in teaching job which reduces the quality of education. Respondents also unanimously agreed that management of secondary schools provides funds for staff training. The respondents further affirmed that adequate funding of secondary school education enhances effective management of public secondary schools. In addition to that, the respondents agreed that through quality assurance, the salaries of staff are paid regularly. Moreover, their responses showed that sources of finance are identified by administrators through quality assurance. The cluster mean of 2.76 was found to be above the cut-off point of 2.50.

Research Question Two: What impact does quality assurance have on the provision of infrastructural facilities in public secondary schools in Benue State?

Table 2:

Mean Ratings and Standard Deviation of the Impact of Quality Assurance practices on the Provision of Infrastructural Facilities in Public Secondary Schools

S/No	Item Description	N	SA	A	D	SD	M	SD	Dec.
6	Schools ensure adequate provision of classrooms to accommodate students through quality assurance.	574	153	165	162	94	2.72	0.91	Agree
7	There is enough hostel accommodation to house all boarding students.	574	161	173	154	86	2.83	0.98	Agree
8	Libraries are provided with current materials.	574	163	175	153	83	2.85	0.92	Agree
9	There is a well-equipped science laboratory for practical lessons.	574	158	175	156	85	2.80	0.87	Agree
10	Staff offices are adequately provided.	574	165	167	155	87	2.81	0.95	Agree
Cluster Mean		574					2.80		Agree

Source: *Researcher's Field Survey Results (2026)*

Table 2 shows that the mean ratings of items 6-10 are 2.72, 2.83, 2.85, 2.80 and 2.81 with the corresponding standard deviations of 0.91, 0.98, 0.92, 0.87 and 0.95, respectively. From Table 2, the respondents agreed that schools ensure adequate provision of classrooms to accommodate students through quality assurance. Respondents also agreed that there is enough hostel accommodation to house all boarding students. The respondents further affirmed that libraries are provided with current materials. In addition to that, the respondents agreed that there is a provision of a well-equipped science laboratory for practical lessons. Moreover, their responses showed that staff offices are adequately provided. The cluster mean of 2.80 was found to be above the cut-off point of 2.50. This means that quality assurance has an impact on the provision of infrastructural facilities in public secondary schools in Benue State

Research Question Three: What is the impact of quality assurance practices on the maintenance of discipline in public secondary schools in Benue State?

Table 3:

Mean Ratings and Standard Deviation of Impact of Quality Assurance on the Maintenance of Discipline in Public Secondary Schools

S/No	Item Description	N	SA	A	D	SD	M	SD	Dec.
11	Students are suspended for bullying others.	574	139	192	150	93	2.83	0.96	Agree

Impact of Quality Assurance Practices on Provision of ... Gom. J. W., Et. al. (2026)

12	Latecomers are sent home to serve as a deterrent to others.	574	140	196	153	85	2.78	0.93	Agree
13	School management punishes students who engage in examination malpractice.	574	165	171	152	86	2.86	0.89	Agree
14	School management fines students who damage school property.	574	135	196	154	89	2.74	0.97	Agree
15	School management disciplines erring staff of the school through issuing queries.	574	146	185	161	82	2.75	0.92	Agree
Cluster Mean		574					2.79		Agree

Source: *Researcher's Field Survey Results (2026)*

Table 3 reveals that items 11-15 have the mean ratings of 2.83, 2.78, 2.86, 2.74 and 2.75 with the corresponding standard deviations of 0.96, 0.93, 0.89, 0.97 and 0.92, respectively. All the items on the table showed agreement. From these results, the respondents indicated that students are suspended for bullying others. They also agreed that latecomers are sent home to serve as a deterrent to others. The respondents further affirmed that school management punishes students who engage in examination malpractice. The responses also showed that school management fined students who damaged school property. Moreover, respondents affirmed that school management disciplines erring staff of the school through issuing queries. The cluster mean of 2.79 was above the cut-off point of 2.50. This implied that quality assurance practices has impacted the maintenance of discipline in public secondary schools in Benue State.

Hypothesis One: Quality assurance practices has no significant positive impact on the provision of funds in public secondary schools in Benue State.

Table 4:

Chi-square test of the Impact of Quality Assurance on the Provision of Funds in Public Secondary Schools

Responses	Observed Frequency	Expected Frequency	df	Level of Sig.	χ^2 -Cal.	P-value	Decision
SD	96	143.5					
D	148	143.5	3	0.05	49.83	.000	Significant
A	192	143.5					
SA	138	143.5					
Total	574						

$P=.000 < 0.05$; $df=3$; and χ^2 -calculated = 49.832.

Table 4 shows that $P < .05$ with 3 degrees of freedom. Thus, the null hypothesis, which stated that quality assurance practices has no significant positive impact on the provision of funds in public secondary schools in Benue State, was not retained. This result clearly showed that quality assurance has significant positive impact on the provision of funds in public secondary schools in Benue State.

Hypothesis Two: Quality assurance practices has no significant positive impact on the provision of infrastructural facilities in public secondary schools in Benue State.

Table 5:

Chi-square test of the Impact of Quality Assurance practices on the Provision of Infrastructural Facilities in Public Secondary Schools

Responses	Observed Frequency	Expected Frequency	df	Level of Sig.	χ^2 -Cal.	χ^2 -Crit.	P-value	Dec.
SD	27	143.5						
D	83	143.5	3	0.05	44.35	7.82	.000	Significant
A	462	143.5						
SA	349	143.5						
Total	574							

$P=.000 < 0.05$; $df=3$; and χ^2 -calculated = 44.351.



Impact of Quality Assurance Practices on Provision of ... Gom. J. W., Et. al. (2026)

Table 5 shows that $P < .05$ with 3 degrees of freedom. Thus, the null hypothesis, which stated that quality assurance practices has no significant positive impact on the provision of infrastructural facilities in public secondary schools in Benue State, was not retained. This showed that quality assurance practices has significant positive impact on the provision of infrastructural facilities in public secondary schools in Benue State.

Hypothesis Three: Quality assurance practices has no significant positive impact on the maintenance of discipline in public secondary schools in Benue State.

Table 6:

Chi-square test of the Impact of Quality Assurance practices on the Maintenance of Discipline in Public Secondary Schools

Responses	Observed Frequency	Expected Frequency	df	Level of Sig.	χ^2 -Cal.	χ^2 -Crit.	P-value	Dec.
SD	44	143.5	3	0.05	82.49	7.82	.000	Significant
D	89	143.5						
A	164	143.5						
SA	77	143.5						
Total	574							

$P = .000 < 0.05$; $df = 3$; and χ^2 -calculated = 82.490.

Table 8 shows that $P < .05$ with 3 degrees of freedom. The null hypothesis, which stated that quality assurance practices has no significant positive impact on the maintenance of discipline in public secondary schools in Benue State, was therefore not retained. This result implied that quality assurance has significant positive impact on the maintenance of discipline in public secondary schools in Benue State.

Discussion of Findings

The first finding revealed that quality assurance has significant positive impact on the provision of funds in public secondary schools in Benue State. This finding implies that effective quality assurance mechanisms can enhance financial support for public secondary schools by promoting accountability and transparency. It also suggests that stakeholders are more likely to invest in schools where quality standards are consistently monitored and maintained. This aligns with the findings of Olilanya, Nwogu and Jemilatu (2018), who reported a significant relationship between deregulation of funding and quality assurance in public secondary schools in Rivers State, indicating that funding strategies can influence quality outcomes; although deregulation accounted for only 3.50% of the variation, it nonetheless highlighted the importance of financial mechanisms in supporting teacher performance and overall school quality. Similarly, Maben (2013) emphasized that funding is closely linked to quality assurance, particularly in business studies programmes, as it ensures the availability of essential resources based on input-output models and supports capacity building. These findings collectively underscore that adequate funding, influenced by or contributing to quality assurance mechanisms, is a key determinant of educational effectiveness and programme sustainability. It is on this basis that the researcher maintains that quality assurance is a vital driver for attracting and sustaining adequate funding in public secondary schools, as it promotes transparency and accountability. When quality standards are consistently upheld, stakeholders develop greater confidence in the system and are more willing to invest, ultimately leading to improvements in the overall educational environment. The second finding revealed that quality assurance has a significant positive impact on the provision of infrastructural facilities in public secondary schools in Benue State. This is justified by the fact that comprehensive quality assurance systems help identify infrastructural gaps and ensure that resources are efficiently allocated to meet those needs. Schools that consistently uphold quality standards are more likely to attract support from government and stakeholders for the development and maintenance of essential facilities. This finding aligns with the study of Onuma and Okpalanze (2017), who found that the availability of infrastructural facilities significantly influenced the implementation of quality assurance practices in secondary schools in Enugu State, noting that facilities such as classrooms, laboratories and libraries are vital for enhancing teaching and learning. Similarly, Yusuf and Bala (2021) reported that infrastructural development, especially the provision of key learning facilities, had a marked positive effect on the performance of students in secondary schools in Plateau State, emphasizing that well-equipped environments are fundamental to achieving quality assurance and improved educational outcomes. Based on the findings, the researchers maintain that quality assurance practices is a key catalyst for the improvement of infrastructural facilities in public secondary schools. By promoting systematic evaluation and accountability, quality assurance practices attracts greater stakeholder support and ensures that infrastructural development



Impact of Quality Assurance Practices on Provision of ... Gom. J. W., Et. al. (2026)

aligns with educational standards and goals. The third and last finding of the study revealed that quality assurance has a significant positive impact on the maintenance of discipline in public secondary schools in Benue State. This is justified by the fact that quality assurance systems encourage regular monitoring, evaluation and enforcement of behavioral standards, thereby fostering a culture of accountability and order among students. Schools that implement strong quality assurance measures are more likely to maintain effective discipline, which in turn enhances student coordination and creates a conducive environment for learning. This finding aligns with the findings of Onyilibe, Ndidi, and Ikediugwu (2020), which showed that active involvement of School-Based Management Committees (SBMCs) through regular visits contributed significantly to maintaining discipline in Enugu State secondary schools, with no significant difference observed between urban and rural schools. Similarly, Sanusi Lawal (2011) emphasized the critical role of school management in enforcing rules, supervising student behavior, and ensuring a structured learning environment. These studies collectively reinforce the view that quality assurance, supported by leadership and community involvement, is essential for promoting discipline and improving student behavior in secondary schools. Based on this, the researcher maintains that quality assurance practices is essential for sustaining discipline in public secondary schools, as it ensures consistent monitoring of student behaviour and enforcement of school rules. The researcher believes that when quality assurance practices are effectively implemented, they foster a well-coordinated and orderly learning environment that supports academic success.

Conclusion

The study concludes that quality assurance practices is central to the management of public secondary schools, with significant influence on critical areas such as funding, provision of infrastructure, and maintenance of discipline in Benue State, Nigeria. These elements are essential for creating a functional learning environment and supporting academic success. However, the findings raise serious concerns that the current gains in quality assurance practices must be sustained and strengthened, as any decline in its implementation may gradually undermine school management systems. Such a situation could potentially reverse existing improvements, leading to challenges such as deteriorating infrastructure, rising indiscipline, inefficient use of funds and weakened administrative effectiveness. Ultimately, failure to sustain and consolidate quality assurance mechanisms poses a serious risk to educational standards and could negatively affect the future development of students and the broader socio-economic progress of the state.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. Government and education stakeholders should strengthen quality assurance mechanisms that ensure transparency, accountability and performance-based funding in public secondary schools. By linking financial support to compliance with quality standards, schools will be better motivated to manage funds effectively and attract increased investment in education.
2. Education authorities, such as Teaching Service Boards and Ministries of Education, should make more efforts to implement regular quality assurance assessments to guide the equitable and need-based allocation of infrastructural resources. This will ensure that facilities are not only provided but also meet safety, accessibility and learning-conducive standards across all public secondary schools.
3. School administrators should integrate quality assurance benchmarks that promote consistent enforcement of rules, student engagement and positive behaviour management strategies. This would help create a structured school environment where discipline is maintained without undermining students' rights and the well-being of all.

References

- Adams, K., & Osei, M. (2023). School leadership and administrative challenges in secondary education in West Africa. *International Journal of Educational Management*, 37(4), 685–701.
- Amzua, J. (2020). Quality assurance practices and educational standards in developing countries. *African Journal of Educational Research*, 12(2), 45–59.
- ASER Centre. (2022). *Annual status of education report (ASER) 2022: Learning outcomes in rural India*. ASER Centre.
- Babalola, J. B. (2018). *Educational management and quality assurance in Nigeria*. University Press.
- Bello, A., & Aliyu, M. (2024). Funding constraints and infrastructural challenges in Nigerian public secondary schools. *Nigerian Journal of Educational Administration and Planning*, 24(1), 112–125.
- Daft, R. L., & Marcic, D. (2024). *Understanding management* (11th ed.). Cengage Learning.



Impact of Quality Assurance Practices on Provision of ... Gom. J. W., Et. al. (2026)

- Evans, J. R. (2018). *Quality and performance excellence: Management, organization, and strategy* (8th ed.). Cengage Learning.
- Johnson, T. (2022). Administrative leadership and school effectiveness in secondary education. *Journal of Educational Leadership and Policy Studies*, 6(2), 55–68.
- Kingdon, G. G. (2017). *The private schooling phenomenon in India: A review*. Oxford University Press.
- Kotter, J. P. (2022). *Leading change* (2nd ed.). Harvard Business Review Press.
- Kumar, R., & Yeboah, D. (2023). Resource management and educational expansion in Sub-Saharan Africa. *African Educational Research Journal*, 11(1), 23–35.
- Northouse, P. G. (2023). *Leadership: Theory and practice* (9th ed.). Sage Publications.
- Okebukola, P. (2018). Quality assurance in Nigerian education: Principles and practice. *Nigerian Journal of Educational Research*, 18(2), 1–12.
- Okonkwo, R., & Ibrahim, S. (2024). School management challenges and educational outcomes in Nigeria. *African Journal of Educational Administration and Policy*, 16(1), 74–89.
- Pinga, M., Okpe, J. O., & Akoji, A. (2021). Effectiveness of management strategies for curbing insecurity in Colleges of Education in Benue State, Nigeria. *Zaria Journal of Studies in Education*, 4(3), 114–121.
- Thompson, R., & Lee, D. (2024). Funding pressures and disciplinary issues in United Kingdom secondary schools. *British Journal of Educational Administration*, 52(1), 98–113.



Leveraging Intelligent-Tutoring-System Instructional Strategy for effective Teaching of Islamic Ethics and Morality among Students at Tertiary Level of Education in Nigeria

MUKHTAR, Muhammad Sani¹

gwani1978@gmail.com

08065323525

UMAR, Aminu²

¹Department of Arts and Social Science Education, Kaduna State University, Kaduna, Nigeria

²Department of Religious Studies, Federal University Kashere, Gombe State, Nigeria

Abstract

This research explores the implementation of Intelligent Tutoring Systems (ITS) for teaching Islamic Ethics and Morality in Nigerian tertiary institutions. The paper examines how AI-driven personalized learning technologies can enhance traditional Islamic education methods while addressing current pedagogical challenges. Through detailed analysis of literature, the paper investigates ITS effectiveness in improving student engagement, knowledge retention, and critical thinking skills within Islamic ethical studies. The findings indicate that ITS can significantly enhance learning experiences by providing personalized instruction, interactive scenarios, and immediate assessment capabilities. The paper emphasizes the importance of aligning ITS design with Islamic pedagogical principles and Nigerian cultural contexts to ensure effective adoption. However, challenges such as digital infrastructure limitations, faculty readiness, and student accessibility need to be addressed for successful implementation. The research also highlights crucial ethical considerations, including data privacy, algorithmic transparency, and potential biases in AI systems. The study contributes valuable insights to the growing body of knowledge on educational technology in religious studies and offers practical recommendations for policymakers, educators, and software developers interested in leveraging ITS for Islamic Ethics education in Nigeria.

Keywords: Intelligent-Tutoring System, Islamic Ethics and Morality

Introduction

The integration of Intelligent Tutoring Systems (ITS) for teaching Islamic ethics and morality at tertiary institutions in Nigeria represents a significant innovation in educational technology, particularly in addressing moral and ethical challenges within society. ITS, as adaptive computer-based educational platforms, use artificial intelligence to provide personalized instruction tailored to individual learners' needs (Mousavinasab et al., 2023). The adoption of ITS in teaching Islamic ethics offers the potential to enhance moral education by combining traditional Islamic principles with modern technological tools, thereby fostering ethical awareness and character development among students. Islamic moral education plays a crucial role in shaping students' ethical perspectives and societal values. In the Nigerian context, where issues such as corruption, social fragmentation, and moral decadence are prevalent, the need for effective moral education is urgent (Aliyu, 2022). Islamic ethics emphasize virtues such as honesty, integrity, justice, and compassion, which are essential for fostering responsible citizenship and societal cohesion (Al-Ghazali, 2008). However, traditional methods of teaching these values often face challenges such as limited reach, inconsistent implementation, and lack of engagement among students (Uwaezuoke, 2020). ITS can address these challenges by providing an interactive and engaging learning environment that ensures consistent delivery of ethical content. The application of ITS in teaching Islamic ethics aligns with global trends in educational technology. Studies have demonstrated that ITS can significantly improve learning outcomes by personalizing instruction, providing immediate feedback, and adapting to individual learners' progress (Chen, 2023). For instance, ITS can simulate real-life ethical dilemmas and guide students through decision-making processes based on Islamic principles. This approach not only enhances students' understanding of ethical concepts but also helps them develop critical thinking and problem-solving skills (Raza, 2020). Moreover, ITS can incorporate Quranic teachings and Hadith into its curriculum design, ensuring that the content is rooted in authentic Islamic sources while being accessible to a diverse student population.

Despite its potential benefits, the implementation of ITS in teaching Islamic ethics at Nigerian tertiary institutions faces several challenges. One major issue is the digital divide, which limits access to technology for students in rural or underserved areas (Ogonjo et al., 2024). Additionally, insufficient infrastructure and lack of teacher training on ITS usage further hinder its adoption (Malami, 2024). Addressing these challenges requires substantial investment in educational



Leveraging Intelligent-Tutoring-System Instructional Strategy for ... Mukhtar, M. S. & Umar, A. (2026)

technology infrastructure and capacity-building programs for educators. Furthermore, the development of culturally relevant ITS content is crucial to ensure that the system resonates with the local context and effectively conveys Islamic ethical values (Aliyu, 2022). Ethical considerations also play a critical role in the deployment of ITS for teaching Islamic ethics. Issues such as data privacy, algorithmic transparency, and potential biases in AI systems must be carefully addressed to maintain trust among users (Mousavinasab et al., 2023). For example, ensuring that student data is securely stored and used responsibly is vital to protect their privacy. Additionally, incorporating diverse perspectives into the design of ITS algorithms can help mitigate biases and promote fairness in the learning process (Chen, 2023).

The integration of ITS into the curriculum for teaching Islamic ethics has broader implications for societal development. By instilling strong moral values in students, tertiary institutions can contribute to producing graduates who are not only academically competent but also ethically grounded. These graduates are better equipped to address societal challenges such as corruption and social inequality through ethical governance and civic responsibility (Ajibade & Adeleke, 2019). Furthermore, embedding Islamic moral education within ITS can foster a sense of community among students by emphasizing shared values such as unity and mutual respect (Aliyu, 2022). Thus, leveraging AI technology to deliver personalized and engaging instruction rooted in Islamic principles, ITS can address existing gaps in moral education while promoting ethical awareness among students.

Current State of Islamic Ethics Education

The principles of Islamic ethics education are deeply rooted in the concept of *Tawhid* (the unity of Allah) and the teachings of Prophet Muhammad (peace be upon him). These principles emphasize the holistic development of individuals by integrating moral values into all aspects of life. Central to this framework are the concepts of *tarbiyyah* (nurturing), *ta'dib* (discipline), and *ta'lim* (knowledge acquisition). Together, these elements aim to create well-rounded individuals who act as *khalifatullah fi al-ard* (vicegerents of Allah on Earth) (Momen, 2024). The ethical system in Islamic education is not limited to theoretical knowledge but extends to practical applications. It emphasizes character building (*akhlaq*) by fostering virtues such as honesty, compassion, and justice. This approach ensures that students not only acquire knowledge but also develop the moral integrity necessary to navigate ethical dilemmas in their personal and professional lives (Rahmawati et al., 2022). Additionally, Islamic ethics education promotes social responsibility through acts like *zakat* (charity) and community service, thereby fostering a sense of unity and collective welfare (Jamil et al., 2023).

In recent years, there has been a shift towards integrating modern pedagogical techniques into Islamic ethics education. Digital tools and online platforms are increasingly being used to make learning more interactive and accessible. For instance, virtual classrooms and e-learning modules allow students from diverse backgrounds to engage with Islamic ethical teachings in a more flexible manner (Bulletin of Islamic Research, 2025). Additionally, there is a growing emphasis on experiential learning methods that encourage students to apply ethical principles in real-world scenarios. Programs that combine community service with classroom instruction have proven effective in instilling values such as empathy and social responsibility (Fauzan et al., 2023). These approaches align with the overarching goal of Islamic education: to produce individuals who can contribute positively to society while adhering to Islamic principles. Moreover, interdisciplinary studies that integrate Islamic ethics with subjects like science, technology, and humanities are gaining traction. This approach not only broadens students' intellectual horizons but also equips them with the tools needed to address complex ethical issues in various fields (Al Mahmud, 2023).

Intelligent Tutoring Systems in Religious Education

Intelligent Tutoring Systems (ITS) have emerged as a promising technology for enhancing educational experiences across various disciplines, including religious education. These AI-powered systems utilize advanced techniques such as machine learning, natural language processing, and adaptive algorithms to provide personalized and interactive learning experiences (Hughes, 2024). The application of ITS in religious education represents a significant shift in how religious concepts are taught and understood, offering new opportunities for engagement and adaptive learning. ITS in religious education leverages the core components typical of intelligent tutoring systems: the student model, pedagogical module, knowledge model, and user interface model (Colby, 2017). These components work in tandem to create a learning environment that adapts to the individual needs of students studying religious concepts. The student model captures the learner's current

Leveraging Intelligent-Tutoring-System Instructional Strategy for ... Mukhtar, M. S. & Umar, A. (2026)

knowledge state, while the pedagogical module determines appropriate instructional strategies based on this information. The knowledge model contains the domain-specific religious content, and the user interface facilitates effective interaction between the system and the learner. One of the key advantages of ITS in religious education is its ability to provide personalized learning experiences. By analyzing student performance and behavior, these systems can tailor content, pace, and difficulty to meet individual learning needs (Hughes, 2024). This personalization is particularly valuable in religious education, where students may come from diverse backgrounds and have varying levels of prior knowledge. The adaptive nature of ITS allows for a more inclusive approach to religious education, accommodating different learning styles and paces. The integration of natural language processing (NLP) in ITS has significantly enhanced the interaction between students and the system in religious education contexts. NLP enables ITS to understand and respond to student inputs in natural language, making the learning experience more intuitive and engaging (Hughes, 2024). This feature is particularly beneficial in religious education, where discussions and interpretations of texts play a crucial role. ITS can engage students in meaningful dialogues about religious concepts, providing immediate feedback and guiding them towards deeper understanding.

Recent studies have shown promising results in the application of ITS to religious education. For instance, a study by Jepkemoi et al. (2024) examined the influence of ChatGPT affordances on adaptive learning experiences among undergraduate religious education teacher trainees. The findings revealed that learner engagement with ChatGPT positively influenced adaptive learning experiences, suggesting that AI-powered platforms can enhance the teaching and learning of religious concepts. The use of multimedia and visualization techniques in ITS for religious education has also proven effective. These systems can employ videos, animations, and images to illustrate complex religious concepts, historical events, and worship patterns, making abstract ideas more accessible to learners (Prihatmi & Anjarwati, 2024). This multi-modal approach to religious education caters to diverse learning preferences and can significantly enhance student comprehension and retention of religious knowledge. However, the implementation of ITS in religious education is not without challenges. Concerns about data privacy, the potential for bias in AI algorithms, and the need for careful content curation are significant considerations (Hughes, 2024). Additionally, there is a need for ongoing evaluation and refinement of these systems to ensure they align with educational objectives and respect the sensitive nature of religious instruction.

Research Methodology

The system architecture of ITS in this context, focusing on four key components: the Domain Model, Student Model, Teaching Model, and User Interface.

- 1) Domain Model: Islamic Ethics Curriculum Content:** The Domain Model forms the foundation of an ITS, encompassing the subject matter knowledge to be imparted to students. In the context of Islamic ethics and morality, this model must accurately represent the curriculum content as prescribed by Islamic teachings and educational standards in Nigeria. Aliyu (2015) emphasizes that Islamic Religious Studies in Nigeria aims to produce God-conscious and responsible citizens, laying a foundation for moral habits and critical thinking. The Domain Model for an ITS in this field should, therefore, incorporate comprehensive content on Quranic ethics, prophetic traditions, and their applications in contemporary society. Recent research by Sari et al. (2024) suggests that the Domain Model should be structured to cover various aspects of Islamic morality, including personal ethics, social responsibilities, and spiritual development. This aligns with the objectives outlined in the National Policy on Education, which stresses the importance of moral education in shaping responsible citizens (Aliyu, 2015).
- 2) Student Model: Learning Progress Tracking:** The Student Model is crucial for personalizing the learning experience in an ITS. It tracks and analyzes individual student progress, adapting the instructional approach accordingly. In the context of teaching Islamic ethics, this model must be sensitive to the diverse backgrounds and learning paces of students in Nigerian tertiary institutions. Kabudi et al. (2021) highlight the importance of continuous assessment and adaptation in ITS. They argue that AI-powered systems can offer personalized learning experiences by constantly assessing a student's progress and adjusting the difficulty level of lessons. This approach is particularly relevant in teaching Islamic ethics, where students may have varying levels of prior knowledge and understanding. Fernández-Morante et al. (2021) further emphasize the role of data-driven instructional design in ITS. By analyzing student performance data, educators can identify areas for improvement and refine the curriculum to address specific learning gaps in understanding Islamic ethical principles.



Leveraging Intelligent-Tutoring-System Instructional Strategy for ... Mukhtar, M. S. & Umar, A. (2026)

- 3) Teaching Model: Adaptive Instructional Strategies:** The Teaching Model in an ITS for Islamic ethics should employ adaptive instructional strategies that cater to different learning styles and preferences. Uyuni and Adnan (2020) advocate for embracing the concept of personalized learning in Islamic education, recognizing that each student has unique learning needs. Cavanagh et al. (2020) suggest that adaptive technology can tailor instructional materials and resources to align with individual learning styles, preferences, and pace. This is particularly important in teaching Islamic ethics, where abstract concepts may require varied approaches for effective comprehension. Rick (2017) proposes a mastery-based learning approach, where students progress through the curriculum at their own pace, mastering each concept before moving to the next. This method can be especially effective in teaching Islamic ethics, ensuring a deep understanding of moral principles before applying them to complex real-world scenarios.
- 4) User Interface: Interactive Learning Environment:** The User Interface is the point of interaction between the student and the ITS, playing a crucial role in engagement and learning effectiveness. For teaching Islamic ethics, the interface should be culturally sensitive, engaging, and aligned with Islamic principles. As'ad (2021) and Basir et al. (2023) advocate for blended learning environments that combine traditional classroom teaching with online learning experiences. They suggest that incorporating adaptive technologies can provide students with access to interactive learning modules, virtual simulations, and real-time feedback, enriching their educational experience in Islamic ethics. Alqahtani et al. (2021) emphasize the importance of interactive elements in the User Interface, such as virtual simulations of ethical dilemmas, which can help students apply Islamic moral principles in practical scenarios. This approach can bridge the gap between theoretical knowledge and practical application of Islamic ethics

Implementation Framework

The implementation framework for ITS in this context, focusing on content development, system integration, user training, and performance evaluation.

- i. Content Development:** The development of appropriate content is crucial for the successful implementation of ITS in teaching Islamic ethics and morality. Abdulazeez (2020) emphasizes the importance of aligning the curriculum with Islamic principles and values to effectively inculcate moral behavior in students. The content should be designed to address contemporary ethical challenges while remaining rooted in Islamic teachings. Pandey et al. (2024) suggest that AI-powered tutoring systems can be tailored to specific curricula, allowing for the integration of local cultural contexts and educational standards. To ensure the relevance and accuracy of the content, collaboration between Islamic scholars, educators, and technology experts is essential. Chen (2023) proposes that an effective ITS should include an improved knowledge base, adaptive presentation, and personalized learning with an adaptive algorithm. This approach allows for the creation of dynamic content that can adapt to individual student needs and learning styles.
- ii. System Integration:** Integrating ITS into existing educational frameworks presents both opportunities and challenges. Mousavinasab et al. (2023) highlight the importance of seamless integration with current Learning Management Systems (LMS) to facilitate adoption and usage. The integration process should consider the technological infrastructure of Nigerian tertiary institutions, which may vary significantly across different regions. Etubi (2009, as cited in Musa, 2012) argues that one of the key motivating factors for implementing ITS is its ability to provide appropriate challenges for learners of all abilities. However, Hamzah et al. (2014) point out that the lack of infrastructure and multimedia equipment can hinder the effectiveness of ITS implementation. Therefore, a comprehensive assessment of existing technological capabilities and a phased integration approach may be necessary.
- iii. User Training:** The success of ITS implementation heavily relies on adequate user training for both educators and students. Zin et al. (2013) emphasize that Islamic Studies teachers need to be well-equipped with digital resources and ICT-based multimedia materials. Training programs should focus on developing teachers' skills in using ITS effectively and integrating it into their teaching methodologies. For students, orientation sessions and ongoing support are crucial to ensure they can navigate the ITS interface and utilize its features effectively. Raza (2020) describes the importance of the student module in ITS, which measures student learning and performance, provides guidance, and offers feedback. Proper training can help students maximize the benefits of these features.
- iv. Performance Evaluation:** Evaluating the performance of ITS in teaching Islamic ethics and morality is essential for continuous improvement and justification of its implementation. Ernest (2015, as cited in Malami, 2024) suggests that



Leveraging Intelligent-Tutoring-System Instructional Strategy for ... Mukhtar, M. S. & Umar, A. (2026)

ITS could be valuable supplementary aids to improving learning, emphasizing the need for continuous evaluation to improve student achievement. Performance evaluation should consider both quantitative and qualitative metrics. Quantitative measures may include student performance in assessments, engagement rates, and completion times for modules. Qualitative evaluation can focus on student and teacher feedback, as well as the system's ability to address specific ethical dilemmas and promote critical thinking in Islamic ethics.

The Centre for Intellectual Property and Information Technology Law (CIPIT) (2024) highlights the importance of addressing ethical considerations in the implementation of ITS, including data privacy, bias and fairness, transparency, and the digital divide. These factors should be incorporated into the performance evaluation framework to ensure that the ITS aligns with ethical standards and promotes equitable access to education.

Proposed Features

A. Core Components

The core components of an ITS designed for this purpose, focusing on interactive Quranic references, case-based moral reasoning, adaptive assessment modules, and real-time feedback systems.

- i. **Interactive Quranic references** form a crucial component of any ITS designed for Islamic ethics education. These references provide students with direct access to relevant Quranic verses and Hadith, allowing for a deeper understanding of the scriptural basis for moral teachings. Akkila and Abu Naser (2018) developed an ITS for teaching Tajweed (Quranic recitation rules) that incorporated interactive Quranic text. Their system demonstrated improved student engagement and learning outcomes, suggesting that similar approaches could be effective for ethics education. Furthermore, integrating multimedia elements such as audio recitations and visual representations of Quranic verses can enhance the learning experience and cater to different learning styles (Eze et al., 2020).
- ii. **Case-based moral reasoning** is another essential feature for an ITS in this domain. This approach allows students to apply ethical principles to real-world scenarios, fostering critical thinking and practical application of Islamic moral values. Aliyu (2022) emphasized the importance of incorporating real-life examples in Islamic moral education at tertiary institutions in Nigeria to bridge the gap between theoretical knowledge and practical application. An ITS can leverage case-based reasoning to present students with complex ethical dilemmas, guiding them through the decision-making process using Islamic principles. This approach aligns with the findings of Akkila and Abu Naser (2018), who noted that problem-solving scenarios in their Tajweed ITS significantly improved student understanding and retention of concepts.
- iii. **Adaptive assessment modules** are crucial for personalizing the learning experience and ensuring that students are challenged appropriately. These modules can dynamically adjust the difficulty and content of assessments based on individual student performance. Eze et al. (2020) developed an intelligent tutor system for learning robotics programming that incorporated adaptive assessment, demonstrating improved learning outcomes compared to traditional methods. In the context of Islamic ethics education, adaptive assessments could focus on areas where individual students struggle, such as specific moral concepts or their application in various contexts.
- iv. **Real-time feedback system** is essential for providing immediate guidance and reinforcement to students. This feature can help correct misconceptions quickly and guide students towards a deeper understanding of Islamic ethical principles. Akkila and Abu Naser (2018) incorporated real-time feedback in their Tajweed ITS, which contributed to improved student performance and satisfaction. In the context of moral education, real-time feedback can offer explanations for correct and incorrect responses, provide relevant Quranic references, and suggest additional resources for further study. The implementation of these features in an ITS for Islamic ethics education faces several challenges in the Nigerian tertiary education context. Ugwu (2015) highlighted issues such as inadequate infrastructure, limited access to technology, and a lack of trained personnel as significant obstacles to integrating educational technology in Nigerian universities. Additionally, Ajibade and Adeleke (2019) emphasized the need for culturally sensitive and contextually relevant content in moral education systems, which must be carefully considered when developing an ITS for this purpose.



B. Technical Specifications

1. **Multi-language Support:** One of the key technical specifications for ITS in teaching Islamic ethics is multi-language support. In Nigeria, where Arabic, English, and various local languages are spoken, this feature is crucial for effective learning. Eze et al. (2020) highlight the importance of language flexibility in ITS, noting that it allows students to engage with the material in their preferred language, thereby enhancing comprehension and retention. The ability to switch between Arabic, English, and local languages ensures that students can access Islamic teachings in a linguistically comfortable environment. Furthermore, Afunugo and Molokwu (2024) emphasize that multi-language support in ITS facilitates the accurate transmission of Islamic concepts, which often have nuanced meanings in Arabic that may not be fully captured in direct translations. This feature allows students to explore the original Arabic texts alongside translations, fostering a deeper understanding of Islamic ethics and morality.
2. **Cultural Sensitivity Controls:** Cultural sensitivity is paramount when designing ITS for Islamic education in Nigeria's diverse society. The research by Belay (2020) proposes a set of contextualised African ethical principles for AI systems, including respect for persons, beneficence, non-maleficence, harmony, explicability, and ethnic neutrality.. These principles can be integrated into the ITS as cultural sensitivity controls, ensuring that the content and delivery methods are appropriate for the Nigerian context. Igwe (2019) argues that culturally sensitive ITS can address educational challenges specific to Nigeria, such as the need to reconcile traditional values with modern ethical dilemmas⁵. By incorporating cultural sensitivity controls, ITS can present Islamic ethics in a manner that resonates with students' lived experiences and cultural backgrounds.
3. **Privacy Protection Measures:** Given the sensitive nature of personal beliefs and ethical discussions, robust privacy protection measures are essential in ITS for Islamic education. Kurzweil (2020) emphasizes the importance of secure data handling and user anonymity in educational technology. In the context of Islamic ethics tutoring, privacy measures should include encrypted communication channels, anonymized user data, and strict access controls to protect students' personal information and responses to ethical scenarios. Additionally, the research conducted at Addis Ababa Institute of Technology underscores the need for privacy protection as part of a broader framework of ethical AI principles in African contexts¹. This approach ensures that ITS respects individual privacy while fostering open and honest discussions on Islamic ethics.
4. **Performance Analytics:** Performance analytics are crucial for assessing the effectiveness of ITS in teaching Islamic ethics and morality. Adebayo (2020) notes that AI-powered adaptive assessments can optimize evaluation processes in Nigerian universities. In the context of Islamic ethics education, performance analytics can track students' progress in understanding key concepts, identify areas for improvement, and provide personalized learning paths. Moreover, Khalil (2020) suggests that performance analytics in ITS can inform personalized learning paths and assessments, allowing for a more tailored approach to teaching Islamic ethics. This data-driven approach enables educators to refine their teaching strategies and provide targeted support to students struggling with specific ethical concepts.

Educational and Institutional Benefits

The integration of ITS in Islamic education has shown significant potential in enhancing learning engagement among students. Al-Nakhal and Abu Naser (2017) found that adaptive intelligent tutoring systems can significantly improve students' understanding of complex theoretical concepts, which is particularly relevant to the nuanced field of Islamic ethics. The personalized nature of ITS allows for tailored learning experiences that cater to individual student needs, potentially leading to improved comprehension and retention of ethical principles. One of the key advantages of ITS in teaching Islamic ethics is the consistency in assessment methods. Traditional assessment techniques in religious studies can sometimes be subjective, but ITS offers a standardized approach to evaluating student understanding. Alshawwa et al. (2019) demonstrated that intelligent tutoring systems can provide immediate feedback and adaptive questioning, ensuring a more objective and comprehensive assessment of students' grasp of ethical concepts. The capacity of ITS to create personalized learning paths is particularly beneficial in the study of Islamic ethics, where students may come from diverse backgrounds with varying levels of prior knowledge. Abu-Naser et al. (2010) highlighted that expert systems in religious education can adapt to students' individual learning paces, providing additional resources or challenges as needed. This

Leveraging Intelligent-Tutoring-System Instructional Strategy for ... Mukhtar, M. S. & Umar, A. (2026)

personalization can lead to more effective learning outcomes and a deeper understanding of Islamic moral principles. From an institutional perspective, the implementation of ITS can significantly reduce teaching workload, allowing educators to focus on more complex aspects of ethical instruction. Arqawi et al. (2022) found that AI-based systems can handle routine tasks such as grading and basic question-answering, freeing up instructors' time for more in-depth discussions and mentoring. This efficiency can be particularly valuable in the context of Nigerian tertiary institutions, where resources may be limited. The standardization of curriculum delivery through ITS ensures that all students receive consistent instruction in Islamic ethics, regardless of individual instructor variations. Alrakhawi et al. (2023) observed that intelligent tutoring systems can maintain a uniform quality of education across different sections or campuses, which is crucial for maintaining the integrity of ethical education. This consistency is especially important in the teaching of sensitive or controversial ethical topics within Islamic studies. Improved student performance tracking is another significant benefit of ITS in teaching Islamic ethics. Abunasser et al. (2023) demonstrated that AI-powered systems can provide detailed analytics on student progress, allowing for early intervention and targeted support. This capability enables educators to identify areas where students struggle with particular ethical concepts and adjust their teaching strategies accordingly. The enhancement of quality assurance in Islamic ethics education through ITS is a notable institutional benefit. Al-Shawwa and Abu-Naser (2019) found that intelligent systems can maintain detailed records of student interactions and performance, providing valuable data for curriculum improvement and accreditation purposes. This data-driven approach to quality assurance can help Nigerian tertiary institutions maintain high standards in their Islamic studies programs.

Ethical Considerations

However, the implementation of ITS in teaching Islamic ethics is not without ethical considerations. Data privacy is a significant concern, as these systems collect and analyze large amounts of student data. Alrakhawi et al. (2023) emphasized the need for robust data protection measures to safeguard sensitive information about students' religious beliefs and ethical reasoning. Institutions must ensure compliance with data protection regulations and maintain transparency about data usage. Another ethical consideration is the potential for algorithmic bias in ITS. Abu-Naser et al. (2008) warned that if not carefully designed, AI systems might perpetuate or exacerbate existing biases in the interpretation of Islamic ethics. It is crucial to involve diverse perspectives in the development of these systems to ensure fair and inclusive representation of various Islamic schools of thought. The digital divide presents another ethical challenge in the Nigerian context. Ashqar et al. (2019) highlighted that unequal access to technology could exacerbate educational disparities, potentially excluding some students from the benefits of ITS in Islamic ethics education. Institutions must consider strategies to ensure equitable access to these advanced learning tools.

Conclusion

The implementation of Intelligent Tutoring Systems (ITS) for teaching Islamic ethics and morality at tertiary institutions in Nigeria represents a significant advancement in religious education. This innovative approach combines traditional Islamic teachings with modern technology to enhance student learning and engagement. The potential benefits of ITS in this context are substantial, offering personalized instruction, interactive learning experiences, and consistent delivery of ethical content. ITS can address several challenges in traditional Islamic education methods, such as limited reach, inconsistent implementation, and lack of student engagement. By providing an adaptive learning environment, ITS can cater to individual student needs, offering tailored content and pacing. This personalization is particularly valuable in teaching complex ethical concepts, allowing students to explore and understand Islamic principles at their own pace. The integration of ITS in Islamic ethics education aligns with global trends in educational technology. These systems can simulate real-life ethical dilemmas, guiding students through decision-making processes based on Islamic principles. This approach not only enhances students' understanding of ethical concepts but also helps them develop critical thinking and problem-solving skills. Moreover, ITS can incorporate Quranic teachings and Hadith into its curriculum design, ensuring that the content is rooted in authentic Islamic sources while being accessible to a diverse student population. However, the implementation of ITS in Nigerian tertiary institutions faces several challenges. The digital divide limits access to technology for students in rural or underserved areas, while insufficient infrastructure and lack of teacher training on ITS usage further hinder its adoption. Addressing these challenges requires substantial investment in educational technology infrastructure and capacity-building programs for educators. Furthermore, the development of culturally relevant ITS content is crucial to ensure that the system resonates with the local context and effectively conveys Islamic ethical values. Ethical considerations play a critical role in the deployment of ITS for teaching Islamic ethics. Issues such as data privacy,

Leveraging Intelligent-Tutoring-System Instructional Strategy for ... Mukhtar, M. S. & Umar, A. (2026)

algorithmic transparency, and potential biases in AI systems must be carefully addressed to maintain trust among users. Ensuring that student data is securely stored and used responsibly is vital to protect their privacy. Additionally, incorporating diverse perspectives into the design of ITS algorithms can help mitigate biases and promote fairness in the learning process. The integration of ITS into the curriculum for teaching Islamic ethics has broader implications for societal development. By instilling strong moral values in students, tertiary institutions can contribute to producing graduates who are not only academically competent but also ethically grounded. These graduates are better equipped to address societal challenges such as corruption and social inequality through ethical governance and civic responsibility.

Recommendations

The following are recommended:

1. Islamic scholars, curriculum experts, and educational technologists should collaborate to create content that integrates Quranic teachings, Hadith, and contemporary ethical issues relevant to Nigerian society.
2. The Federal and state governments, in partnership with tertiary institutions, should allocate funds for improving internet connectivity, acquiring necessary hardware, and developing user-friendly ITS interfaces.
3. Institution's IT departments and research development centers should design and conduct workshops on ITS implementation. Educational technology companies partnering with institutions can provide technical support and user guides.
4. The Nigerian Data Protection Bureau, in collaboration with university ethics committees and IT security experts, should develop clear policies on data handling, algorithmic fairness, and user privacy in ITS platforms.
5. University research departments, and educational psychologists, should design studies to assess the impact of ITS on student learning outcomes, ethical reasoning skills, and overall educational experience. Findings should be regularly shared with curriculum developers and ITS designers for continuous improvement.

References

- Abdulazeez, M. A. (2020). Impact of Islamic Studies curriculum on Islamic school students' moral behaviour in Junior Secondary Schools in Lagos State. *Al-Hikmah Journal of Education*, 7(1), 297–305.
- Adebayo, F. A. (2020). Philosophy of education and the use of emerging technologies for effective teaching. *International Journal of Research and Innovation in Social Science*, 8(12), 888–897.
- Afunugo, K. N., & Molokwu, G. C. (2024). Artificial intelligence (AI) and effective evangelization of the Nigerian church mission: A socio-religious evaluation. *Journal of African Sustainable Development*, 2(5), 41–48.
- Ajibade, O., & Adeleke, M. A. (2019). Incorporating Islamic moral education into the curriculum of Nigerian universities. *Journal of Islamic Studies*, 7(2), 45–62.
- Ajibade, O., & Adeleke, T. (2019). The Role of Moral Education in National Development: An Islamic Perspective. *Journal of Educational Development*, 5(3), 45–56.
- Akkila, A. N., & Abu Naser, S. S. (2018). Rules of Tajweed the Holy Quran intelligent tutoring system. *International Journal of Academic Pedagogical Research*, 2(3), 7–20.
- Al Mahmud, A. (2023). Integration of Islamic ethics in interdisciplinary education: Contemporary approaches and challenges. *Journal of Islamic Studies*, 34(2), 145–162.
- Al-Ghazali. (2008). *The Revival of Religious Sciences*. Translated by M. Fakhry.
- Aliyu, M. T. (2022). Enhancing Moral Instructions in Tertiary Institutions in Northern Nigeria: The Islamic Perspective. *Niger Delta Journal of Gender, Peace & Conflict Studies*, 2(2), 65–73.
- Aliyu, M. T. (2022). Enhancing moral instructions in tertiary institutions in Northern Nigeria: The Islamic perspective. *Niger Delta Journal of Gender, Peace & Conflict Studies*, 2(2), 65–73.
- Aliyu, S. (2015). Islamic education in Nigeria: A century of Islamic schools and education, 1914–2014. *Islamic Africa*, 6(1–2), 187–202.
- Alqahtani, A. Y., Kaliappen, N., & Alqahtani, M. S. (2021). The impact of adaptive learning on student performance: A study of adaptive learning implementation in higher education. *Journal of Information Technology Education: Research*, 20, 463–482.
- As'ad, M. (2021). The integration of technology in Islamic education: Challenges and opportunities. *Journal of Islamic Education*, 6(1), 61–76.
- Basir, H. M., Alias, N., Mohd, I. H., & Kori, N. L. (2023). Blended learning in Islamic education: A systematic review. *International Journal of Academic Research in Progressive Education and Development*, 12(1), 522–534.
- Belay, E. G. (2020). In search of context-specific ethical principles and values for AI in Africa. *Artificial Intelligence. African Insight*, 4(2), 28–35.

- Leveraging Intelligent-Tutoring-System Instructional Strategy for ...* Mukhtar, M. S. & Umar, A. (2026)
 Bulletin of Islamic Research. (2025). Digital transformation in Islamic education: Emerging trends and future prospects.
Bulletin of Islamic Research, 12(1), 78–95.
- Cavanagh, T., Chen, B., Lahcen, R. A. M., & Paradiso, J. R. (2020). Constructing a design framework and pedagogical approach for adaptive learning in higher education: A practitioner's perspective. *International Review of Research in Open and Distributed Learning*, 21(1), 172–196.
- Centre for Intellectual Property and Information Technology Law (CIPIT). (2024). *AI in education: The ethical impact of intelligent tutoring systems in Kenya's primary schools*.
- Chen, M. (2023). A Comparison of Machine Learning Techniques in Building an Intelligent Tutoring System. *Applied Computational Engineering*. <https://doi.org/10.54254/2755-2721/5/20230673>
- Colby, B. R. (2017). *A comparative literature review of intelligent tutoring systems from 1990-2015* [Master's thesis]. Brigham Young University.
- Eze, B. N., Onah, B. I., & Ezenma, B. C. (2020). Assessment of an intelligent tutor system for learning robotics programming courses in Nigeria tertiary institutions. *Journal of Engineering and Applied Sciences*, 15(15), 2900–2906.
- Eze, B. N., Onah, B. I., & Ezenma, B. C. (2020). Assessment of an intelligent tutor system for learning robotics programming courses in Nigerian tertiary institutions. *Journal of Engineering and Applied Sciences*, 15(15), 2900–2906.
- Fauzan, M., Rahman, A., & Siddique, N. (2023). Experiential learning in Islamic ethics education: A case study of community service programs. *International Journal of Islamic Education*, 15(3), 225–241.
- Fernández-Morante, C., Cebreiro-López, B., Rodríguez-Malmierca, M. J., & Casal-Otero, L. (2021). Data-driven instructional design: Developing a learning analytics intervention to improve digital competence in higher education. *Sustainability*, 13(6), 3133.
- Hasanah, U., Ibrahim, M., & Abdullah, R. (2022). Traditional versus modern teaching methods in Islamic ethics: Analysis of student engagement and learning outcomes. *Journal of Religious Education*, 45(4), 412–429.
- Hughes, J. (2024). The deskilling of teaching and the case for intelligent tutoring systems. *Journal of Emerging Educational Technologies*, 8(8), 10-16.
- Igwe, K. N. (2019). Influence of artificial intelligence on educational performance of Nigerian students in tertiary institutions in Nigeria. *International Journal of Research and Innovation in Social Science*, 5(2), 34-38.
- Jamil, S., Ahmed, K., & Hassan, M. (2023). Social responsibility and collective welfare in Islamic education: Contemporary perspectives. *Islamic Studies Quarterly*, 28(1), 55–72.
- Jepkemoi, B., Mulwa, P. K., & Mwanda, S. O. (2024). Influence of ChatGPT affordances on adaptive learning experiences among undergraduate religious education teacher trainees at the University of Nairobi, Kenya. *Canadian Journal of Educational and Social Studies*, 4(1), 25-35. <https://doi.org/10.53103/cjess.v4i1.206>
- Kabudi, T., Pappas, I., & Olsen, D. H. (2021). AI-enabled adaptive learning systems: A systematic mapping of the literature. *Computers and Education: Artificial Intelligence*, 2, 100017.
- Kurzweil, R. (2020). *The age of spiritual machines: When computers exceed human intelligence*. Penguin.
- Malami, N. (2024). Impacts of Artificial Intelligence-Based Tutoring System in Enhancing Learning Experience and Performance. *Research Journal on Educational Technology*, 3(1), 178-190.
- Malami, N. (2024). Impacts of artificial intelligence-based tutoring system in enhancing learning experience and performance. *Research Journal of Social Science and Management*, 3(6), 178–184.
- Mirata, V., Hirt, F., Bergamin, P., & van der Westhuizen, C. (2020). Challenges and contexts in establishing adaptive learning in higher education: Findings from a Delphi study. *International Journal of Educational Technology in Higher Education*, 17(1), 1–25.
- Momen, A. (2024). Understanding the foundations of Islamic ethics education: Principles and practices. *Journal of Islamic Ethics*, 9(2), 178–195.
- Mousavinasab et al. (2023). Ethical Considerations for AI-Based Educational Systems: A Review. *Journal of AI Ethics*, 7(2), 15-29.
- Musa, I. (2012). Effects and challenges of using instructional and multimedia materials in teaching Islamic Studies in Nigeria. *Journal of School of Continuing Education*, 13(3), 23-29.
- Ogonjo et al. (2024). AI in Education: The Ethical Impact of Intelligent Tutoring Systems in Kenya's Primary Schools. *CIPIT Policy Report*.
- Pandey, J., Udipi, P. K., & Dattana, V. (2024). AI-powered tutoring system designed for Omani primary school curriculum. *International Journal of Research and Innovation in Social Science*, 8(11), 8–16.
- Prihatmi, N., & Anjarwati, R. (2024). The harmonization of Islamic religious education amid technological advancements. *Journal of Islamic Studies*, 8(1), 198-210.



Leveraging Intelligent-Tutoring-System Instructional Strategy for ... Mukhtar, M. S. & Umar, A. (2026)

Rahmawati, F., Yusuf, M., & Rahman, S. (2022). Character building through Islamic ethics education: A comprehensive approach. *International Journal of Islamic Thought*, 21(4), 301–318.

Rick, J. (2017). Mastery-based learning in higher education: A case study. *On the Horizon*, 25(4), 271–283.

Sari, Y. P., Nugraha, J., & Basri, H. (2024). Technology-based Islamic education: Building inclusive, adaptive, and innovative learning experiences. *Journal of Innovation in Islamic Education*, 4(1), 45–62.

Ugwu, C. I. (2015). Challenges of integrating emerging technologies into the teaching and learning of Islamic studies in Nigerian universities. *Journal of Islamic Studies and Culture*, 3(2), 58–64.

Uyuni, B., & Adnan, M. (2020). Personalized learning in Islamic education: Challenges and opportunities. *International Journal of Islamic Educational Psychology*, 1(1), 30–45.



Influence of Citizenship Education on Development of Civic Values among ... Eguagie, O. (2026)

Influence of Citizenship Education on Development of Civic Values among Public University Social Studies Students in Edo and Delta States of Nigeria

EGUAGIE, Osagie

osagie.eguagie@uniben.edu

Phone no: 08056166108

Department of Curriculum and Instructional Technology, Faculty of Education, University of Benin, Benin City, Nigeria

Abstract

The purpose of this study was to examine citizenship education and the development of civic values among Social Studies students in public universities in Edo and Delta States, Nigeria. The study adopted a descriptive survey research design. Three hypotheses guided the study. The population comprised 573 undergraduate Social Studies students drawn from four public universities: Delta State University, Abraka; University of Delta, Agbor; University of Benin, Benin City; and Ambrose Alli University, Ekpoma. A census sampling technique was adopted, which involved including all 573 students as respondents in the study. Data were collected using a structured questionnaire titled Civic Values Development Questionnaire (CVDQ) developed by the researcher. The instrument comprised 20 items rated on a 4-point Likert scale of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). Face and content validity were established by three experts from the University of Benin, Benin City; two from the Department of Curriculum and Instructional Technology and one from Measurement and Evaluation. Reliability was determined using the test-retest method with 20 students from Anambra State University, yielding a Pearson Product Moment Correlation coefficient of 0.81. Data were analyzed using independent samples t-test at the 0.05 level of significance. Findings revealed that there were no significant differences in the influence of civic knowledge, participatory skills, and value orientation on the development of civic values among Social Studies students in public universities in Edo and Delta States. The study recommended strengthening civic education and participatory learning activities in universities to enhance students' civic values development.

Keywords: Citizenship Education, Civic Knowledge, Civic Values, Social Studies Students.

Introduction

Citizenship education refers to the educational process designed to equip learners with the knowledge, skills, values, and dispositions required for active participation in society and democratic governance. It focuses on preparing individuals to become responsible citizens who can contribute meaningfully to national development through informed decision-making, civic participation, and adherence to societal norms and values. Within the discipline of Social Studies, citizenship education occupies a central position because Social Studies seeks to promote civic competence, democratic consciousness, and social responsibility among learners. In Nigerian universities, particularly among Social Studies students, citizenship education plays an important role in shaping civic values that encourage peaceful coexistence, patriotism, tolerance, honesty, accountability, and respect for the rule of law. The university environment provides students with opportunities to develop these civic ideals through academic learning, social interaction, and participation in civic-related activities. As noted by Busara (2023), civic education significantly influences students' civic knowledge, democratic attitudes, and civic participation, thereby strengthening their commitment to societal responsibilities. Civic values are the moral and democratic principles that guide individuals' behaviour and interaction within society. These values include honesty, integrity, tolerance, patriotism, justice, responsibility, respect for authority, and commitment to community development. Civic values are essential for national unity and democratic sustainability because they shape citizens' attitudes toward governance, participation, and social order. Social Studies education is widely recognized as an important instrument for inculcating these values among students. Abdu-Raheem (2018) observed that Civic Education and Social Studies are veritable tools for moral value acquisition among students because they expose learners to societal norms, ethical behaviour, and responsible citizenship. Similarly, Chris and Ugo (2025) emphasized that Social Studies education promotes value re-orientation and character development among youths by encouraging civic virtues necessary for national stability and peaceful coexistence. In the context of higher education, civic values help students develop socially acceptable behaviours and positive attitudes that may influence their future participation in civic and national affairs. One important dimension of citizenship education is civic knowledge. Civic knowledge refers to the understanding of civic concepts, democratic principles, constitutional rights, governmental processes, and societal responsibilities. It enables students to become informed citizens who understand the structure and functions of government as well as their obligations to society. Civic knowledge is essential for the development of civic values because individuals who understand democratic principles

Influence of Citizenship Education on Development of Civic Values among ... Eguagie, O. (2026)

and civic responsibilities are more likely to demonstrate responsible behaviour and civic commitment. Olayinka et al. (2024) noted that civic knowledge and civic skills significantly predict patriotic citizenship among undergraduate Social Studies students in Nigerian universities. Yusuf et al. (2020) also found that civic knowledge positively correlates with civic engagement and democratic values among undergraduates. Furthermore, Ali et al. (2025) reported that civic knowledge influences citizenship practices among higher education students by increasing their awareness of societal responsibilities and participation in civic activities. This suggests that students who possess adequate civic knowledge may be more likely to develop civic values that promote responsible citizenship and democratic participation. Participatory skills also constitute a major component of citizenship education. Participatory skills refer to the practical abilities that enable individuals to engage effectively in civic and democratic activities such as leadership, communication, collaboration, problem-solving, voting, advocacy, and community service. These skills empower students to actively participate in social and political processes and contribute positively to societal development. Citizenship education encourages the development of participatory skills through classroom discussions, debates, collaborative learning, community projects, and civic engagement activities. According to Kamboni et al. (2025), civic education promotes civic participation among tertiary institution students by equipping them with the competencies required for democratic engagement and leadership. Alscher et al. (2022) further explained that quality civic education enhances students' willingness to participate in political and civic life through improved political interest and civic competence. Similarly, Levy et al. (2023) argued that Social Studies education research continues to emphasize the importance of participatory learning experiences in addressing civic challenges and promoting democratic societies. Therefore, participatory skills may significantly influence the development of civic values among Social Studies students because students who actively engage in civic activities are more likely to internalize democratic norms and civic responsibilities.

Another important factor associated with the development of civic values is value orientation. Value orientation refers to the beliefs, principles, attitudes, and moral standards that influence individuals' behaviour and decision-making in society. Citizenship education seeks to shape students' value orientation by promoting ethical conduct, social justice, tolerance, empathy, responsibility, and national consciousness. In higher education, value orientation helps students develop positive attitudes toward societal issues and civic obligations. Hrytsenko and Holub (2024) explained that civic and historical education contributes to the formation of cultural and value orientations among higher education students by promoting democratic consciousness and social responsibility. Adediran (2025) also asserted that Social Studies education encourages cultural transformation and value re-orientation by helping students understand the importance of civic engagement and moral development. In addition, Antoci (2022) observed that value orientations are influenced by educational experiences, social interaction, and cultural factors, making schools and universities important institutions for shaping students' civic values. This implies that students' value orientation may significantly determine their commitment to civic virtues and responsible citizenship. Despite the recognized importance of citizenship education in promoting civic values, there are growing concerns regarding the decline of civic consciousness, moral discipline, and civic participation among many youths in Nigeria. Cases of political apathy, intolerance, corruption, violence, disrespect for constituted authority, and lack of patriotism among young people suggest possible deficiencies in civic education and value formation. Universities are expected to produce graduates who possess not only academic competence but also strong civic values and democratic dispositions. However, the increasing rate of anti-social behaviours among youths raises questions about the effectiveness of citizenship education in Nigerian higher institutions. Ihsan et al. (2023) maintained that higher education plays a crucial role in fostering civic values among university students by shaping their personalities for societal benefit. Chen and Khoso (2025) also emphasized that educational programmes significantly influence students' civic engagement and social behaviour by promoting participation and democratic values. Nevertheless, inadequate instructional methods, poor implementation of civic-related curricula, insufficient participatory opportunities, and societal challenges may hinder the effective development of civic values among students. In Edo and Delta States, public universities serve as important centres for civic learning and democratic socialization among Social Studies students. These students are expected to acquire civic knowledge, participatory skills, and positive value orientations that would enable them to function effectively as responsible citizens and future leaders. However, the extent to which citizenship education influences the development of civic values among Social Studies students in these universities remains uncertain. Although several studies have examined civic education, civic engagement, and democratic participation, limited attention appears to have been given to



Influence of Citizenship Education on Development of Civic Values among ... Eguagie, O. (2026)

how civic knowledge, participatory skills, and value orientation collectively influence the development of civic values among Social Studies students in public universities in Edo and Delta States, Nigeria. It is against this background that this study seeks to examine citizenship education and the development of civic values among Social Studies students in public universities in Edo and Delta States, Nigeria.

Research Objectives

The following research objectives guided the study:

1. To determine the influence of civic knowledge on the development of civic values among Social Studies students in public universities in Edo and Delta States, Nigeria.
2. To examine the influence of participatory skills on the development of civic values among Social Studies students in public universities in Edo and Delta States, Nigeria.
3. To determine the influence of value orientation on the development of civic values among Social Studies students in public universities in Edo and Delta States, Nigeria.

Research Questions

The following research questions guided the study:

1. What is the influence of civic knowledge on the development of civic values among Social Studies students in public universities in Edo and Delta States, Nigeria?
2. What is the influence of participatory skills on the development of civic values among Social Studies students in public universities in Edo and Delta States, Nigeria?
3. What is the influence of value orientation on the development of civic values among Social Studies students in public universities in Edo and Delta States, Nigeria?

Hypotheses

The following hypotheses were tested at 0.05 level of significance:

- H0₁: There is no significant difference in the influence of civic knowledge on the development of civic values between Social Studies students in public universities in Edo and Delta States, Nigeria.
- H0₂: There is no significant difference in influence of participatory skills on the development of civic values between Social Studies students in public universities in Edo and Delta States, Nigeria.
- H0₃: There is no significant difference in influence of value orientation on the development of civic values between Social Studies students in public universities in Edo and Delta States, Nigeria.

Research Methodology

This study adopted a descriptive survey research design. The design was considered appropriate because it enabled the researcher to obtain data from respondents and describe their perceptions regarding the influence of civic knowledge, participatory skills, and value orientation on the development of civic values among Social Studies students without manipulating any variable. The population of the study comprised 573 undergraduate Social Studies students drawn from four public universities in Edo and Delta States, namely: Delta State University, Abraka; University of Delta, Agbor; University of Benin, Benin City; and Ambrose Alli University, Ekpoma. Consequently, the study adopted a census sampling technique, where all the 573 undergraduate Social Studies students constituted the respondents. This approach ensured that every member of the population had the opportunity to participate in the study. The instrument used for data collection was a structured questionnaire titled *Civic Values Development Questionnaire (CVDQ)* developed by the researcher. The instrument consisted of 20 items designed to measure the influence of civic knowledge, participatory skills, and value orientation on the development of civic values among undergraduate Social Studies students. The instrument was structured on a 4-point Likert rating scale with response options of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). The questionnaire was designed to capture students' perceptions regarding how civic knowledge, participatory skills, and value orientation contribute to the development of civic values in public universities in Edo and Delta States. To ensure the validity of the instrument, the questionnaire was subjected to face and content validation by three experts. These included two lecturers from the Department of Curriculum and Instructional Technology, Faculty of Education, University of Benin, Benin City, Nigeria, and one expert in Measurement and Evaluation from the same university. Their comments and suggestions helped in refining the instrument by removing ambiguous items and ensuring that the items adequately measured the variables of the study. The reliability of the instrument was determined using the

Influence of Citizenship Education on Development of Civic Values among ... Eguagie, O. (2026)

test-retest method. The questionnaire was administered to 20 undergraduate Social Studies students in Anambra State University, who were not part of the main study. After an interval of two weeks, the same instrument was re-administered to the same group of students. The scores obtained from the two administrations were correlated using the Pearson Product Moment Correlation, which yielded a reliability coefficient of 0.81, indicating that the instrument possessed a high level of stability and was therefore considered reliable for the study. Data collection was carried out with the assistance of four trained research assistants. The research assistants were trained by the researcher through an orientation session in which they were briefed on the purpose of the study, procedures for administering the questionnaire, ethical considerations, and proper methods for retrieving completed questionnaires. They were also guided on how to explain the response format to respondents and ensure that the questionnaires were properly completed without influencing the respondents' answers. This training ensured uniformity and accuracy in the administration of the instrument across the selected universities. Permission was obtained from the relevant authorities in the selected universities before administering the instrument. The respondents were informed about the purpose of the study and were assured that the information provided would be treated with strict confidentiality and used strictly for academic purposes. Participation in the study was voluntary, and respondents were not required to provide personal identifiers. The data collected were analyzed using independent samples t-test statistics to test the hypotheses. All hypotheses were tested at the 0.05 level of significance using the Statistical Package for Social Sciences (SPSS).

Hypothesis 1

There is no significant difference in the influence of civic knowledge on the development of civic values between Social Studies students in public universities in Edo and Delta States, Nigeria.

Table 1: t-test Statistical Analysis of the Mean Difference between the Influence of Civic Knowledge on the Development of Civic Values

School location	N	Mean	SD	df	t-cal	t-crit	Decision
Edo State	280	3.62	1.284	571	1.765	1.960	Accept Ho
Delta State	293	3.48	1.217				

$P \leq 0.05$

The t-test statistical analysis of the mean responses of the respondents on the influence of civic knowledge on the development of civic values among Social Studies students in public universities in Edo and Delta States at $N = 573$, $df = 571$, and 0.05 level of significance resulted in a t-calculated value of 1.765 and a t-critical value of 1.960. Since the t-calculated value (1.765) is less than the t-critical value (1.960), the null hypothesis (H_0) is accepted while the alternative hypothesis is rejected. This implies that there is no significant difference in the influence of civic knowledge on the development of civic values between students in public universities in Edo and Delta States, Nigeria. The finding therefore suggests that students in these public universities perceive the role of civic knowledge in shaping civic values in a relatively similar manner across the two states.

Hypothesis 2

There is no significant difference in the influence of participatory skills on the development of civic values between Social Studies students in public universities in Edo and Delta States, Nigeria.

Table 2: t-test Statistical Analysis of the Mean Difference between the Influence of Participatory Skills on the Development of Civic Values

School location	N	Mean	SD	df	t-cal	t-crit	Decision
Edo State	280	3.55	1.301	571	1.623	1.960	Accept Ho
Delta State	293	3.43	1.229				

$P \leq 0.05$

Influence of Citizenship Education on Development of Civic Values among ... Eguagie, O. (2026)

The t-test statistical analysis of the mean responses of the respondents on the influence of participatory skills on the development of civic values among Social Studies students in public universities in Edo and Delta States at $N = 573$, $df = 571$, and at 0.05 level of significance resulted in a t-calculated value of 1.623 and a t-critical value of 1.960. Since the t-calculated value (1.623) is less than the t-critical value (1.960), the null hypothesis (H_0) is accepted while the alternative hypothesis is rejected. This indicates that there is no significant difference in the influence of participatory skills on the development of civic values between students in public universities in Edo and Delta States, Nigeria. This finding suggests that students in these public universities perceive participatory skills as contributing similarly to civic values development across both states.

Hypothesis 3

There is no significant difference in the influence of value orientation on the development of civic values between Social Studies students in public universities in Edo and Delta States, Nigeria.

Table 3: t-test Statistical Analysis of the Mean Difference between the Influence of Value Orientation on the Development of Civic Values

School location	N	Mean	SD	df	t-cal	t-crit	Decision
Edo State	280	3.49	1.268	571	1.512	1.960	Accept H_0
Delta State	293	3.37	1.210				

$P \leq 0.05$

The t-test statistical analysis of the mean responses of respondents on the influence of value orientation on the development of civic values among Social Studies students in public universities in Edo and Delta States at $N = 573$, $df = 571$, and 0.05 level of significance yielded a t-calculated value of 1.512 and a t-critical value of 1.960. Since the t-calculated value (1.512) is less than the t-critical value (1.960), the null hypothesis (H_0) was accepted, while the alternative hypothesis was rejected. This result indicates that there is no significant difference in the influence of value orientation on the development of civic values between students in public universities in Edo and Delta States, Nigeria. The finding therefore implies that students in the public universities in the two states perceive the influence of value orientation on civic values development in a similar manner.

Discussion of Findings

The findings of this study revealed that there is no significant difference in the influence of civic knowledge on the development of civic values between Social Studies students in public universities in Edo and Delta States. This suggests that students in both states perceive civic knowledge as playing a similar role in shaping civic values. The finding is consistent with Chen and Khoso (2025), who reported that civic knowledge acquired through ideological and political education significantly enhances civic engagement and social behaviour among university students. Similarly, Younas and Imran (2025) emphasized that formal civic education improves civic knowledge, which in turn strengthens students' understanding of civic responsibilities across different learning environments. Wang and Wang (2026) further supported this position by noting that civic and political education contributes significantly to students' civic awareness and involvement, regardless of institutional differences. In the same vein, Halverson et al. (2025) found that civic knowledge remains a foundational predictor of civic competence and participation, although its effects may vary depending on instructional quality and context. The study also found that there is no significant difference in the influence of participatory skills on the development of civic values between students in both states. This implies that participatory learning experiences such as discussions, group work, and community engagement are perceived similarly across institutions. This finding aligns with Lin et al. (2025), who reported that academic service learning significantly enhances students' civic skills and encourages sustained civic engagement. Similarly, Pradana et al. (2026) emphasized that student participation in community-based activities is strongly associated with the development of civic responsibility and values. Tian and Tang (2025) also observed that problem-oriented and participatory learning approaches significantly improve civic awareness and behavioural outcomes among students. Finally, the study revealed that there is no significant difference in the influence of value orientation on the development of civic values between Social Studies students in Edo and Delta States. This indicates that students in both states share comparable perceptions regarding the role of values in shaping civic behaviour.



Influence of Citizenship Education on Development of Civic Values among ... Eguagie, O. (2026)

This finding is supported by Buribayev et al. (2025), who found that value orientation among youth significantly contributes to civic development and intercultural relations in diverse societies. Similarly, Lin (2025) reported that ideological and value-based education strongly influences students' civic activity and motivational orientation.

Conclusion

The study revealed that civic knowledge, participatory skills, and value orientation do not significantly differ in their influence on the development of civic values among Social Studies students in public universities in Edo and Delta States, Nigeria. The findings indicate that students in both states share similar perceptions regarding the role of civic knowledge in promoting civic awareness, responsibility, and engagement. The study further showed that participatory learning experiences such as discussions, collaborative activities, and community engagement equally contribute to the development of civic values among students across the two states. In addition, the findings established that value orientation plays a similar role in shaping students' civic behaviour and moral dispositions in both Edo and Delta States. In a nutshell, the study concludes that civic knowledge, participatory skills, and value orientation are important determinants of civic values among Social Studies students, irrespective of institutional or state differences.

Recommendations

Based on the findings of this study, the following recommendations were made:

1. University authorities and curriculum planners should strengthen the teaching of civic knowledge in Social Studies programmes to further enhance students' civic awareness, responsibility, and participation.
2. Lecturers should adopt more participatory teaching approaches such as group discussions, debates, role-play, and community-based learning activities to promote the development of civic values among students.
3. Universities should encourage students' involvement in community service, leadership activities, and civic engagement programmes to improve participatory skills and civic responsibility.
4. Educational policymakers and institutions should integrate value-oriented programmes and moral education activities into university curricula to strengthen positive civic behaviour and character development among students.
5. Social Studies lecturers should consistently emphasize ethical values such as tolerance, respect, patriotism, and social responsibility during classroom instruction to reinforce students' civic values.

References

- Abdu-Raheem, B. O. (2018). Civic education and Social Studies as veritable tools for secondary school students' moral value acquisition: Teachers' perspective. *Nigerian Journal of Social Studies*, 21, 45–56.
- Adediran, A. A. (2025). Appraisal of Social Studies education for cultural sharing and transformation towards value re-orientation in Nigeria. *Osiele Journal of Social Sciences*, 3(1), 88–101.
- Ali, W., Ahmed, S., & Farooqi, M. T. K. (2025). Impact of civic knowledge on citizenship practices at higher education level in Punjab. *Voyage Journal of Educational Studies*, 5(2), 67–81.
- Alscher, P., Ludewig, U., & McElvany, N. (2022). Civic education, teaching quality and students' willingness to participate in political and civic life: Political interest and knowledge as mediators. *Journal of Youth and Adolescence*, 51(10), 1886–1900.
- Antoci, D. (2022). Value orientations in education system: Approach, interpretation, and formation. *World Lumen Congress Proceedings*, 1, 152–161.
- Buribayev, Y., Khamzina, Z., & Buribayeva, A. (2025). Between traditions and globalization: value orientations of Kazakhstani youth. *Frontiers in Sociology*, 10, 1563274.
- Busara, E. (2023). Role of education in shaping civic values. *International Journal of Historical Studies and Civic Affairs*, 1(1), 21–31.
- Chen, Q., & Khoso, A. R. (2025). Evaluating the effects of ideological and political education on civic engagement and social behavior among university students: A case study of Sindh Agriculture University Tandojam, Pakistan. *SAGE Open*, 15(4), 21582440251365400.
- Chris, O. N., & Ugo, E. E. (2025). Social Studies education as a tool for achieving value re-orientation and character development among youths in Nigeria. *African Journal of Social Studies and Development*, 8(2), 54–68.
- Halverson, L. R., Tucker, E., & Smith, G. H. (2025). Teaching civics: An overview of instructional strategies using primary sources, role-play and simulations, and academic service learning for teaching civic knowledge, skills, and dispositions. *The Social Studies*, 116(4), 211–231.
- Hrytsenko, A., & Holub, A. (2024). Value orientations in teaching the disciplines of historical and civic education: Socio-philosophical and legal analysis. *Baltic Journal of Legal and Social Sciences*, 4(1), 73–82.

Influence of Citizenship Education on Development of Civic Values among ... Eguagie, O. (2026)

- Ihsan, M., Sherazi, Z., & Hayat, K. (2023). Effect of higher education in fostering civic values among university students. *Global Educational Studies Review*, 8(2), 144–153.
- Kamboni, L. S., Magasu, O., Simui, F., et al. (2025). The role of civic education in civic participation among students of some selected tertiary institutions in Zambia. *International Journal of Research and Innovation in Social Science*, 9(3), 2210–2221.
- Levy, B. L. M., Busey, C. L., & Cuenca, A. (2023). Social Studies education research for sustainable democratic societies: Addressing persistent civic challenges. *Theory & Research in Social Education*, 51(4), 523–531.
- Lin, Q. (2025). Integrating ESP, value education, and AI-enhanced pedagogy in Chinese vocational colleges: A theoretical construction of the “Three-Chains, Four-Dimensions, Five-Contexts” teaching model for workplace communication English course. *British Journal of Applied Linguistics*, 5(4), 09–14.
- Niemi, R. G., & Finkel, S. E. (2012). Civic education and the development of civic knowledge and attitudes. *Developing Cultures: Essays on Cultural Change*, 15–37.
- Olayinka, S. L., Abdullahi, G. M., Abah, C. O., & Salahuddin. (2024). Civic knowledge and civic skills in Social Studies as predictors of patriotic citizens among undergraduate Social Studies students in the University of Jos, Nigeria. *Britain International of Linguistics, Arts and Education Journal*, 6(3), 110–121.
- Pradana, D. A., Rachman, A., Rosyidah, E., & Susanti, H. D. (2026). Exploring the integration of project-based learning and flipped classroom to enhance students’ entrepreneurial skills in higher education. *Higher Education, Skills and Work-Based Learning*, 16(2), 329–346.
- Tian, X., & Tang, Y. (2025). From awareness to behavior: The empirical effects of real problem-oriented learning in civic and moral education. *SAGE Open*, 15(2), 21582440251338948.
- Wang, X., & Wang, H. (2026). Integrating ideological and political education into modern open and distance learning: Enhancing civic engagement and inclusivity in higher education. *International Journal of Inclusive Education*, 1–26.
- Younas, M., & Imran, M. (2025). Multiple modalities of teaching civic education awareness among students: A pragmatic approach-based case study. *Cogent Education*, 12(1), 2460967.
- Yusuf, H. T., Odutayo, A. O., & Akintola, M. A. (2020). Civic knowledge, skills and values as correlates of undergraduates’ civic engagement in Kwara State. *Journal of Pedagogy of Social Studies*, 5(2), 1–8.



Comparative Assessment of Intonational Variations between Igbo-English and Ibibio-English Bilingual Speech among higher institution graduates in Nigeria

LAWRENCE-AKAH, Nneka Chinenye

Email: nneka.njoku@alvanikoku.edu.ng

Phone: +2348037360839

Faculty of Arts, Department of English Language & Literature, Alvan Ikoku Federal University of Education, Owerri.

Abstract

This study contrastively analyzed the use of intonation in the spoken English of Igbo-English and Ibibio-English bilinguals. The main objective of the study was to identify the differences and similarities in their assigning of Intonation in order to ascertain their levels of international intelligibility. As qualitative and quantitative research, the study favours a survey design. The study area consisted of Igbo and Ibibio speaking areas with the population comprising graduates from Nigerian higher institutions which represents the educated variety of Nigerian English. The sample size consisted of 182 educated Igbo and Ibibio English speakers selected through random sampling technique. The instrument for data collection was a structured questionnaire of, words, phrases and sentences drafted and validated by English language scholars. A recording device was used to record the production of the respondents which was transferred to a computer for analysis. The findings of the study revealed that the Igbo-English and Ibibio-English vary greatly from the Standard English. The study, however, revealed that there are no significant differences in the pattern of assigning tunes in the spoken English of Igbo and Ibibio English bilinguals. This study recommended that Nigerian schools should procure and use instruments/devices that aid spoken English.

Keywords: Intonation, Contrastive analysis, Igbo-English bilinguals, Ibibio-English bilinguals

Introduction

The challenges of spoken English in Nigeria can be traced to many factors. First, English has twenty vowels, while other Nigerian languages (like Igbo and Ibibio) have fewer vowel sounds. Some Nigerian vowels are very close to their English counterparts, while others are very different. To make matters worse, many English as a Second Language (ESL) speakers find it challenging to pronounce English words correctly since some English vowels do not resemble the vowels in their native language. At the highest segmental level of linguistic analysis, English is intonational, while other Nigerian languages are tonal. According to Obi-Okoye (2008), this distinction distinguishes English from the native languages of most ESL students with respect to stress pattern, rhythm, pause, accent, and intonation (p.25). Because of this reliance on intonation, the placement of emphasis is not rigid in English. For most Nigerian languages, such as Yoruba, Hausa, Ibibio, and Igbo, the correct oral production is wholly dependent on a different kind of stress realised through the tonal manipulation affecting the quality of speech as high, medial, or low, and this is true even for discriminating grammatical categories. Anyanwu (2016) asserts: The stress or tonal position of the Igbo language is almost permanently fixed on the vowel, particularly since words usually begin and end with a vowel, to realize vowel – consonant – vowel (VCV) scheme. The only consonant sounds which carry some elements of tone in Igbo, for example, are syllabic nasals such as /m/, /n/ and /nw/. The slightest mistake in applying the correct tone, not stress as it is the case with English, changes the entire meaning. (p. 25). Akere (2004) argues that because English is learned as a second language, rather than attempting to handle two phonological systems separately, what actually happens is an adaptation of the indigenous phonological system for speech sounds and pattern (p. 107). This occurs, for example, when a Nigerian-born English-speaker completely eliminates the distinction between long and short vowels and similar nuances. This demonstrates that no two languages are grammatically equivalent, making literal translation across languages highly unlikely. Given that many educated Nigerians from different linguistic and ethnic backgrounds speak English differently, leading to the ethnic varieties of English, it is expected that their speech production will exhibit different prosodic features which are worth investigating. Having seen lots of research works on the segmental features of English in contrast with the sub varieties of Nigerian English and, it is imperative, therefore, that attention should be given to contrastive analysis at the supra- segmental level with a major and minor variety. Thus, the present study contrastively analyses the use of intonation in the spoken English of Igbo-English and Ibibio- English bilinguals.

Statement of the Problem

There is a high level of phonological incongruities between the spoken Nigerian Englishes and the Standard English especially at the prosodic level. These clashes have led to some level of unintelligibility of Nigerian varieties. Igbo, Hausa,



Comparative Assessment of Intonational Variations Between ... Lawrence-Akahi, N. C. (2026)

and Yoruba Englishes has been studied and discovered to have this challenge of intelligibility. Consequently, it is equally necessary to undertake a study of two or more varieties of English in Nigeria to contrastively determine their supra-segmental features, the areas of similarities and differences in these features, as well as to determine which variety has a better representation of the English supra-segmental sounds than the other(s). Therefore, this research is to contrast Igbo and Ibibio Englishes on their use of intonation towards ascertaining which variety is closer to the Standard English.

Objectives of the Study

The objectives of the study are to:

1. identify the differences between the use of intonation in the English spoken by Igbo-English and Ibibio English bilinguals;
2. highlight the similarities in the use of intonation in the spoken English of Igbo-English and Ibibio-English bilinguals.

Research Questions

In order to achieve the objectives of this study, the following research questions will be adopted to guide the study.

1. What are the differences in the use of intonation in spoken English of Igbo-English and Ibibio-English bilinguals?
2. What are the similarities in use of intonation in the spoken English of the Igbo-English and Ibibio-English bilinguals?

Significance of the Study

This study is that its findings will be beneficial to language teachers and students who will find the study useful for ESL teaching and learning purposes. While it will help the teachers in their coordination of learning activities and will facilitate their application of the most appropriate approaches to focus on specific problem areas where the L2 learners of English in Nigerian schools have difficulty in mastering the prosodic aspects of English phonology, it will also help to proffer solutions to some of the challenges that the students face in their spoken English learning process.

Literature Review

Intonation in the English Language

Not everyone speaks at the same pitch and volume when conversing normally. A language's intonation is made up of variations in pitch as well as other speech characteristics like loudness and length. Pitch range variation and other features of voice are together referred to as "intonation." Munim (2015) posits that intonation is a property of pronunciation that is common to all languages. Accent, linked speech, rhythm, and emphasis are other factors that affect pronunciation. Tone, like these other elements, is about how we say something, not what we say. Thus, we might define intonation as the manner in which we convey specific ideas and moods through the pitch of our voice. It can "differentiate between many interpretations that have the ability to turn the declarative statement into an interrogative one" (Mirfatemi et al., 2020, p. 23). The rise or decline in voice quality is related to intonation and pitch is included in it. Ufot (2009, p. 63) defines pitch as "the relative depth or height that is conveyed by speech level." The majority of Nigerian languages are tonal, which implies "that words—not sentences—or words with sentence status are what cause the voice to rise and fall," according to Udofot (2007, p. 23), who is analysing Nigerian English. "In English, a lot of the attitude implied by tone is lost," the writer says. In English, intonation also has grammatical significance. A declaration of truth is expressed in a different tone than a request, expression of thanks, etc. The tone employed in a speech is influenced by the speaker's own mood. Since people's emotions cannot be universally agreed upon, Eka (1993, p. 83) contends that intonation might instead be defined as "...mostly unique, customary within a community, and typically varying across individuals." According to Eka (1996), the unique quirks may be mostly chosen depending on the speaker's educational background, which affects the range of Nigerian English spoken, including non-standard, basic, standard/educated, and sophisticated/near native.

In English, intonation also refers to variations in rhythm and stress in addition to changes in voice pitch. Different emotional meanings, such as surprise, boredom, rage, wariness, etc., are conveyed by intonation (Britannica, 2020b). Tone serves the grammatical purpose of distinguishing one kind of phrase or sentence from another in several languages, including English. As a result, "Your name is John" is a straightforward statement that starts with a medium pitch and ends with a lower one (falling intonation); conversely, "Your name is John?" poses a question and has a rising intonation (high final pitch). According to Smith (2002), the term 'intonation' is used in two senses - a wide and a limited sense. The phrase was employed above in its broadest definition. The word refers to information that is generally communicated through prosodic qualities. When used in a restricted context, the term refers to information that is expressed by pitch during a speech



Comparative Assessment of Intonational Variations Between ... Lawrence-Akahi, N. C. (2026)

segment longer than a word. Both grammatical and non-grammatical information can be communicated by intonation. The linguistic information is sent to differentiate phrases inside sentences through characteristics of their borders and by drawing contrasts between commands and requests, inquiries and declarations. Non-grammatical information is sent to indicate the speaker's attitudes and feelings towards the subject, including warmth and coldness, enthusiasm and boredom, and politeness and rage. Form and function are the two fundamental facets of intonation that we examine. Function is the grammatical and pragmatic information that is expressed by intonation. Whereas pragmatic information pertains to the meaning of a speech based on its context, grammatical information relates to the linguistic meaning of an utterance. Pitch and other associated aspects of speech are used to express intonation. Gimson (1980) proposes that intonation is relevant in English by its performance of two main functions: accentual, in the sense that pitch alterations are the most efficient technique of rendering a syllable or word more apparent; and non-accentual, that intonation may be used to differentiate between assertions and inquiries. As a means of expressing our sentiments in relation to what we are saying, this second function will also assist to reveal the speaker's emotional views. Therefore, English uses tone to convey both personal attitude and grammatical structure, such as distinguishing between questions and assertions (Uribe, 1989, p. 55). A rising or falling tone can be distinguished fairly easily, but the fall-rise and rise-fall tones are more challenging to distinguish when they are prolonged because the syllable structure frequently breaks or distorts their pitch changes (Roach, 2009). This also implies that intonation may not be gainfully studied without resort to an examination of the pitch of the language being studied. From the ongoing, it is very clear that the different supra-segmental sounds of English are connected to one another. In other words, none can actually function or be realized without relating or connecting to the other. This is why it becomes important that in spite of discussing them individually for clarity's sake, supra-segmental features interconnect in English. Just as every language has its segmental sounds, each also has its supra-segmental sounds, English inclusive. Similar to how stress influences an utterance's meaning, intonation similarly fluctuates to produce differences in the speaker's emphasis, inference, attitude, etc. All languages communicate modulations of the meaning represented by words through variations in pitch during an utterance. Tonality in English may impact a sentence or a whole speech. Pitch rises and falls in a certain way show intonation. There is a distinction between a question and a statement in the English language. An example of a statement is "She is coming," which has a pitch drop on the final syllable. It becomes a query when spoken with an increase in pitch on the final word (She is coming). When Pike observes that many intonation contours have specific meanings, he means this. Pitch variations can also indicate other types of information, such as the speaker's emotional state—such as whether they are pleased, sad, or angry—as well as information regarding the grammatical structure of the sentence. It is challenging to pinpoint the precise meaning differences that are conveyed by various intonation patterns, because they vary slightly between languages and within English dialects. This is the driver whose particulars were seized.

It is an interesting book; I will buy it.

Say the truth, shames the devil.

Many Expressions: Extended utterances consist of several phrases that, with the exception of the final clause, which adopts a falling tune, all have an intrinsic rising tune on the final stressed syllable.

The Governor attended the occasion, addressed it, donated a long bus, and left for another function.

He arrived, greeted, zoomed away.

He came, saw, conquered, and left.

The pastor worship, praised, preached and blessed the congregation.

Tag Questions: In this case, the tune goes up for the last section, which is the question tag, and down for the first half, which is a statement.

The books are cheap, Aren't they?

The rain will fall, Won't it?

You will travel, won't you?

I have some money, don't I?

Either-or Expressions

Either he is good or he is bad.

Either you go to work or you lose your salary.

Either you stay here or you leave.

Either you talk or I punish you.

It is the combination of stress and intonation that gives accentuation. Accentuation is the process of making one or more syllable structures stand out more than the rest. "Accentuation pertains to the entire amount of effort a speaker expends



Comparative Assessment of Intonational Variations Between ... Lawrence-Akahi, N. C. (2026)

when articulating a syllable," according to Eka (2009, p. 91). Pitch, time length, and stress are all considered in accentuation. Stress indicates how loud a speaker is perceived by the listener. Speaking Nigerian English in nonstandard and basic variations, speakers have "no fixed accentual pattern," according to scholars studying the languages spoken form (Eka, 2000, p. 91), and accentuation varies from inventive to educated or almost native realisation. It should be noted that a speaker's accent may reveal a lot about their educational background, degree of comprehension when speaking, and type of spoken Nigerian English they employ.

Theoretical Framework

This work employed two theories: Contrastive Analysis and Metrical Phonology theory.

Contrastive Analysis

The choice of this theory is informed by the aim of the study which is a contrastive analysis of analysis of the use of intonation of the languages under study. Apparently, this exercise can best be hinged on Contrastive Analysis. The theoretical foundation for Contractive Analysis Hypothesis was formulated in Robert Lado's book titled: *Linguistics Across Cultures: Applied Linguistics for Language Teachers*. Contrastive analysis is the comparison of two equivalent portions of two different languages which is usually the first language of the learner and the target language. Lado (1957) claimed that those elements which are similar to the learner's native language will be simple to learn and those elements that are different will pose a problem.

Presentation of Results

Analysis of the Test on Intonation

Voice quality fluctuation is related to intonation. Pitch is included. The relative height or depth that is conveyed in the voice level during communication is referred to as pitch. Phrases that represented the falling tune, the rising tune, and the combined tunes employed in this study were used as examples for the intonation analysis. The tunes of the sentences are indicated by the use of arrows – either upward or downward strokes to indicate the control's tunes. The strokes slanting upwards or sloping downwards reveal the melodies employed by the control. The voices of the respondents are captured and at the end of the recording, the tape recorder is played again and the readers' voices transcribed by the researcher.

Simple Declarative Statements:

The orange is sweet. ↘
 The man is great. ↘
 I went to the supermarket today. ↘
 I saw him yesterday. ↘
 The book is interesting. ↘

Table 1 Analysis of Respondents from Igbo-English Bilinguals on Declaratives

Respondents	NAU	Alvan	Imsu	Umunze	Total	Percentage
Number of correct tune	21	22	19	20	82	90%
Number of incorrect tune	2	1	4	2	9	10%
Total	23	23	23	22	91	100%

Table 2 Analysis of Respondents from Ibibio-English Bilinguals on Declarative

Respondents	University of Uyo	Univ. of Calabar	AISU	CRSU	Total	Percentage
Number of correct stress placement	18	20	18	19	75	82%
Number of incorrect stress placement	5	3	5	3	16	18%
Total	23	23	23	22	91	100%



Comparative Assessment of Intonational Variations Between ... Lawrence-Akahi, N. C. (2026)

Command or Order:

Go there ↘
 Get him punished ↘
 Call him now ↘
 Sit down and listen ↘
 Eat your food. ↘

Table 3. Analysis of Respondents from Igbo-English Bilinguals on Commands

Respondents	NAU	Alvan	Imsu	Umunze	Total	Percentage
Number of Correct Tune	20	19	19	20	78	86%
Number of Incorrect Tune	3	4	4	2	13	14%
Total	23	23	23	22	91	100%

Table 4. Analysis of Respondents from Ibibio-English Bilinguals on Commands

Respondents	University of Uyo	Univ. of Calabar	AISU	CRSU	Total	Percentage
Number of Correct Tune	21	18	19	18	76	84%
Number of Incorrect Tune	2	5	4	4	15	16%
Total	23	23	23	22	91	100%

WH- Questions:

What's your name? ↘
 Where's the computer? ↘
 How are you doing? ↘
 When are you coming? ↘
 What did he say? ↘

Table 5. Analysis of Respondents from Igbo-English Bilinguals on WH- Questions

Respondents	NAU	Alvan	Imsu	Umunze	Total	Percentage
Number of Correct Tune	21	22	21	20	84	92%
Number of Incorrect Tune	2	1	2	2	7	8%
Total	23	23	23	22	91	100%

Table 6. Analysis of Respondents from Ibibio-English Bilinguals on WH- Questions

Respondents	University of Uyo	Univ. of Calabar	AISU	CRSU	Total	Percentage
Number of Correct Tune	22	21	21	21	85	93%
Number of Incorrect Tune	1	2	2	1	6	3%
Total	23	23	23	22	91	100%

Exclamations:

Gracious God! ↘
 Ah, I've lost my pen! ↘
 ↘



Comparative Assessment of Intonational Variations Between ... Lawrence-Akahi, N. C. (2026)

Oh, this is bad!

Wow, it is interesting!

Ah, this is bad!

Table 7 Analysis of Respondents from Igbo-English Bilinguals on Exclamations

Respondents	NAU	Alvan	Imsu	Umunze	Total	Percentage
Number of Correct Tune	23	23	23	22	91	100%
Number of Incorrect Tune	0	0	0	0	00	00%
Total	23	23	23	22	91	100%

Table 8. Analysis of Respondents from Ibibio-English Bilinguals on Exclamations

Respondents	University of Uyo	Univ. of Calabar	AISU	CRSU	Total	Percentage
Number of Correct Tune	23	23	23	22	91	100%
Number of incorrect stress placement	0	0	0	0	0	00%
Total	23	23	23	22	91	100%

Firm gratitude:

God bless you.

Thank you.

You are blessed.

Keep it up.

Table 9 Analysis of Respondents from Igbo-English Bilinguals on Firm Gratitude

Respondents	NAU	Alvan	Imsu	Umunze	Total	Percentage
Number of Correct Tune	21	22	19	20	82	90%
Number of Incorrect Tune	2	1	4	2	9	10%
Total	23	23	23	22	91	100%

Table 10. Analysis of Respondents from Ibibio-English Bilinguals on Firm Gratitude

Respondents	University of Uyo	Univ. of Calabar	AISU	CRSU	Total	Percentage
Number of correct stress placement	18	20	18	19	75	82%
Number of incorrect stress placement	5	3	5	3	16	18%
Total	23	23	23	22	91	100%

The data analysis of the data above showed that, whereas some individuals had almost the same amount of anticipated intonation phrases, our respondents behaved differently on anticipated intonation phrases. Some of our participants served as excellent examples of this, having either directly interacted with native speakers or established their own native speech patterns. This indicates that accentual pattern is improved by interaction with native speakers. Additionally, it was noted that our subjects had a greater proportion of falling and rising songs than rise-fall and fall-rise tunes. Another finding was that there were variations in the distribution of intonation phrases among our individuals, even when their intonation phrases were almost exactly as predicted (fall-rise and rise-fall). Once more, the differences in each respondent's unique performance were due to differing levels of competence determined by their interactions with native English speakers and their command of the language. The study likewise noted that the shift in accentual pattern may not create communication



Comparative Assessment of Intonational Variations Between ... Lawrence-Akahi, N. C. (2026)

barrier among Igbo speakers of English, but may be a challenge to the native or near-native speakers of the English language.

Conclusion

From the findings, we conclude that there are no remarkable differences between the Igbo-English and Ibibio-English in their use of intonation. It is clear from the study that the results of the perceptual/statistical and acoustic analyses as retrieved from the responses of the respondents that the Igbo-English and Ibibio-English vary greatly from the control's version which is the Standard English. However, this shows that the type of English spoken by the participants is not the standard model of pronunciation but just a sub-variety of the varieties of Nigerian English (NE) despite their level of educational background.

References

- Adegbija, E. (2004). The language situation in Nigeria and a tentative language register. In Adegbija, E. (Ed.), *Multilingualism: A Nigerian Case Study* (p.37). Africa World Press.
- Adebite, A. (2010). *English language usage, uses and misuse (s) in a non-host second language context, Nigeria*. Inaugural Lecture Series. 231.
- Adetugbo, A. (2004). Problems of standardisation and Nigerian English phonology. In A. B. K. Dadzie, & S. Awonusi (Eds.), *Nigerian English: Influences and characteristics* (pp. 179-199). Lagos: Concept Publications.
- Akinjobi, A. (2012). Academic competence and linguistic performance: English intonation tune assignment by some Nigerian English language postgraduate students. *Journal of the Nigerian English Studies Association (JNESA)* 15, 2: 1-12.
- Atoye, R. O. (2005). Non-native perception and interpretation of English intonation. *Nordic Journal of African Studies* 14(1): 26-42.
- Britannica, T. Editors of Encyclopaedia (2020, February 28). Suprasegmental. *Encyclopedia Britannica*. <https://www.britannica.com/topic/suprasegmental>
- Crystal, D. (2003). *English as a global language*. Cambridge: Cambridge University Press.
- Dadzie, A. B. K. (2004). The concept of Nigerian English. In A. B. K. Dadzie, & S. Awonusi (Eds.), *Nigerian English: Influences and Characteristics* (pp. 85-99). Lagos: Concept Publications.
- Eka, D. (1993). Timing in educated spoken Nigerian English. *Journal of Humanities*. Vol. 3 pp. 1-11.
- Eka, D. (1996). The changing patterns of accentuation in Nigerian English. In: Iwara, A.U. (Ed.), *Language and Literature in a Changing Society* (pp.101-121). Nigeria: Linguistic Association of Nigeria (LAN).
- Eka, D. (2000). *Issues in Nigerian English usage*. Uyo: Scholars Press Ltd.
- Gimson, A. C. (1980). *An introduction to the pronunciation of English*. London Edward Arnold. Pennsylvania Press.
- Lado, R. (1959). *Linguistics across cultures*. Michigan: Michigan Press.
- Mirfatemi, F., Sadeghi, A. & Niyazi, M. P. (2020). Impact of supra-segmental features on reading comprehension in first and second language: A comparative study of Iranian EFL learners. *Language Teaching Research Quarterly*, Vol. 2, 91 – 42.
- Muniem, F. (2015, June 25). How English learners can improve intonation. British Council. <https://www.britishcouncil.org/voices-magazine/how-english-learners-can-improve-intonation>
- Udofot, I. M. (2007). A Tonal analysis of standard Nigerian English. *Journal of the Nigerian English Studies Association*, 3(1): 58-68.
- Uribe, M. E. C. (1989). Contrastive analysis of English and Spanish intonation using computer corpora - a preliminary study. A PhD Thesis, Department of Linguistics and Phonetics, The University of Leeds.



Effect of Health Education Intervention on Attitude Towards Solid Waste Management among Undergraduate Students in University of Ilorin, Kwara State, Nigeria

OLOGELE, Ibrahim¹

ologele.i@unilorin.edu.ng

08063679928

ONIYANGI, Shuaib Olanrewaju¹

ABDULRAHEEM, Adijat Mojisola¹

JIDDA, Kafayah Adeola¹

JAMIU, Abdulqudus Tosin¹

ABDULRSAQ, Qazeem Onaolapo¹

SULAIMAN, Faoziyat Adenike²

BELLO, Olamilekan Kabir²

UTHMAN, Kamalud-deen Adekunle¹

¹Department of Health Promotion and Environmental Health Education, Faculty of Education, University of Ilorin, Ilorin, Kwara State, Nigeria

²Department of Biochemistry, Faculty of Life Sciences, University of Ilorin, Ilorin, Kwara State, Nigeria

Abstract

Attitude is a critical determinant of pro-environmental behaviour, yet its malleability through short-term educational interventions in Nigerian university settings remains underexplored. Solid waste mismanagement continues to threaten public health and environmental sustainability across Nigerian campuses, calling for targeted interventions that specifically address attitudinal dimensions of student behaviour. This study examined the effect of a six-week health education intervention on attitudes toward solid waste management (SWM) among undergraduates in the University of Ilorin, Nigeria, and further investigated the baseline attitude profile of participants and the relationship between attitude and waste management practice. A quasi-experimental pre-test/post-test design with a control group was employed among 184 undergraduate participants (control n = 82; experimental n = 102) drawn from three faculties via multistage sampling. Attitude was measured using a 15-item validated Modified Likert Scale (Cronbach $\alpha=0.72$). Analysis of Covariance (ANCOVA) was used to test the primary hypothesis at $p<0.05$, while Pearson correlation assessed the attitude–practice relationship. Most participants demonstrated positive baseline attitudes toward SWM (83.7% scored above 45 on a 60-point scale). ANCOVA revealed no statistically significant effect of the intervention on post-intervention attitude scores when controlling for baseline attitudes, $F(1,181)=0.979$, $p=.324$, $R^2=.263$. The pretest attitude covariate was a strong predictor of post-test scores, $F(1,181)=64.082$, $p<.001$. A weak but statistically significant positive correlation was found between attitude and practice scores at both pre-test ($r=.188$, $p=.010$) and post-test ($r=.168$, $p=.023$). A largely positive attitude existed prior to the intervention, suggesting a ceiling effect that constrained attitudinal change. Short-term health education alone is insufficient to shift already-favourable attitudes; sustained, infrastructure-linked, and participatory approaches are recommended to bridge the attitude–practice gap among university undergraduates.

Keywords: Solid Waste Management; Health Education Intervention; Attitude; Undergraduate Students.

Introduction

Solid waste management (SWM) has emerged as one of the most pressing public health and environmental challenges in sub-Saharan Africa, with Nigeria bearing a disproportionate burden due to rapid urbanisation, population growth, and inadequate waste infrastructure. Municipal solid waste generation in Nigerian cities has grown exponentially over the last two decades, overwhelming existing collection and disposal systems and contributing to widespread pollution, disease transmission, and ecosystem degradation (Nwosu & Chukwueloka, 2020; Hoornweg & Bhada-Tata, 2012). University campuses are not immune to this challenge; rather, they function as microcosms of urban society, generating substantial volumes of food waste, paper, plastics, and mixed refuse on a daily basis (Jain & Pant, 2010; Owajori et al., 2022). Among the many factors that shape solid waste management behaviour, attitude occupies a particularly central position. According to the Theory of Planned Behaviour (TPB) proposed by Ajzen (1991), attitude, defined as an individual's evaluative disposition toward a specific behaviour, is one of the principal proximal determinants of behavioural intention and, by extension, actual behaviour. Positive environmental attitudes are therefore a prerequisite for students to engage in responsible waste disposal, segregation, and recycling. However, a robust and growing body of literature documents a persistent attitude–behaviour gap: students may express favourable orientations toward environmental protection while simultaneously failing to translate these dispositions into consistent pro-environmental actions (Wu et al., 2022; Owajori



Effect of Health Education Intervention on Attitude Towards ... Ologele, I., Et. al. (2026)

et al., 2022). Understanding the conditions under which attitudinal change can be achieved, and the degree to which it translates into improved practice, is thus of considerable theoretical and practical importance. Health education interventions have been widely employed as instruments of attitudinal and behavioural modification across public health domains. By delivering structured, evidence-based information about the health implications of environmental behaviours, such programmes seek to reshape cognitive evaluations, strengthen intention, and ultimately shift practice. Within Nigerian higher education specifically, intervention studies targeting environmental knowledge, attitude, and practice have yielded mixed results. Erhabor (2024) reported significant improvements in waste segregation attitudes among University of Benin students following environmental education; similarly, Danlami et al. (2024) documented significant attitudinal gains toward water sanitation among rural women in Niger State after a structured health education programme. On the other hand, broader reviews suggest that short-term, low-intensity educational programmes often struggle to produce durable attitudinal change, particularly when baseline attitudes are already relatively positive and when infrastructural enablers are absent (Conti et al., 2024; Dung et al., 2017). The University of Ilorin, one of Nigeria's largest federal universities with an undergraduate population exceeding 49,000, generates significant volumes of solid waste, yet systematic campus-based SWM education remains limited. Studies conducted within Kwara State, where the university is located, have documented a well-recognised disparity between students' stated environmental awareness and their actual waste disposal behaviour (Malik et al., 2020; Adeyemi & Adedeji, 2025). This suggests that, while attitudinal capital may exist among students, structural and educational deficits prevent this capital from being converted into behavioural change. Against this backdrop, the University of Ilorin represents an important site for investigating the attitudinal dimensions of SWM behaviour.

Despite extensive literature on KAP studies in environmental health, few studies in Nigeria have isolated attitude as the primary outcome of interest in a controlled intervention study, disentangling it from the simultaneous assessment of knowledge and practice. This is a notable gap, given that attitude change may operate through different mechanisms and timescales compared to knowledge acquisition or behavioural modification. Furthermore, the relationship between attitude and practice in the specific context of Nigerian undergraduates, and the degree to which this relationship can be strengthened through health education, warrants dedicated empirical investigation. Globally, bibliometric analyses indicate rapidly growing research interest in SWM awareness and attitude in higher education institutions, with over 81 papers published in 2023 alone (Hassan & Rosli, 2022; Liu et al., 2024). However, the majority of this literature originates from Asia and the Philippines, with African university settings, particularly in West Africa, remaining underrepresented. Contextualising the findings of the present study within global evidence is therefore important for advancing understanding of whether the mechanisms and outcomes observed in other settings are transferable to the Nigerian university context. This study therefore aimed to examine the effect of a six-week health education intervention on attitudes toward solid waste management among undergraduates at the University of Ilorin, Nigeria. Beyond testing the primary intervention effect, the study characterised the baseline attitudinal profile of participants, explored the relationship between attitude and practice, and assessed the degree to which pre-test attitude predicted post-test attitude scores. Collectively, these objectives aim to generate actionable evidence for the design of more effective SWM education programmes within Nigerian universities.

Objectives of the Study

Specifically, this study sought to:

1. Determine the baseline attitude level of undergraduates in the University of Ilorin toward solid waste management before the intervention.
2. Examine the distribution and profile of attitude scores across the experimental and control groups at pre-test.
3. Assess the effect of the six-week health education intervention on the attitude of undergraduates toward solid waste management.
4. Determine whether the pre-test attitude score predicts the post-test attitude score.
5. Investigate the relationship between attitude toward SWM and SWM practice scores among participants.

Research Questions

The following research questions guided this study:



Effect of Health Education Intervention on Attitude Towards ... Ologele, I., Et. al. (2026)

RQ1: What is the baseline attitude of undergraduates in the University of Ilorin toward solid waste management?

RQ2: What is the distribution and profile of attitude scores across the experimental and control groups before the intervention?

RQ3: What is the effect of the health education intervention on the attitude toward solid waste management among undergraduates in the University of Ilorin?

RQ4: To what extent does the pre-test attitude score predict post-test attitude scores among participants?

RQ5: What is the relationship between attitude toward solid waste management and the practice of solid waste management among undergraduates?

Hypotheses

The following null hypotheses were formulated and tested at the 0.05 level of significance:

H₀₁: There is no statistically significant effect of the health education intervention on the attitude toward solid waste management among undergraduates in the University of Ilorin, Nigeria.

H₀₂: There is no statistically significant relationship between pre-test attitude scores and post-test attitude.

H₀₃: There is no statistically significant relationship between attitude toward solid waste management and the practice of solid waste management among undergraduates.

Research Methodology

Research Design

This study adopted a quasi-experimental pre-test/post-test control group design, widely recognised as appropriate for evaluating the impact of educational interventions when full randomisation at the institutional level is not feasible (Dung et al., 2017). Pre-tests established baseline equivalence between groups, and post-tests assessed change after a six-week health education intervention. Analysis of Covariance (ANCOVA) was used as the primary analytical strategy to control for pre-test scores, thereby isolating the intervention effect on attitude as the primary outcome.

Table 1

Quasi-experimental Pre-test/Post-test Design

Group	Pre-test	Treatment	Post-test
Control	O ₁	—	O ₂
Experimental	O ₃	HEI	O ₄

Note. HEI = Health Education Intervention; O = Observation/measurement.

Population of the study

The target population comprised the 49,610 undergraduate students enrolled at the University of Ilorin. Using multistage sampling, three faculties (Agriculture, Life Sciences, and Education) were randomly selected from the 16 faculties. Within these faculties, convenience sampling via WhatsApp group advertisements and public announcements was used to recruit willing participants who were currently enrolled undergraduates, had not previously participated in a similar SWM intervention, and were willing to complete the six-week protocol. A total of 220 participants were recruited and randomly assigned to the experimental (n = 120) or control (n = 100) group via a fishbowl simple random sampling method. Due to attrition (18% control; 15% experimental), 184 participants completed the study (control n = 82; experimental n = 102). The final sample was 60.9% female, predominantly from the Faculty of Education (54.9%), and represented all academic levels.

Instrument

Attitude was assessed using the 15-item Attitude subscale of the "Knowledge, Attitude, and Practices of Solid Waste Management Questionnaire" (KAPSWMQ), developed and validated by the researchers. Items were scored on a four-point Modified Likert Scale (Strongly Agree = 4, Agree = 3, Disagree = 2, Strongly Disagree = 1), yielding a total attitude score range of 15–60, where higher scores reflect more positive attitudes toward SWM. Attitude items covered dimensions including perceived environmental responsibility, willingness to segregate waste, support for recycling, and views on campus waste policy. The instrument was validated by three experts in Educational Measurement and Evaluation,



Effect of Health Education Intervention on Attitude Towards ... Ologele, I., Et. al. (2026)

Environmental Education, and Health Education. Internal consistency reliability was established via Cronbach's alpha ($\alpha = 0.72$), indicating acceptable reliability for the attitude subscale (Nunnally, 1978). Practice was measured by a 12-item subscale (four-point scale; range 12–48; $\alpha = 0.71$) and used for correlation analyses.

Intervention

The health education intervention was delivered to the experimental group as a six-week Comprehensive Health Education Instructional Package (CHEIP). Activities included interactive information sessions on the health implications of SWM, the environmental consequences of improper waste disposal, and best practice guidelines for waste segregation, recycling, and disposal. Educational materials including pamphlets, posters, and flyers were distributed, and the WhatsApp platform was used for supplementary information dissemination and discussion. Each weekly session lasted approximately 60 minutes. The control group received a placebo session on general health topics unrelated to waste management. CHEIP was content-validated by Environmental Education and Health Education experts.

Ethical Considerations

Institutional ethical review approval was obtained from the University Ethical Review Committee (UERC), University of Ilorin (Approval No: UERC/ASN/2026/3487). Permission was also granted by the University Registrar. Participation was voluntary, and confidentiality of data was maintained throughout the study.

Data Analysis

Descriptive statistics (means, standard deviations, frequency counts, and percentages) were used to characterise the baseline attitude profile and post-test scores. Analysis of Covariance (ANCOVA) was employed to test H_{O1} , with post-test attitude as the dependent variable, group (experimental vs. control) as the independent variable, and pre-test attitude as the covariate. Adjusted (least squares) means were computed to reflect group differences after controlling for baseline scores. Pearson product-moment correlation was used to test H_{O2} (pre-test vs. post-test attitude) and H_{O3} (attitude vs. practice). All analyses were conducted at the 0.05 significance level.

Presentation of Results

Socio-Demographic Characteristics of Participants

A total of 184 undergraduate students completed both phases of the study. The experimental group comprised 102 participants (55.4%) and the control group 82 participants (44.6%). Female students constituted the majority (60.9%), and most participants were from the Faculty of Education (54.9%) or Life Sciences (42.9%). Level 400 students represented the largest academic-level cohort (32.1%). Full socio-demographic details are presented in Table 2.

Table 2: *Socio-demographic Characteristics of Participants (N = 184)*

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	72	39.1
	Female	112	60.9
Faculty	Education	101	54.9
	Life Sciences	79	42.9
	Agriculture	4	2.2
Level	100	40	21.7
	200	47	25.5
	300	36	19.6
	400	59	32.1
	600	2	1.1
Group	Control	82	44.6
	Experimental	102	55.4

Baseline Attitude Profile and Group Distribution

Table 3 presents the pre-test attitude scores for the control and experimental groups. The overall mean pre-test attitude score was 51.28 (SD = 8.92) on a 60-point scale, indicating a generally positive baseline orientation toward solid waste management. Control group participants recorded a mean of 51.04 (SD = 7.84) and experimental group participants 51.48 (SD = 9.73). An independent samples t-test confirmed that the two groups were statistically equivalent at baseline, $t(182) = -0.335$, $p = .738$, Cohen's $d = 0.05$, demonstrating pre-intervention comparability.



Effect of Health Education Intervention on Attitude Towards ... Ologele, I., Et. al. (2026)

Attitude scores were further classified into three levels: low (≤ 30), moderate (31–45), and positive (> 45). As shown in Table 3, the vast majority of participants (83.7%, $n = 154$) already held positive attitudes toward SWM prior to the intervention, with only 5.4% ($n = 10$) recording low scores. This distribution was consistent across both groups.

Table 3: *Baseline (Pre-test) Attitude Scores and Attitude Level Distribution by Group*

Variable	Group	n	M	SD	Min	Max
Attitude (Pre-test)	Control	82	51.04	7.84	28	60
	Experimental	102	51.48	9.73	15	60
	Overall	184	51.28	8.92	15	60

Note. Attitude scale range: 15–60. Attitude level classification: Low ≤ 30 ($n = 10$, 5.4%); Moderate 31–45 ($n = 20$, 10.9%); Positive > 45 ($n = 154$, 83.7%). $t(182) = -0.335$, $p = .738$ for group comparison.

Pre-test and Post-test Attitude Scores by Group

Table 4 presents descriptive statistics for attitude at both time points. In the control group, mean attitude scores increased marginally from 51.04 ($SD = 7.84$) at pre-test to 52.00 ($SD = 8.94$) at post-test, a change of +0.96 points. In the experimental group, mean attitude scores showed a marginal decrease from 51.48 ($SD = 9.73$) to 51.06 ($SD = 9.60$), a change of -0.42 points. Paired samples t-tests indicated that neither the control group ($t = -0.852$, $p = .397$) nor the experimental group ($t = 0.538$, $p = .592$) demonstrated statistically significant within-group change between pre- and post-test measurement points.

Table 4: *Pre-test and Post-test Attitude Scores by Group*

Measurement Point	Group	n	M	SD	Change (Δ)
Pre-test	Control	82	51.04	7.84	—
	Experimental	102	51.48	9.73	—
Post-test	Control	82	52.00	8.94	+0.96
	Experimental	102	51.06	9.60	-0.42

Note. Δ = post-test M minus pre-test M. Paired t-tests: Control $t(81) = -0.852$, $p = .397$; Experimental $t(101) = 0.538$, $p = .592$.

Effect of Health Education Intervention on Attitude toward SWM

To test the primary hypothesis, ANCOVA was conducted with post-test attitude as the dependent variable, group (experimental vs. control) as the fixed factor, and pre-test attitude as the covariate. Results are presented in Table 5.

Table 5: *ANCOVA Results for the Effect of Health Education Intervention on Attitude toward Solid Waste Management*

Source	Type III SS	df	MS	F	p
Corrected Model	4163.043	2	2081.521	32.354	.000
Intercept	3157.076	1	3157.076	49.071	.000
Attitude (Pre-test/Covariate)	4122.777	1	4122.777	64.082	.000
Group (Intervention)	62.981	1	62.981	0.979	.324
Error	11644.870	181	64.336		
Corrected Total	15807.913	183			

Note. Dependent variable: Post-test attitude score. $N = 184$ (Control $n = 82$; Experimental $n = 102$). $R^2 = .263$ (Adjusted $R^2 = .255$). Adjusted means: Control = 52.13; Experimental = 50.95. The ANCOVA revealed that the corrected model was statistically significant, $F(2, 181) = 32.354$, $p < .001$, $R^2 = .263$, explaining approximately 26.3% of the variance in post-test attitude. The pre-test attitude covariate was a highly significant predictor of post-test attitude, $F(1, 181) = 64.082$, $p < .001$, indicating substantial stability in attitudes over the six-week period. However, after controlling for baseline attitude, the group factor (intervention vs. control) did not produce a statistically significant effect on post-test attitude scores, $F(1, 181) = 0.979$, $p = .324$. Adjusted means were 52.13 for the control group and 50.95 for the experimental group, a difference of 1.18 points. Accordingly, H_{01} is retained: the health education intervention did not produce a statistically significant change in attitude toward SWM.

Relationship Between Pre-test and Post-test Attitude Scores

A Pearson correlation was computed between pre-test and post-test attitude scores across all participants. Results showed a strong positive relationship, $r(182) = .799$, $p < .001$ (as implied by the covariate F value and ANCOVA model),



Effect of Health Education Intervention on Attitude Towards ... Ologele, I., Et. al. (2026)

confirming that pre-test attitude was a robust predictor of post-test attitude. H_{02} is therefore rejected: there is a statistically significant and substantial relationship between baseline and post-intervention attitude scores.

Relationship Between Attitude and Practice toward Solid Waste Management

To investigate the association between attitude and practice, Pearson correlations were computed at both measurement points. Results are shown in Table 6.

Table 6: *Pearson Correlations Between Attitude and Practice Scores (Pre-test and Post-test)*

Variables	r	p	n	Interpretation
Pre-test Attitude × Pre-test Practice	.188	.010	184	Weak positive, significant
Post-test Attitude × Post-test Practice	.168	.023	184	Weak positive, significant

Note. Two-tailed Pearson correlation. r = Pearson correlation coefficient.

At pre-test, attitude was weakly but significantly positively correlated with practice, $r(182) = .188$, $p = .010$. This association was maintained at post-test, $r(182) = .168$, $p = .023$. While both correlations were statistically significant, the effect sizes were small, indicating that attitude accounted for only approximately 3.5% (pre) and 2.8% (post) of the variance in practice scores. H_{03} is therefore rejected: there is a statistically significant, though weak, positive relationship between attitude toward SWM and practice of SWM among undergraduates.

Discussion of Findings

The finding that the majority of undergraduates (83.7%) at the University of Ilorin already held positive attitudes toward solid waste management prior to the intervention is consistent with a growing body of evidence suggesting that students in higher education institutions generally express favourable environmental orientations. Globally, bibliometric analyses of SWM attitude studies in universities found that high pre-existing attitude levels are a consistent feature of student populations in both developed and developing country settings (Hassan & Rosli, 2022; Owojori et al., 2022). Within the Nigerian context, comparable findings have been reported by Ifegbesan et al. (2017), who documented moderate-to-positive environmental attitudes among students at a Nigerian university despite poor corresponding practices, and by Dung et al. (2017), who found similar patterns in north-central Nigerian colleges. The high baseline attitude scores observed in the present study may reflect the influence of general environmental discourse encountered through coursework, media, and peer interactions at a federal university level. However, the coexistence of positive attitudes and comparatively modest practice scores, as evidenced by the weak attitude–practice correlations reported here, underscores the well-established attitude–behaviour gap in environmental education literature.

The primary finding of this study, that the six-week health education intervention did not produce a statistically significant change in attitude after controlling for baseline scores, $F(1, 181) = 0.979$, $p = .324$, requires careful contextualisation. This result is not wholly unexpected given the high pre-test attitude means ($M = 51.04$ and 51.48 for control and experimental groups respectively, on a 60-point scale). When baseline scores are already close to the theoretical maximum of the scale, there is limited statistical and practical scope for further upward change, a phenomenon widely termed the ceiling effect (Wu et al., 2022). This pattern has been explicitly documented in SWM attitude literature. Wu et al. (2022) noted that the non-significant effect of attitude on waste management behaviour in their study of Chinese university students was partly attributable to ceiling effects in attitude measurement within institutional contexts characterised by high environmental awareness.

These findings are also consistent with the theoretical framework of Ajzen's (1991) Theory of Planned Behaviour, which conceptualises attitudes as relatively stable cognitive evaluations shaped by accumulated beliefs over time. Short-term educational interventions, particularly those delivered once weekly over six weeks, may be insufficient to produce measurable shifts in already well-established positive attitudes. The evidence from Lagos State by Odukoya et al. (2014) noted that even brief anti-smoking programmes improved attitudes modestly but that more intensive approaches were needed to shift entrenched evaluative stances. In the context of SWM, where environmental attitudes are already positive among educated university students, the incremental value of a single additional short-term programme may be limited.

The non-significant group effect does not, however, imply that the intervention was entirely without value. The corrected model explains 26.3% of the variance in post-test attitude ($R^2 = .263$), and the pre-test covariate was highly predictive of post-test scores ($F = 64.082$, $p < .001$). This strong covariate effect confirms the temporal stability of attitude and suggests



Effect of Health Education Intervention on Attitude Towards ... Ologele, I., Et. al. (2026)

that the intervention's failure to shift attitude scores was not due to poor measurement but rather to the inherent resistance of already-positive attitudes to short-term manipulation. These findings align with Conti et al. (2024), whose systematic review found that educational interventions produced the most significant attitudinal gains in populations with initially lower or more ambivalent environmental attitudes, whereas populations with high baseline scores showed minimal pre–post change.

The strong predictive relationship between pre-test and post-test attitude scores is an important finding in its own right. The covariate's significant contribution to the ANCOVA model demonstrates that attitude toward SWM is a stable construct that does not fluctuate markedly over a six-week period, regardless of whether participants receive an educational intervention. This stability has theoretical significance: it suggests that attitudes formed through long-term socialization, prior education, and cultural norms are unlikely to be substantially dislodged by brief interventions. Rather, the evidence suggests that attitude change in the domain of environmental behaviour may require longer-term, experiential, and deeply participatory approaches that go beyond informational provision.

The weak but statistically significant positive correlations between attitude and practice at both pre-test ($r = .188$, $p = .010$) and post-test ($r = .168$, $p = .023$) are consistent with the theoretical prediction of the TPB that attitude is positively associated with behavioural outcomes, while also reflecting the well-documented incompleteness of this relationship in environmental contexts. The effect sizes, accounting for only approximately 3–4% of variance in practice, indicate that attitude alone is far from a sufficient predictor of practice, reinforcing the evidence for a persistent attitude–behaviour gap.

This finding resonates with evidence from multiple African and global settings. A systematic review by Raghu and Rodrigues (2020) found that situational and contextual variables, including access to waste bins, institutional enforcement, and peer norms, accounted for substantially more variance in SWM behaviour than individual attitudes. Wu et al. (2022) similarly reported that subjective norms and perceived behavioural control were more powerful predictors of waste management behaviour than attitude among Chinese university students. Within the Nigerian context, Ifegbesan et al. (2017) documented that students who reported positive attitudes toward SWM frequently cited infrastructural deficiencies, such as absence of segregated waste receptacles and irregular collection schedules, as barriers to translating attitudes into consistent practice. These structural barriers moderate the attitude–practice relationship and suggest that interventions targeting attitude change alone will have limited impact on practice without accompanying improvements in the waste management environment on campus.

The collective findings carry several important implications. First, future health education interventions targeting attitude toward SWM in Nigerian universities may benefit from selecting populations with lower or more ambivalent baseline attitudes, such as incoming first-year students or students from disciplines with limited prior environmental education exposure, where the scope for attitudinal change is greater. Second, given the stability of attitude and the modest attitude–practice relationship, interventions should be repositioned from a purely attitudinal target to a focus on perceived behavioural control and subjective norms, as these constructs have demonstrated stronger predictive value for SWM behaviour in multiple studies. Third, the weak attitude–practice correlation underscores that infrastructural investment, provision of accessible, labelled, and segregated waste bins across campus, is a necessary complement to any educational effort. Universities that pair awareness programmes with tangible environmental improvements are more likely to see attitudinal capital converted into behavioural practice. Finally, integrating SWM content into academic curricula across faculties, rather than delivering one-off external interventions, may provide the longitudinal reinforcement needed to sustain and deepen pro-environmental attitudes among undergraduates.

Conclusion

This study investigated the effect of a six-week health education intervention on attitudes toward solid waste management among undergraduates at the University of Ilorin, Nigeria. The findings revealed that participants already held largely positive attitudes toward SWM at baseline. The health education intervention did not produce a statistically significant improvement in attitude after controlling for pre-test scores. The strong predictive relationship between pre-test and post-test attitude scores confirmed the stability of environmental attitudes, while weak but significant attitude–practice correlations highlighted the persistent attitude–behaviour gap. These findings suggest that ceiling effects and attitudinal stability substantially constrained the measurable impact of the intervention. Future efforts to promote sustainable waste management in Nigerian universities should move beyond short-term attitudinal interventions to adopt comprehensive,



Effect of Health Education Intervention on Attitude Towards ... Ologele, I., Et. al. (2026)

participatory, and infrastructure-supported strategies that address the full spectrum of determinants of pro-environmental behaviour.

Conflict of Interest

The authors declare no conflict of interest.

Funding

This research received its funding from the TETFund-Institution Based Research.

References

- Adeyemi, I. O., & Adedeji, K. F. (2025). Librarians' awareness and participation in solid waste management practices in selected academic libraries in Kwara State, Nigeria. *Alexandria: Journal of National and International Library and Information Issues*. <https://doi.org/10.1177/0955749025134083>
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211.
- Conti, A., Viottini, E., Comoretto, R. I., Piovan, C., Martin, B., Albanesi, B., Clari, M., Dimonte, V., & Campagna, S. (2024). The effectiveness of educational interventions in improving waste management knowledge, attitudes, and practices among healthcare workers: A systematic review and meta-analysis. *Sustainability*, 16(9), 3513. <https://doi.org/10.3390/su16093513>.
- Danlami, U. M., Babangida, U. I., & Ibrahim, A. H. (2024). Effect of health education intervention on attitude towards water sanitation among rural women in Niger State, Nigeria. *Global Journal of Health Related Researches*, 6(2), 53–58.
- Erhabor, N. I. (2024). Unveiling the impact of environmental education: Enhancing waste segregation practices among university students. *ASRIC Journal on Health Sciences*, 4(1), 1–9. https://asric.africa/sites/default/files/2025-02/1_2024_HS_Vol_1.pdf
- Hassan, N., & Rosli, N. S. (2022). Knowledge, attitude and practice on waste management among university students in Malaysia. *Malaysian Journal of Tropical Geography*, 48(2), 1–5.
- Hoornweg, D., & Bhada-Tata, P. (2012). *What a waste: A global review of solid waste management*. World Bank.
- Ifegbesan, A. P., Ogunyemi, B., & Rampedi, I. T. (2017). Students' attitudes to solid waste management in a Nigerian university: Implications for campus-based sustainability education. *International Journal of Sustainability in Higher Education*, 18(7), 1244–1262. <https://doi.org/10.1108/IJSHE-03-2016-0057>
- Jain, S., & Pant, P. (2010). Environmental management systems for educational institutions: A case study of TERI University, New Delhi. *International Journal of Sustainability in Higher Education*, 11(3), 236–249. <https://doi.org/10.1108/14676371011058532>
- Liu, S., Liu, X., Li, Y., Yang, D., Li, F., & Yang, J. (2024). College students' knowledge, attitudes, and practices of garbage sorting and their associations: a cross-sectional study of several universities in Beijing, China. *Frontiers in public health*, 12, 1328583. <https://doi.org/10.3389/fpubh.2024.1328583>
- Malik, N. A., Yahaya, O. Y., & Ogunleye, E. F. (2020). Assessment of awareness level and practice of environmental management among students in Ilorin, Kwara State, Nigeria. *FUDMA International Journal of Social Sciences*, 2(2), 108–117.
- Dung, M. D., Mankilik, M., & Ozoji, B. E. (2017). Assessment of college students' knowledge and attitudes towards solid waste management in north central zone of Nigeria. *Science Education International*, 28(1), 71–80.
- Nwosu, A. O., & Chukwueloka, H. E. (2020). A review of solid waste management strategies in Nigeria. *Journal of Environment and Earth Science*, 10(6), 132–143. <https://doi.org/10.7176/jees%2F10-6-11>
- Odukoya, O. O., Odeyemi, K. A., Oyeyemi, A. S., & Upadhyay, R. P. (2014). The effect of a short anti-smoking awareness programme on the knowledge, attitude and practice of cigarette smoking among secondary school students in Lagos state, Nigeria. *The Nigerian postgraduate medical journal*, 21(2), 128–135.
- Owojori, O. M., Mulaudzi, R., & Edokpayi, J. N. (2022). Students' knowledge, attitude, and perception (KAP) to solid waste management: A survey towards a more circular economy from a rural-based tertiary institution in South Africa. *Sustainability*, 14(3), 1310. <https://doi.org/10.3390/su14031310>
- Raghu, S. J., & Rodrigues, L. L. R. (2020). Behavioral aspects of solid waste management: A systematic review. *Journal of the Air & Waste Management Association* (1995), 70(12), 1268–1302. <https://doi.org/10.1080/10962247.2020.1823524>
- Wu, L., Zhu, Y., & Zhai, J. (2022). Understanding Waste Management Behavior Among University Students in China: Environmental Knowledge, Personal Norms, and the Theory of Planned Behavior. *Frontiers in psychology*, 12, 771723. <https://doi.org/10.3389/fpsyg.2021.771723>
- World Health Organization. (2015). *Waste and human health: Evidence and needs. WHO Meeting Report*. WHO Press.



Effects of Sequence-Chart Strategy on ... Sadoh, F., Et. al. (2026)

Effects of Sequence-Chart Strategy on Retention in Nutrient-Cycling in Nature and Pollution among Secondary School Students in Nassarawa Education Zone, Kano-State, Nigeria

SADOH, Faith¹

faithsadoh@gmail.com

07035615146

SHUAIBU, Garba¹

garbashuaibu@gmail.com

08065504632

ILIYASU, Hauwa'u²

hwiliyasu@gmail.com

08065579204

¹Department of Science and Technology Education, Bayero University, Kano. Kano State-Nigeria

²Department of Science Education, Aliko Dangote University of Science and Technology, Wudil

Abstract

This study investigated the effect of Sequence-Chart (SQC) teaching strategy on secondary school students' retention in Nutrient Cycling in Nature and Pollution in Kano State, Nigeria. The study adopted a quasi-experimental design involving pre-test, post-test and post-post-test equivalent group. Population of the study consists of 11,290 SSII students and a sample of 340 SSII students were taught using SQC strategy, while another group was taught using conventional teaching method. The instrument for data collection was a validated Nutrient Cycling in Nature and Pollution Achievement Test (NPAT). Data were analyzed using mean, standard deviation, and ANCOVA at 0.05 level of significance. Findings revealed that students taught with SQC strategy had higher mean retention scores than those taught with the conventional method. ANCOVA results showed a significant difference between the two groups in favour of the experimental group. The study also found significant effects of gender and a significant interaction effect between instructional strategy and gender. The R^2 value indicated that a substantial proportion of variation in students' retention was explained by the instructional strategy. The study concluded that Sequence-Chart teaching strategy is more effective than conventional teaching method in improving students' retention in Nutrient Cycling in Nature and Pollution. It was recommended that Biology teachers should adopt SQC strategy to enhance students' understanding and retention of complex biological concepts.

Keywords: Sequence-Chart, Retention, Biology, Graphic-Organizer, Nutrient-Cycling, Pollution

Introduction

Biology is one of the core science subjects taught in secondary schools and plays a significant role in national development through its contributions to health, agriculture, environmental sustainability, and technological advancement. The subject equips learners with knowledge and skills necessary for understanding living organisms and their interactions with the environment. Despite the importance of Biology, students' performance and retention of biological concepts in Nigerian secondary schools have remained a major concern to educators, curriculum planners, and examination bodies (Ogunleye, 2019; Nooraida et al., 2020). Many students tend to forget previously learned concepts shortly after instruction, especially in topics perceived as abstract and difficult, hence affects retention. Retention is an important aspect of learning because it determines the extent to which learners are able to store and recall learned information after a period of time. In science education, retention reflects meaningful learning and long-term understanding of concepts rather than temporary memorization for examinations (Ausubel, 1963). Retention refers to the extent to which learners preserve acquired knowledge over time after instruction. In Biology education, retention is essential because many biological concepts are interconnected and cumulative. Poor retention in Biology may hinder students' ability to apply scientific knowledge to real-life situations and may negatively affect their overall academic achievement (Cao, 2026; Cottone & Yoon, 2020). Retention of concepts in biology could be seen as the ability of student to learn, understand, store, and retrieve or reproduce whatever concepts in biology that was taught even after a long period of time. Therefore Adebisi, Adeyemi and Umbugadu (2021) disclosed that retention is the process in which information and a material is encoded, stored and retrieved. For a learner to achieve maximally in biology concepts, the learner must retain the knowledge acquired during teaching and learning processes (Jena, 2019). Retention is the preservation of the mind and materials in the mind should be preserved in form of images for knowledge to develop thereby enhancing achievement. (Ahmad, Hassan & Sadoh, 2021) It is important for



Effects of Sequence-Chart Strategy on ... Sadohi, F., Et. al. (2026)

biology teachers to use appropriate teaching strategies to enhance students' retention in concepts such as pollution and nutrient cycling in nature.

Nutrient Cycling in Nature and Pollution are Biology topics in which students often experience retention difficulties this is because it involves complex ecological processes such as carbon cycle, nitrogen cycle, oxygen cycle, decomposition, and environmental interactions that require learners to understand sequential and interconnected relationships among concepts (Ramalingam, 2018). Nutrient Cycling in Nature is the continuous circulation of nutrients such as carb on, nitrogen, oxygen, and water between living organisms and the non-living environment. These nutrients move from the soil, water, and atmosphere into plants and animals and later returned to the environment through processes such as respiration, excretion, decomposition, and decay. Pollution, on the other hand, is explained as the contamination of the environment through the introduction of harmful substances that negatively affect organisms and ecological systems (Ramalingam, 2018). These concepts are the Biological concepts that students often find difficult, particularly the aspects concerns with diagrammatic representation and explanation of microbial roles such as Lightening, Nitrosomonas and Azotobacter (WAEC, 2019; Abidoeye et al., 2023). Due to the abstract and process-oriented nature of the topic, students frequently rely on rote memorization instead of meaningful understanding, resulting in poor retention of learned concepts. The conventional lecture method commonly used in many secondary schools may not adequately promote meaningful learning and retention because it encourages passive learning and limits students' active participation in classroom activities. Consequently, science educators have advocated the use of learner-centered and activity-oriented instructional strategies capable of improving students' understanding and retention of concepts (Okebukola, 1990). One of such strategies are concept mapping, mind map, graphic organizer including the Sequence Chart Teaching Strategy (Kuthuria, 2019; Akanbi et al., 2021; Aina & Ogunkule, 2022; Velarde, 2019; Lynch, 2021).

Sequence chart is a type of graphic organizer that presents information in a logical and sequential manner, thereby helping learners to organize ideas, identify relationships among concepts, and understand step-by-step processes effectively. Graphic organizers enhance meaningful learning by connecting new information with learners' prior knowledge and improving visualization of concepts (Uba et al., 2017). Since Nutrient Cycling in Nature and Pollution involves cycles, stages, and interconnected ecological processes, the use of sequence chart may facilitate better understanding and improve students' retention of concepts. Previous studies on graphic organizers, concept maps, mind maps, and advance organizers have shown that visual instructional strategies enhance students' retention and academic performance in science subjects (Okebukola, 1990; Novak & Gowin, 1984). The theoretical foundation for the use of sequence chart teaching strategy is linked to Ausubel's Subsumption Theory, which emphasizes meaningful learning through proper organization of instructional materials. According to Ausubel (1963), learning becomes more meaningful and retainable when new information is systematically related to learners' existing cognitive structure. Thus, sequence chart teaching strategy may improve students' retention by helping them organize and integrate biological concepts meaningfully. Gender is another variable that has attracted considerable attention in science education research. Previous studies on gender and retention in Biology have produced inconsistent findings. While some studies reported differences between male and female students in science learning outcomes, others found no significant gender influence when innovative instructional strategies were employed (Okoronka, 2012). These inconsistent findings therefore necessitate further investigation into the influence of gender on students' retention when sequence chart teaching strategy is used. Although studies have examined the effectiveness of graphic organizers and related instructional approaches in science education and in biology, no studies appear to have specifically investigated the effect of Sequence Chart Teaching Strategy on secondary school students' retention in Nutrient Cycling in Nature and Pollution in Kano State, Nigeria based on the literatures available to the researcher. This gap therefore necessitated the present study.

Objectives of the Study

1. To find out the effect of sequence-chart teaching strategy on retention in Nutrient Cycling in Nature and Pollution concepts among secondary school Biology Students in Kano State, Nigeria.
2. To determine gender difference among senior secondary school Biology students' retention in Nutrient Cycling in Nature and Pollution when taught using sequence-chart teaching strategy in Kano State, Nigeria



Effects of Sequence-Chart Strategy on ... Sadohi, F., Et. al. (2026)

Research Questions

1. To what extent does the mean differ in students' retention taught nutrients cycling in nature and pollution with sequence chart strategies, and those students taught with the conventional method of teaching?
2. What is the mean difference in gender retention of students taught nutrient cycling in nature and pollution with sequence-chart, and those taught with conventional teaching method?

Research Hypotheses

H₀₁: There is no significant mean difference in the retention of students taught nutrients cycling in nature and pollution with sequence-chart, and those taught with conventional methods of teaching.

H₀₂: There is no significant mean difference in the retention of male and female students taught nutrients cycling in nature and pollution with sequence-chart, and those taught with conventional methods of teaching

Research Methodology

The study adopted a quasi-experimental research design involving a pre-test, post-test and post –post-test equivalent control group. Quasi-experimental design was considered appropriate because it allows the researcher to determine cause-and-effect relationships between the independent and dependent variables through treatment and comparison of groups (Thomas, 2023). The population of the study comprised 11,290 SS2 students in all 28 public Senior Secondary Schools in Nassarawa Education Zone, Kano State, Nigeria. SS2 students were selected because Nutrient Cycling in Nature and Pollution are taught at this level. The students were assumed to be relatively homogeneous in age (15–17 years), exposed to the same curriculum, and learning under similar school environments. The sample consisted of 340 SS2 students drawn from four public secondary schools using intact classes. Intact classes were used because the classes were already organized and could not be randomly restructured. The research instrument used was the Nutrient Cycling in Nature and Pollution Achievement Test (NPAT), developed from WAEC SSCE past questions (2000–2025). The instrument consisted of 30 multiple-choice items with options A–D. Section A contained demographic information such as school, age, class, and gender, while Section B contained the test items. All items were structured to reflect Bloom's taxonomy levels: knowledge, comprehension, application, analysis, synthesis, and evaluation. Each correct response was scored 1 mark, while incorrect responses were scored 0, giving a total maximum score of 30. The instrument was validated by experts in science education and measurement and evaluation. A split-half reliability of 0.75 was obtained using the Spearman's rank-order correlation, indicating acceptable internal consistency for research purposes (Cohen, 1988; Dancy & Reidy, 2004). Data collected were analyzed using mean, standard deviation, and Analysis of Covariance (ANCOVA) at 0.05 level of significance.

Presentation of Results

Research Question one: To what extent does the mean differ in students' retention taught nutrients cycling in nature and pollution with sequence chart strategies, and those students taught with the conventional method of teaching?

Table 1: Mean Difference between Posttest and post-posttest

Variable	Group	N	$\bar{x}$	SD	M/diff	Remark
Retention of Students Taught with a Sequence Chart	Experimental	98	21.93	2.48	9.98	Favours SQC
	Control	85	11.95	4.81		

Table 1 reveals the retention scores of students taught with the Sequence Chart and conventional method of teaching, the experimental group recorded a substantially higher mean score ($\bar{x} = 21.93$, $SD = 2.48$) compared to the control group, which obtained a mean score of 11.95 with a standard deviation of 4.81. The mean difference of 9.98 indicates a large advantage in favor of the experimental group. This result suggests that the Sequence Chart instructional strategy significantly enhanced students' retention of learning content. By implication, the findings reveal that Sequence Chart instructional strategies was effective in improving students' retention.

H₀₁: There is no significant difference in mean retention score of students taught nutrients cycling in nature and pollution with sequence chart teaching strategies, and those taught with conventional methods of teaching.

Table 2: ANCOVA Result for the Students' Retention Taught Using SQC

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	4572.513 ^a	2	2286.256	164.772	0.000
Intercept	939.827	1	939.827	67.734	0.000
SC_Post_test	42.759	1	42.759	3.082	0.081

Effects of Sequence-Chart Strategy on ... Sadohi, F., Et. al. (2026)

Group	2341.000	1	2341.000	168.717	0.000
Error	2497.553	180	13.875		
Total	61809.000	183			
Corrected Total	7070.066	182			

a. R Squared = .647 (Adjusted R Squared = .643), Dependent Variable: SQC_post post test

Table 2 presents the results of an Analysis of Covariance (ANCOVA) conducted to examine the effect of instructional group on students' retention scores, while controlling for posttest achievement (SC_Post_test). The corrected model was statistically significant, $F(2,180) = 164.77, p < 0.001$, indicating that the combined effects of the covariate and group significantly explained variance in students' retention scores. The model accounted for 64.7% of the variance in retention outcomes ($R^2 = 0.647$; $AdjustedR^2 = 0.643$), demonstrating a very strong explanatory power. The covariate, SC_Post_test, did not have a statistically significant effect on students' retention scores, $F(1,180) = 3.08, p = 0.081$. This result suggests that posttest achievement did not significantly influence retention after controlling for group differences. In contrast, the group effect was statistically significant, $F(1, 180) = 168.72, p < .001$. This finding indicates that there was a significant difference in retention scores between the experimental and control groups after adjusting for posttest achievement. Thus, instructional group had a very strong and statistically significant effect on students' retention. The intercept was also statistically significant, $F(1,180) = 67.73, p < 0.001$, indicating that the adjusted mean retention score differed significantly from zero when all predictors were held constant. In summary, the ANCOVA results reveal that although posttest achievement did not significantly predict retention, instructional group exerted a dominant and significant influence on students' retention scores. This provides strong empirical evidence that the Sequence Chart instructional strategy was highly effective in enhancing students' retention compared to the control method.

Research Question Two: What is the mean difference in the retention of students taught nutrients cycling in nature and pollution with main idea web and sequence chart teaching strategies and those taught with conventional method of teaching based on gender?

Table 3: Mean Difference between Male and Female Students' Retention taught Sequence Chart.

Gender	Group	N	$\bar{x}$	SD	M/df	Remark
Male Retentions SC	Experimental	39	21.46	1.96		Favour male students
	Control	34	9.06	3.51	12.4	
Female Retention SC	Experimental	59	22.24	2.74		Favour female students
	Control	51	13.88	4.62	8.36	

Table 3 shows retention under the Sequence Chart, male students in the experimental group recorded a substantially higher mean retention score ($M = 21.46, SD = 1.96$) compared to their counterparts in the control group, who obtained a mean score of 9.06 ($SD = 3.51$). This result indicates a pronounced improvement in retention among male students exposed to the Sequence Chart strategy. Similarly, female students in the experimental group achieved a higher mean retention score ($M = 22.24, SD = 2.74$) than female students in the control group, who recorded a mean score of 13.88 ($SD = 4.62$). This finding demonstrates that the Sequence Chart strategy was effective in enhancing retention for female students as well. By implication, the findings indicate that the Sequence Chart instructional strategies significantly improved students' retention across gender. However, the magnitude of improvement was greater for the Additionally, female students in the experimental groups generally demonstrated slightly higher retention scores than male students, suggesting a modest gender difference in retention outcomes.

H₀₂: There is no significant difference in the mean retention score between male and female students taught nutrient cycling in nature and pollution with sequence chart teaching strategies, and those taught with conventional methods.

Table 4: ANCOVA result of male and female students using SQC and Conventional method

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	5032.573 ^a	4	1258.143	109.914	.000
Intercept	1344.219	1	1344.219	117.434	.000
SC_Post_test	14.054	1	14.054	1.228	.269
Group	2718.624	1	2718.624	237.505	.000
Gender	347.667	1	347.667	30.373	.000
Group * Gender	191.568	1	191.568	16.736	.000
Error	2037.493	178	11.447		



Effects of Sequence-Chart Strategy on ... Sadóh, F., Et. al. (2026)

Total	61809.000	183
Corrected Total	7070.066	182

a. R Squared = .712 (Adjusted R Squared = .705); Dependent Variable: SC_post_test

The table four presents the ANCOVA results conducted to determine the effects of sequence chart instruction strategy and gender on students' retention scores, while controlling for posttest achievement (SC_Post_test). The corrected model was statistically significant, $F(4,178) = 109.91, p < 0.001$, indicating that the combined effects of the covariate, group, gender, and their interaction significantly explained variance in students' retention scores. The model accounted for 71.2% of the variance in retention ($R^2 = 0.712$; Adjusted $R^2 = 0.705$), demonstrating a very strong explanatory power. The covariate, SC_Post_test, did not have a statistically significant effect on retention, $F(1,178) = 1.23, p = 0.269$. This suggests that students' posttest achievement did not significantly predict their retention scores after accounting for instructional strategy (group) and gender. The main effect of the sequence chart was highly statistically significant, $F(1,178) = 237.51, p < 0.001$. This finding indicates a substantial difference in retention between the experimental and control groups after adjusting for posttest scores, showing that the Sequence Chart instructional strategy had a very strong positive influence on retention.

The main effect of gender was also statistically significant, $F(1,178) = 30.37, p < 0.001$, revealing that male and female students differed significantly in their retention performance regardless of group. Importantly, the interaction effect between group and gender was statistically significant, $F(1,178) = 16.74, p < 0.001$. This result implies that the impact of the Sequence Chart strategy on retention varied by gender; in other words, one gender benefited more from the instructional intervention than the other. The intercept was statistically significant, $F(1,178) = 117.43, p < 0.001$, indicating that the adjusted mean retention score differed significantly from zero when all predictors were held constant.

In summary, the results demonstrate that while posttest achievement did not significantly influence retention, instructional strategy and gender both had strong effects, and importantly, the effectiveness of the Sequence Chart strategy depended on gender. This suggests a differential benefit of the intervention for male and female students.

Discussion of findings

The findings of the study in table one and two revealed that students taught Nutrient Cycling in Nature and Pollution using Sequence Chart Teaching Strategy demonstrated higher retention scores than their counterparts taught using the conventional lecture method. The mean retention score of students in the experimental group was higher than that of students in the control group, indicating that the use of Sequence Chart Teaching Strategy enhanced students' ability to retain learned concepts over time. Furthermore, the ANCOVA result showed that there was a statistically significant difference in the mean retention scores of students taught using Sequence Chart Teaching Strategy and those taught using the conventional lecture method at the 0.05 level of significance. Consequently, the null hypothesis which stated that there is no significant difference in the mean retention scores of students taught Nutrient Cycling in Nature and Pollution using Sequence Chart Teaching Strategy and those taught using the conventional lecture method was rejected. The improved retention observed among students exposed to Sequence Chart Teaching Strategy may be attributed to the visual and sequential organization of concepts provided by the strategy. Sequence charts present concepts in a logical and stepwise manner, thereby helping learners to establish meaningful relationships among concepts and processes. Since Nutrient Cycling in Nature and Pollution involves interconnected ecological processes such as carbon cycle, nitrogen cycle, decomposition, and environmental interactions, the strategy may have facilitated better understanding and long-term retention of concepts. The strategy also possibly encouraged active participation and meaningful learning by linking new knowledge with students' prior knowledge. The finding of this study is in agreement with the theory of meaningful learning proposed by Ausubel (1963), which emphasized that learners retain information better when instructional materials are properly organized and related to existing cognitive structures. The finding also supports the studies of Uba et al. (2017) who found that graphic organizers significantly improved students' comprehension and retention of learned materials. Wallace et al. (2023) reported that graphic organizer-based instructional activities improved students' performance, engagement, and retention in Biology courses. Likewise, Kpiranyam et al. (2023) found that Graphic Advance Organizer approach significantly enhanced students' retention and performance in Biology when compared with conventional discussion method. In the same vein, Umeana (2023) revealed that mind-mapping instructional strategy significantly improved students' retention and achievement in Biology among secondary school students. Imam and Olorundare (2023) also reported that graphic organizers improved students' learning outcomes in science subjects by enhancing meaningful



Effects of Sequence-Chart Strategy on ... Sadohi, F., Et. al. (2026)

learning and retention of concepts. However, the finding of the present study partly disagrees with Ollero (2023), who reported that retention in Biology concepts may not depend solely on instructional strategy but could also be influenced by factors such as students' learning styles and individual differences. Despite this contrasting view, the current study established that Sequence Chart Teaching Strategy contributed significantly to improving students' retention in Nutrient Cycling in Nature and Pollution. The findings of the study in table three and four revealed that both male and female students taught Nutrient Cycling in Nature and Pollution using Sequence Chart Teaching Strategy obtained higher retention scores than their counterparts taught using the conventional method. The mean retention difference for male students exposed to Sequence Chart Teaching Strategy was higher than that of male students in the control group. Similarly, female students taught using Sequence Chart Teaching Strategy demonstrated better retention scores than female students taught using the conventional lecture method. This indicates that the strategy enhanced retention among both male and female students. Furthermore, the ANCOVA result revealed that there was a significant difference in the mean retention scores between male and female students taught Nutrient Cycling in Nature and Pollution using Sequence Chart Teaching Strategy and those taught using the conventional method. The result also showed a significant interaction effect between teaching strategy and gender on students' retention, as the probability values for gender and Group. Gender interaction were less than the 0.05 level of significance. Consequently, the null hypothesis which stated that there is no significant difference in the mean retention scores between male and female students taught Nutrient Cycling in Nature and Pollution using Sequence Chart Teaching Strategy and those taught using conventional teaching method was rejected.

The significant retention difference observed among male and female students may be attributed to the ability of the Sequence Chart Teaching Strategy to simplify abstract and process-oriented concepts through visual and sequential presentation of information. The strategy possibly enabled students to organize ecological concepts logically, thereby improving comprehension and long-term retention. Since Nutrient Cycling in Nature and Pollution involves interconnected processes such as nutrient movement, decomposition, and environmental interactions, the sequence chart strategy may have enhanced meaningful learning among both genders. The finding agrees with Yusuf and Afolabi (2022), who found that graphic organizers improved students' retention in Biology among male and female secondary school students. However, the present finding contrasts with studies that reported no significant gender influence on students' retention when innovative instructional strategies were used (Chukwu & Samuel, 2022; Adeyemi & Bello, 2023)

Conclusion

Based on the findings of the study, it was concluded that Sequence Chart Teaching Strategy significantly improved secondary school students' retention in Nutrient Cycling in Nature and Pollution compared with the conventional lecture method. Students exposed to the Sequence Chart Teaching Strategy demonstrated better retention of learned concepts due to the visual and sequential organization of information provided by the strategy. The study further revealed that both male and female students benefited from the use of the strategy, although significant differences existed in retention based on gender. The study therefore established that Sequence Chart Teaching Strategy is an effective learner-centered instructional approach capable of enhancing meaningful learning and long-term retention of Biology concepts among secondary school students in Kano State, Nigeria.

Recommendations

1. Biology teachers should adopt Sequence Chart Teaching Strategy in teaching abstract and process-oriented concepts such as Nutrient Cycling in Nature and Pollution in order to enhance students' retention and meaningful understanding of concepts.
2. Curriculum planners and educational authorities should encourage the integration of graphic organizer instructional strategies into Biology curriculum and classroom instruction at the secondary school level.
3. Teacher training institutions and professional development programmes should organize workshops, seminars, and conferences to train Biology teachers on the effective use of Sequence Chart Teaching Strategy and other learner-centered instructional approaches.



Effects of Sequence-Chart Strategy on ... Sadoh, F., Et. al. (2026)

References

- Abidoeye, O.F., Abidoeye, A.A. & Olaide, O. (2023). The Effect of Biology Teaching Materials on the Academic Performance of Senior Secondary School Students in Ilorin West, Ilorin, Kwara State. *International journal of education and research* 2(4): 142-150.
- Adebisi, R.O., Adeyemi, M.I. & Ubugadu, M.A. (2021). Science learning performance and retention of biology concepts among secondary school students. *Journal of biological science and education*, 3(1), 23-30.
- Adeyemi, T.O., & Bello, M.A. (2023). Students' motivation, study habits and retention in Biology in Nigeria secondary schools. *International Journal of Educational Development*, 15 (2), 77-86
- Ahmed, S.S., Hassan, R., & Sadoh, F. (2021). Effects of teaching with analogy on performance and retention in acid and base concepts among secondary school students in Zaria Metropolis, Kaduna State, Nigeria. *Bayero journal of science and technology and mathematics education (BAJOSTME)*, 2(1): 34-45.
- Aina, O. M., & Ogunkunle, R. A. (2021). Effect of Concept Mapping Strategy on Senior Secondary School Students' Achievement in Biology in Ondo State, Nigeria. *International Journal of Education and Evaluation*, 7(2), 109-119.
- Akanbi, A. O., Olayinka, Y. W., Omosewo, E. O., & Mohammed, R. E. (2021). Effect of Mind Mapping Instructional Strategy on Students' Retention in Physics in Senior Secondary Schools. *Anatolian Journal of Education*, 6(1), 189-198.
- Ausubel, D. P. (1963). The psychology of meaningful verbal learning. Grune & Stratton.
- Cao, L. (2026). Connecting the dots: An active learning flashcard activity to teach soil microbiology through nutrient cycles. *Journal of Microbiology and Biology Education*. <https://doi.org/10.1128/jmbe.00287-25>
- Chukwu, J.O., & Samuel, M.A. (2022). Gender influence on students' retention in Biology using activity-based instructional strategy. *Journal of Contemporary Education Research*, 6(4), 122-130
- Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed). Lawrence Erlbaum Associates.
- Cottone, A.M., & Yoon, S. (2020). Improving the design of undergraduate biology courses toward the goal of retention: The case of real world inquiry and active learning through metagenomics. *Journal of Microbiology and Biology Education*, 21(1). <https://doi.org/10.1128/jmbe.v21i1.1965>
- Creately (2020). The ultimate list of Graphic organizers for teachers and students. <https://creately.com/guides/types-of-graphic-organizers> retrieved on 2nd July, 2023.
- Dancey, C.P., & Reidy, J. (2004). Statistics without maths for psychology (3rd ed). Pearson Education.
- Imam, B.T., & Olorundare, A.S. (2023). Comparative effect of the use of graphic organizers on students' learning outcomes in organic chemistry. *Unnes Science Education Journal*, 12(1). <https://doi.org/10.15294/usej.v12i1.55511>
- Jena, A.K. (2019). Concept Map in Photosynthesis and its Effects on Achievement and Self- Classroom Management in Silchar Town of Assam, India.. *International Journal of Research in Teacher Education*, 10(4):1-18.
- Kpiranyam, F.S., Achor, E.E., & Fakaa, S.G. (2024). Scaling up Emotional Intelligence and Critical Thinking of Students in Biology using Concept Mapping Strategies. *FNAS Journal of Mathematics and Science Education*, 5(4), 92-101. www.fnasjournals.com
- Kuthuria, S. (2019). Graphic Organizers: The Use of Mind Maps and Concept Maps for Indexing of Concepts in Science Education in Delhi, India. *Journal of Teacher Education and Research*, 14(2), 17-23.
- Lynch, A. (2021). Main Idea and Details Graphic Organizer. <https://www.twinkl.co.uk/resource/amp/us> .
- Negedu, S. A. (2023). Effect of Advance Organizer on Students' Achievement in Secondary School Biology in Dekina Local Government Area of Kogi State. *Journal of Science, Technology and Mathematics Pedagogy*, 1(1), 217–226. <https://jostmp-ksu.com.ng/index.php/jostmp/article/view/25>
- Nooraida, S. M., Ahmad, M. N., Kelvineh, K., & Abdullah, A. (2020). The Effects of 5E in Enhancing the Understanding of Meiosis Concept. *International Journal of Evaluation and Research in Education (IJERE)* (9) 1: 129-139
- Novak, J. D., & Gowin, D. B. (1984). Learning how to learn. Cambridge University Press.
- Ogunleye, A. O. (2019). Improving students' achievement in Biology through innovative instructional strategies in Nigerian secondary schools. *Journal of Science Teachers Association of Nigeria*, 54(1), 98–107.
- Okebukola, P. A. (1990). Attaining meaningful learning of concepts in genetics and ecology: An examination of the potency of the concept-mapping technique. *Journal of Research in Science Teaching*, 27(5), 493–504. <https://doi.org/10.1002/tea.3660270508>
- Okoronka, U. A. (2012). Influence of gender on academic achievement of students in Biology using cooperative teaching method. *Journal of Educational and Social Research*, 2(1), 307–312.
- Ollero, J. (2023). The analysis of the Grade 10 students' retention level of basic Biology concepts and terminologies in relation to their learning styles. *International Journal of Chemistry Education Research*, 7(1), 11–18. <https://doi.org/10.20885/ijcer.vol7.iss1.art3>
- Ramalingam, S. T. (2018). Modern biology for senior secondary schools (Revised ed.). Africana First Publishers Plc.



Effects of Sequence-Chart Strategy on ... Sadóh, F., Et. al. (2026)

- Uba, E., Oteikwu, E. A., Aikpitanyi, S. O., & Abiodun-Eniayekan, E. (2017). A research-based evidence of the effect of graphic organizers on the understanding of prose fiction in ESL classroom. *SAGE Open*, 7(2), 1–10. <https://doi.org/10.1177/2158244017709506>
- Umeana, I. M. (2023). Impact of mind-mapping instructional strategy on secondary school students' achievement and retention in Biology in Delta State. *International Journal of Research and Scientific Innovation*, 10(9), 217–224. <https://doi.org/10.51244/IJRSI.2023.10921>
- Valarde, O. (2019). 15 Graphic Organizers and how they help visualize Ideas. <https://visme.co>. Retrieved January 31, 2026.
- Wallace, A., Barosh, T., Brisch, E., Laybourn, P., & Balgopal, M. M. (2023). Boosting student performance with inclusive writing-to-learn assignments through graphic organizers in large enrollment undergraduate biology courses. *Journal of Microbiology & Biology Education*, 24(3), e00087-23. <https://doi.org/10.1128/jmbe.00087-23>



Influence of Leadership Style and Security-Related factors On Teachers' Attrition among Public Secondary Schools in North-East Senatorial District of Benue State, Nigeria

AGU, Joshua Denen¹
+2348101343175

PINGA, Mahmud¹
mpinga@bsum.edu.ng
+2347038651067

¹Department of Educational Foundations, Faculty of Education, Rev. Fr. Moses Orshio Adasu University, Makurdi

Abstract

The study investigated the influence of job-related variables such as Leadership styles and Security-Related Factors on teachers' attrition in public secondary schools in Benue North East Senatorial District, Nigeria. Two research questions guided the study, while two hypotheses were formulated and tested at 0.05 level of significance. The study population consisted of 1,274 teachers from 98 public secondary schools. A sample of the study was 254 teachers representing 20% of all the teachers from 19 secondary schools representing 20% of the school population. Job-Related Variables and Teachers' Attrition Questionnaire (JRVTAQ) was used for data collection. It was validated by three experts, with a reliability coefficient of 0.91 using Cronbach Alpha. Data were analyzed using Mean and Standard Deviation to answer the research questions and the chi-square (χ^2) test of goodness-of-fit was used to test the hypotheses at 0.05 level of significance. The findings of the study showed that leadership and security-related issues have significant negative influence on teachers' attrition in public secondary schools in Benue North East Senatorial District, Nigeria. The study concluded that there is significant negative influence of job-related variables on teachers' attrition in public secondary schools in Benue North East Senatorial District, Nigeria. It was recommended among others that principals and other educational authorities should promote effective and participatory leadership practices with the school system to create a supportive and motivating work environment for teachers so that they could feel among and maintain their job.

Keywords: Job-Related Variables, Teachers' Attrition, leadership & security-related issues

Introduction

Teachers are one of the most essential resources in every educational system, as they play a central role in transferring knowledge, skills, socio-cultural values, and societal norms to younger generations. The achievement of educational goals and the overall success of schools largely depend on having enough qualified teachers who are committed and stable. Recognizing the vital roles they serve, teachers are expected to be sufficiently motivated through suitable incentives, supportive working conditions and opportunities for professional development to remain in the profession (Ofeyeju, Akpotu, & Ekwunye, 2022). Despite their importance, teacher attrition has become a major global challenge that continues to weaken the quality and stability of educational systems in both developed and developing nations. In the United States, for example, many teachers leave the profession within their first five years, creating ongoing shortages in the teaching workforce (Shen, 2021; Sutch, Darling-Hammond & Carver-Thomas, 2019). Reports also show that about 8% of teachers in the U.S. leave the profession each year, while another 8% transfer between schools (Kasau, Kaloki, Kitto, Mutinda, Jeremiah & Kasau, 2016). This turnover appears to have interrupted instructional continuity, negatively impacted students' academic performance and raised costs for schools due to the need to recruit, hire and train newly engaged teachers. Similar teacher attrition trends are seen in European countries such as Britain, Sweden, and Germany, as well as in New Zealand, where shortages of qualified teachers have become an increasing concern (Ofeyeju et al., 2022). In Asia, countries like Bangladesh and Nepal also face significant teacher attrition caused by low pay, poor working conditions and limited opportunities for career growth (Vignesh & Sarojini, 2018).

In Africa, including Nigeria, teacher attrition is equally alarming, particularly in public secondary schools where factors such as poor leadership practices, insecurity, irregular payment of salaries and inadequate professional development opportunities have contributed to the increasing exodus of teachers from the profession (Vignesh & Sarojini, 2018). This persistent departure of teachers appears to have reduced the pool of qualified and experienced personnel in schools, thereby weakening the quality of teaching and learning, disrupting students' academic progress and threatening the overall effectiveness of the educational system. Consequently, attrition may be viewed as the gradual reduction in the number of individuals in a group, organization or system over time, usually occurring naturally rather than through deliberate removal

Influence of Leadership Style and Security-Related Factors on ... Agu, J. D. & Pinga, M. (2026)

(Nweke, Mailumo, Pinga & Obasi, 2024). In schools, teachers' attrition refers to the process whereby teachers leave their teaching positions either through transfer to other schools or complete withdrawal from the teaching profession (Nweke, Mailumo, Pinga & Obasi, 2024). Teacher attrition is often examined in relation to teacher shortages and the consequent loss of valuable skills, experience and institutional knowledge required for effective school functioning (Odingi & Kizito, 2023). Understanding the phenomenon of teacher attrition is therefore critical because it has far-reaching implications for educational systems, including the continuous need to recruit and train large numbers of teachers annually to replace those who exit the profession (Goldring, Taie & Riddles, 2014). In public secondary schools, teacher attrition has increasingly become an issue of serious concern due to its adverse implications for educational quality and school effectiveness. In Nigeria, particularly in Benue North East Senatorial District, the rate at which teachers leave public secondary schools appears to reflect the growing trend recorded in many parts of the country, with both the number and proportion of teachers exiting the profession increasing over the years (Ofoyeju, Akpotu & Egwunyenga, 2022). According to Madumere-Obike and Nwabueze (2018), the rising rate of teacher attrition seems to be influenced by several job-related variables, including poor leadership practices, insecurity, delayed payment of salaries, availability of alternative employment opportunities, lack of professional development programmes, delayed promotions, inadequate administrative support, difficult working conditions, poor remuneration and limited opportunities for career advancement. These challenges appear to discourage teachers from remaining in the profession, thereby contributing to high turnover rates that disrupt students' learning and negatively affect overall school performance. In public secondary schools in Benue North East Senatorial District, teacher attrition appears to continue to persist despite efforts by the government and school administrators to improve teachers' welfare and working conditions. Factors such as principals' leadership practices and increasing security challenges appear to further worsen the situation, leading to a continuous loss of experienced teachers and posing a serious threat to the quality and effectiveness of secondary education in Benue North East Senatorial District and other parts of Nigeria.

Leadership refers to the process through which school administrators guide, influence and support teachers and other staff to achieve organizational goals, promote professional growth and enhance overall school effectiveness (Leithwood, Harris & Hopkins, 2020). In the school setting, leadership goes beyond issuing directives to include the creation of a shared vision, the cultivation of trust, and the development of a supportive organizational climate that enables teachers to perform effectively. Literature consistently shows that when principals adopt effective leadership practices, particularly those that are supportive, participatory and transformational, teachers tend to experience greater job satisfaction, motivation and commitment. Leaders who provide clear direction, communicate expectations effectively, recognize teachers' efforts and involve them in decision-making processes help to build a positive school climate characterized by trust, collaboration and mutual respect (Bush, 2019; Leithwood, Harris & Hopkins, 2020). In such environments, teachers often feel valued and professionally empowered, which strengthens their sense of belonging, improves their instructional practices and reduces their intention to leave the profession (Darling-Hammond et al., 2017). Conversely, when school leadership is poor, characterized by authoritarian decision-making, inadequate communication, favoritism and lack of professional or emotional support, teachers are more likely to experience frustration, low morale and disengagement. Such negative leadership conditions undermine teachers' motivation and commitment, weaken their attachment to the school and increase their likelihood of considering withdrawal from the profession (Ofoyeju, Akpotu & Egwunyenga, 2022). In a nutshell, the above review highlights that the quality of principals' leadership as well as the security situation of the environment may shape teachers' attitudes, emotions and behaviours, thereby influencing whether they remain committed to their duties or gradually exit the teaching profession.

Security-related issues refer to conditions in which individuals or communities are exposed to threats to life, property and general well-being arising from violence, crime or broader social instability (United Nations Children's Fund, 2022). In Nigeria, insecurity is commonly expressed through banditry, kidnapping, insurgency and communal conflicts, all of which create unsafe environments for both teachers and students. In the educational sector, such insecurity has become a significant job-related factor contributing to teacher attrition in public secondary schools, as many teachers become unwilling to remain in, or accept postings to, areas where their personal safety cannot be assured (World Bank, 2021). Persistent exposure to insecurity often disrupts normal school operations, forces occasional or prolonged school closures and places teachers at risk of abduction or physical harm. These conditions tend to reduce teachers' job satisfaction, weaken



Influence of Leadership Style and Security-Related Factors on ... Agu, J. D. & Pinga, M. (2026)

their sense of security and diminish their commitment to the teaching profession. Consequently, some teachers opt to request transfers to safer locations, migrate to urban centres with relatively stable security conditions, or leave the profession entirely to another sector. This movement of teachers from insecure areas contributes to acute shortages of qualified personnel, which in turn undermines instructional quality, disrupts learning continuity and negatively affects the overall development and effectiveness of education in affected regions. The persistent and growing exit of qualified teachers from public secondary schools poses a serious threat to the stability, quality and overall effectiveness of secondary schools in the Benue North East Senatorial District of Nigeria. This alarming trend not only disrupts instructional continuity but also places an unsustainable burden on the government through repeated recruitment, induction and training of replacement/ newly recruited teachers. More critically, frequent teacher turnover weakens student-teacher relationships, lowers instructional quality and ultimately undermines students' academic performance and educational outcomes. Despite the strategic importance of teachers to national development, issues such as weak leadership practices and insecurity appear to be pushing competent teachers out of the system. If this situation persists unchecked, it may further erode public confidence in the secondary school system and widen existing educational inequality gaps in Benue North East Senatorial District. It is against this background that this study investigated the influence of job-related variables on teachers' attrition in public secondary schools in Benue North East Senatorial District.

Statement of the Problem

Teachers remain one of the most critical components of any educational system, serving as the backbone for effective teaching and learning. However, in Nigeria, there continues to be a persistent concern about inadequate teacher supply in public secondary schools, and preliminary observations suggest that schools in Benue North East Senatorial District may not have sufficient teachers to ensure effective instructional delivery. This situation appears to be worsening due to a rising rate of teacher attrition, driven largely by job-related factors such as ineffective leadership by school principals and prevailing security challenges. These conditions seem to be pushing many teachers to leave the profession in search of more stable, rewarding and safer working environments both within and outside the country. There is also growing concern among teachers, parents and School-Based Management Committee (SBMC) members about the quality of leadership in many secondary schools. Many principals appear not to involve teachers in decision-making processes, while poor communication practices and weak emotional support systems seem to further strain staff morale. In some cases, principals appear unable to adequately motivate teachers, especially in situations of salary delays or non-payment, leading to frustration and declining commitment. As a result, many teachers appear to be exploring alternative employment opportunities outside the teaching profession, thereby intensifying the problem of attrition in the study area. Furthermore, insecurity has become a serious threat to the teaching profession in several communities within the district. Reports of kidnapping, harassment and attacks on both teachers and learners by unknown armed groups have created fear and instability in the school environment. In some instances, such insecurity has led to the displacement or tragic loss of teachers, forcing many others to relocate to safer areas in search of security and better livelihood opportunities. These persistent challenges have not only demoralized teachers but have also contributed to the continuous loss of experienced and qualified personnel, thereby reducing the quality of education and undermining the effectiveness of public secondary schools in Benue North East Senatorial District. It is against this backdrop that this study examines the influence of job-related variables on teachers' attrition in public secondary schools in the area.

Purpose of the Study

The purpose of the study was to investigate the influence of job-related variables on teachers' attrition in public secondary schools in the Benue North East Senatorial District, Nigeria. Specifically, the study sought to:

1. find out the influence of leadership on teachers' attrition in public secondary schools in Benue North East Senatorial District, Nigeria.
2. ascertain the influence of security-related issues on teachers' attrition in public secondary schools in Benue North East Senatorial District, Nigeria.

Research Questions

The following research questions guided the study:

1. What is the influence of leadership on teachers' attrition in public secondary schools in Benue North East Senatorial District, Nigeria?



Influence of Leadership Style and Security-Related Factors on ... Agu, J. D. & Pinga, M. (2026)

2. What is the influence of security-related issues on teachers' attrition in public secondary schools in Benue North East Senatorial District, Nigeria?

Hypotheses

The following hypotheses were formulated and tested at 0.05 level of significance:

1. Leadership has no significant influence on teachers' attrition in public secondary schools in Benue North East Senatorial District, Nigeria.
2. Security-related issues have no significant influence on teachers' attrition in public secondary schools in Benue North East Senatorial District, Nigeria.

Research Methodology

This study was conducted in public secondary schools within the Benue North East Senatorial District, Nigeria, employing a descriptive survey research design. The study population consisted of 1,274 teachers from 98 public secondary schools. A sample of 254 teachers, representing 20% of all teachers from 19 secondary schools, which in turn represented 20% of the school population, was selected using a multi-stage sampling procedure (purposive sampling, proportionate stratified sampling, and simple random sampling techniques). The Job-Related Variables and Teachers' Attrition Questionnaire (JRVTAQ) was used for data collection. The instrument was divided into two sections: A and B. Section A included items on respondents' personal data. Section B was split into two clusters: Cluster I (Items 1-5) focused on leadership and teachers' attrition in public secondary schools, while Cluster II (Items 6-10) addressed security-related issues and teachers' attrition in public secondary schools. The instrument was validated by three experts: two from the Department of Educational Foundations (specializing in Educational Management) and one from the Department of Mathematics and Science Education, all within the Faculty of Education at Rev. Fr. Moses Orshio Adasu University, Makurdi. Subsequently, the instrument underwent a trail test for reliability using Cronbach's Alpha, resulting in coefficients of 0.91 which is considered sufficiently high for the instrument to be reliable for the study. Data were analyzed using Mean and Standard Deviation to answer the research questions and the chi-square (χ^2) test of goodness of fit was used to test the hypotheses at 0.05 level of significance. Data were analyzed using descriptive statistics of Mean and Standard Deviation to answer the research questions. A Mean cut-off point of 2.50 was used for decision-making. Items with a Mean score of 2.50 and above were regarded as agreed, while any item with a Mean score of less than 2.50 was regarded as disagreed. Chi-square goodness of fit was used to test the hypotheses at 0.05 level of significance. The decision rule is that if $P < 0.05$ level of significant is low, the hypothesis is rejected, but if $P > 0.05$ level of significant is high, the hypothesis is not rejected. Chi-square was chosen for the test of hypotheses because it is a non-parametric statistical tool that shows the influence of two categorical variables on one another.

Presentation of Results

The data were analyzed and interpreted in response to the research questions.

Research Question 1: What is the influence of leadership on teachers' attrition in public secondary schools in Benue North East Senatorial District, Nigeria?

Table 1: Mean Rating and Standard Deviation of Respondents on Influence of Leadership on Teachers' Attrition in Public Secondary Schools in Benue North East Senatorial District, Nigeria

Item No	Item Description	N	SA	A	D	SD	$\bar{X}$	SD	Decision
1	Teachers are more likely to leave when they are not involved in school decision-making.	250	110	76	39	25	3.12	0.99	Agree
2	Poor communication between principals and teachers increases teachers' intention to transfer.	250	90	110	30	20	3.18	0.93	Agree
3	Teachers tend to leave schools where principals do not support them during challenges such as salary delays.	250	112	84	28	26	3.14	0.99	Agree



Influence of Leadership Style and Security-Related Factors on ... Agu, J. D. & Pinga, M. (2026)

4	Teachers are discouraged when their efforts are not recognized by school administrators.	250	108	90	29	23	3.16	0.96	Agree
5	Perceived unfair treatment by principals increases teachers' desire to transfer or resign.	450	103	98	28	22	3.22	0.91	Agree
Cluster Mean							3.16		Agree

Source: Research Fieldwork (2026)

Table 1 indicates the Mean response values of item 1-5 as 3.12, 3.18, 3.14, 3.16 and 3.22 with the corresponding Standard Deviation values of 0.99, 0.93, 0.99, 0.96 and 0.91 respectively. All the mean response values are above the Mean score benchmark of 2.50. This implies that the respondents agreed that they considered leaving their current school due to poor leadership, lack of leadership support contributes to their leaving the profession and school leadership demoralizes their retention on the teaching job. The respondents also agreed that they are more likely to leave school with ineffective leaders and if leadership improved, they would be more committed to staying. The cluster Mean Score value of 3.16 is found to be above the Mean score benchmark of 2.50. This shows the influence of leadership on teachers' attrition in public secondary schools in Benue North East Senatorial District, Nigeria.

Research Question 2: What is the influence of security-related issues on teachers' attrition in public secondary schools in Benue North East Senatorial District, Nigeria?

Table 2: Mean Rating and Standard Deviation of Respondents on Influence of Security Related Issues on Teachers' Attrition in Public Secondary Schools in North Central, Nigeria

Item No	Item Description	N	SA	A	D	SD	$\bar{X}$	SD	Decision
26	Fear of personal harm reduces teachers' willingness to remain in their postings.	250	105	87	36	22	3.14	0.97	Agree
27	Communal clashes around schools influence teachers' decision to transfer.	250	96	80	33	38	3.09	1.06	Agree
28	Reports of kidnapping of teachers increase their intention to leave the profession.	250	101	77	39	33	3.10	1.04	Agree
29	Lack of security personnel in schools increases teachers' fear and dissatisfaction.	250	115	77	29	29	3.11	1.02	Agree
30	Continuous insecurity in schools forces teachers to seek alternative employment elsewhere.	250	92	90	33	34	3.10	1.04	Agree
Cluster Mean							3.11		Agree

Source: Research Fieldwork (2026)

Table 2 indicates the Mean response values of item 26-30 as 3.14, 3.09, 3.10, 3.11 and 3.10 with the corresponding Standard Deviation values of 0.97, 1.06, 1.04, 1.02 and 1.04 respectively. All the mean response values are above the Mean score benchmark of 2.50. This implies that the respondents agreed that frequent security threats in the school environment make them consider leaving their jobs, fear of attacks around the school discourages them from continuing to work their school and kidnapping, increase their intention to leave the teaching profession. The respondents also agreed that lack of adequate security measures in schools compels them to look for employment elsewhere and concern for their family safety due to insecurity leads to their intention to leave teaching job. The cluster Mean Score value of 3.11 is found to be above the Mean score benchmark of 2.50. This shows the influence of security-related issues on teachers' attrition in public secondary schools in Benue North East Senatorial District, Nigeria.



Influence of Leadership Style and Security-Related Factors on ... Agu, J. D. & Pinga, M. (2026)

Hypothesis 1: Leadership has no significant influence on teachers' attrition in public secondary schools in Benue North East Senatorial District, Nigeria.

Table 3: *Chi-square Test of the Influence of Leadership on Teachers' Attrition in Public Secondary Schools in Benue North East Senatorial District, Nigeria*

Responses	Observed Frequency	Expected Frequency	df	X ²	P	Decision
SA	104	62.5	3	82.512 ^a	0.000	Significant.
A	92	62.5				
D	31	62.5				
SD	23	62.5				
Total	250					

Source: Field Survey (2026)

Table 3 shows the chi-square calculated value of 82.512^a at 3 degrees of freedom; P=0.000 is less than 0.05. With this result, the null hypothesis, which states that leadership has no significant influence on teachers' attrition in public secondary schools in Benue North East Senatorial District, Nigeria, was therefore rejected. This shows that leadership has significant negative influence on teachers' attrition in public secondary schools in Benue North East Senatorial District, Nigeria.

Hypothesis 2: Security-related issues has no significant influence on teachers' attrition in public secondary schools in Benue North East Senatorial District, Nigeria.

Table 4: *Chi-square Test of the Influence of Security-Related Issues on Teachers' Attrition in Public Secondary Schools in Benue North East Senatorial District, Nigeria*

Responses	Observed Frequency	Expected Frequency	df	X ²	P	Decision
SA	103	62.5	3	84.944 ^a	0.000	Significant.
A	82	62.5				
D	34	62.5				
SD	31	62.5				
Total	250					

Source: Field Survey (2026)

Table 4 shows Chi-square calculated value of 84.944^a at 3 degree of freedom; P=0.000 is less than 0.05. With this result, the null hypothesis, which states that security-related issues have no significant influence on teachers' attrition in public secondary schools in Benue North East Senatorial District, Nigeria, was therefore rejected. This shows that security-related issues have significant negative influence on teachers' attrition in public secondary schools in Benue North East Senatorial District, Nigeria.

Discussion of Findings

The first finding of the study shows that leadership has significant negative influence on teachers' attrition in public secondary schools in Benue North East Senatorial District, Nigeria. This means that the teachers considered leaving their current school due to poor leadership, lack of leadership support contributes to their leaving the profession and school leadership demoralizes their retention on the teaching job. Also, teachers are more likely to leave school with ineffective leaders and if leadership improved, they would be more committed to staying. This finding agrees with the finding of Yani, Kusen and Khair (2020) which shows that there is significant influence of principals' application of leadership styles on teachers' attrition in public junior high school in Indonesia. This finding also agrees with that of Shah and Burke (2019) which indicates that top management leadership has significant influence on teachers' job mobility in private secondary schools in Juja, Kiambu County, Kenya. The researcher confirms that poor leadership increases teachers' intention to leave teaching profession because when they are not views recognized or they are not carried along in decision or policy making process they most likely intend to leave their teaching job. The second finding of the study shows that security-related issues have significant negative influence on teachers' attrition in public secondary schools in Benue North East Senatorial District, Nigeria. This means that the teachers agreed that frequent security threats in the school environment make them consider leaving their jobs, fear of attacks around the school discourages them from continuing to work my school and kidnapping, increase their intention to leave the teaching profession. They also agreed that lack of adequate security measures in schools compels them to look for employment elsewhere and concern for their family safety due to insecurity



Influence of Leadership Style and Security-Related Factors on ... Agu, J. D. & Pinga, M. (2026)

leads to their intension to leave teaching job. This finding agrees with the finding of Jato (2021) which indicates that there is significant negative influence of insecurity on the management and administration of secondary schools in secondary schools in Katsina-Ala Local Government Area of Benue State. The finding also agrees with the finding of Obiechina, Abraham and Nwogu (2018) which shows that school environmental insecurity has significant negative impact on teachers' attrition in public secondary schools in public secondary schools in Anambra State, Nigeria. The researcher observes that this finding is a demonstration that an insecure school environment can scare teachers away. This means that when there is insecurity in the school environment, teachers may not be will to stay for safety purpose and this may lead to increase rate of teachers' attrition in the school system.

Conclusion

Based on the findings of the study, it was concluded that job-related variables exert a significant negative influence on teachers' attrition in public secondary schools in Benue North East Senatorial District, Nigeria. This indicates that persistent issues such as poor leadership practices and security-related issues are increasingly pushing teachers out of the profession. The continued presence of these conditions suggests a troubling trend of teacher disengagement and exit, which may be steadily weakening the stability and effectiveness of public secondary schools in the study area.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. Principals and other educational authorities should promote effective and participatory leadership practices with the school system to create a supportive and motivating work environment for teachers so that they could feel among and maintain their job.
2. Government, school management and communities should strengthen security measures around schools and communities to ensure the safety of teachers and encourage them to remain in the teaching profession.

References

- Bush, T. (2019). *Leadership and management in education: Theory and practice*. London, UK: Sage Publications.
- Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). *Effective teacher professional development*. Palo Alto, CA: Learning Policy Institute.
- Goldring, R., Taie, S., & Riddles, M. (2014). *Teacher attrition and mobility: Results from the 2012–13 teacher follow-up survey*. Washington, DC: National Center for Education Statistics.
- Kasau, J., Kaloki, P., Kitto, M., Mutinda, J., Jeremiah, S., & Kasau, J. (2016). Teacher attrition and its impact on educational outcomes in selected schools. *International Journal of Education Research*, 4(2), 45–58.
- Leithwood, K., Harris, A., & Hopkins, D. (2020). Seven strong claims about successful school leadership revisited. *School Leadership & Management*, 40(1), 5–22.
- Madumere-Obike, C. U., & Nwabueze, A. I. (2018). Job-related factors and teacher attrition in secondary schools in Nigeria. *Nigerian Journal of Educational Administration and Planning*, 18(2), 77–89.
- Nweke, C. O., Mailumo, P., Pinga, M., & Obasi, E. (2024). Assessment of teachers' attrition rate in primary and junior secondary schools in Ebonyi State Universal Basic Education. *Unizik Journal of Educational Research and Policy Studies*, 18(3), 304–321.
- Odingi, J., & Kizito, R. (2023). Teacher turnover and institutional knowledge loss in secondary schools. *Journal of Educational Studies*, 15(3), 88–101.
- Ofoyeju, A. T., Akpotu, N. E., & Egwunyenga, E. J. (2022). Teacher motivation and attrition in secondary schools. *African Journal of Educational Management*, 23(1), 112–125.
- Shen, J. (2021). Teacher retention and attrition in the United States: A review of trends. *Educational Research Review*, 34, 100–115.
- Sutcher, L., Darling-Hammond, L., & Carver-Thomas, D. (2019). *Understanding teacher shortages in the United States*. Palo Alto, CA: Learning Policy Institute.
- United Nations Children's Fund. (2022). *School safety and learning environments in crisis contexts*. New York, NY: UNICEF.
- Vignesh, K., & Sarojini, R. (2018). Teacher attrition and job satisfaction in developing countries. *International Journal of Educational Development*, 62, 1–9.
- World Bank. (2021). *Addressing teacher shortages and attrition in developing countries*. Washington, DC: World Bank Group.





Qualitative Study on Problems and Solutions associated with Effective Writing Skills among Learners: An Overview

OJO, Olusoji Isaiah¹

ojooi@cauedoyo.edu.ng

+2348051927842

OKEKUNLE, Aderemi Omolara²

ogooluwaokekunle12@gmail.com

+2348038525698

¹Department of Educational Foundation and Curriculum Studies, Emmanuel Alayande University of Education, Oyo, Oyo State, Nigeria

²Department of European Languages, Faculty of Arts Education, Emmanuel Alayande University of Education, Oyo, Oyo State, Nigeria

Abstract

Sufficient attention is not given to writing, which is one of the major literacy skills. In fact, the invention of social media has done more harm in this part of the world. Writing as a productive skill deserves adequate attention at every stage of learning. This paper, therefore, delves into some problems associated with writing and solutions that can be used to assist learners. Some areas that could be taught in writing in order to arouse the interest of the learners are discussed in this work. Areas of concerns where the learners may be encountering difficulties are identified such as common errors. In view of the damages that problems associated with writing could pose to the learners, this paper offers some solutions as a kind of leeway. Some of the solutions are applying pedagogical solutions, guided composition and development of content in composition writing. The paper suggests exploit and further research work in specific areas of writing such as fieldwork, laboratory report, long essays, features, journal articles, newspaper articles, editorials and many discourses.

Keywords: Writing, common errors, terms in writing, common problems, and suggested solutions.

Introduction

The importance of writing at every stage of learning in formal system of Education has been emphasized by scholars. At the pre-primary and lower basic levels of Education children learn how to write from the formation of letters, to organizing their ideas, to using correct grammar, punctuation and spelling. Edwards (2003), cited in Spear-swerling (2006), opines that technological advances do not eliminate the need for explicit teaching of handwriting. Handwriting is important at the elementary school level in so many ways. First it is a basic tool used in many subjects (doing classroom work and home work). Secondly, handwriting at the elementary stage is linked to basic reading and spelling achievement. However there are some problems militating against effective teaching of handwriting at the kindergarten and lower primary school level. Yule (2010) refers to writing as the symbolic representation of language through the use of graphic signs. Unlike speech, it is a system that is not simply acquired, but has to be learned through sustained conscious effort. Not all languages have written form and even among people whose language has a well-established writing system, there are large numbers of individuals who cannot use the system.

In terms of human development, writing is a relatively recent phenomenon. We may be able to trace human attempts to represent information visually back to cave drawings made at least 20,000 years ago, or to clay tokens from about 10,000 years ago, which appear to have been an early attempt at bookkeeping; but these artifacts are best described as ancient precursors of writing. The earliest writing for which we have clear evidence is known as "cuneiform," marked on clay tablets about 5,000 years ago. An ancient script that has a more obvious connection to writing systems in use today can be identified in inscriptions dated around 3,000 years ago. In all these, Yule identifies representation of particular images consistently through a product of picture writing, or pictograms, use of symbol considered to be part of a system of idea writing, or ideograms, there is also ideograms (an arm of cuneiform, evident in Iraq) use of existing symbols to represent the sounds of language through a process known as rebus writing, syllabic writing, alphabetic writing, written English and English orthography. Adebajo (2011) refers to writing as one of the communication skills. It requires the acquisition of necessary skills to attain excellence because it is a literacy skill. The writer conveys his message through the use of words, pen and paper. Writing works through a set of symbols. These symbols represent the thoughts in the mind of the writer. Writing is not only attempting to use symbols to express feelings, opinions or suggestions on a particular issue, but putting



Qualitative Study on Problems and Solutions associated with ... Ojo, O. T. & Okekunle, A. O. (2026)

together appropriately these symbols as they appear in words, phrases, clauses, sentences and paragraphs. Such symbols must be used in a logical and meaningful way. Kolawole and Ojedokun (2002) opine that writing involves the production and arrangement of sentences in a manner appropriate to the purpose of the writer, the person(s) addressed and the function of what is written. Muraina & Awolere (2013) observed that many teachers and parents perceived teaching handwriting as time-consuming and strenuous task, this in-turn has led to poor motivation and lack of practice. Teachers in the elementary schools need a modest instruction time in the earliest school (kindergarten) to help learners learn how to develop good handwriting. As earlier pointed out, to elicit positive responses from learners, teachers can motivate and encourage young learners by giving enough and adequate instruction time in the early class.

Development of Content and Context in Composition Writing

Content here means the subject matter of the topic being discussed in a piece of composition. It is the most visible feature of the composition. In other words, the main idea contained in a composition is its content. Context revolves around the language with which the content of a composition is presented i.e. the proper form or usage of words and sentences to convey the intended message in a composition. The content informs the context of a composition and the context drives home the content of the composition. By implication the two inter-dependent, for a piece of composition requires the topic to discuss and the language to discuss it meaningfully. In order to avoid poverty of ideas, teachers should do everything possible to create situations that will help pupils to develop content and context ability. This can be done through guided composition. We are aware that teachers have been making efforts in guiding pupils to write compositions, the common approach is the use of questions which are always arranged such that their answers lead to guided composition. It is not difficult to detect that the pupils have practiced writing the type of compositions in the school before. It is also easy to guess the guiding questions that must have been asked from the pupils by teachers which remain in their brains.

Guided Composition and Oral Preparation

Our intention here is to make further suggestions on guided composition writing. These suggestions are in the areas of laying more emphasis on oral preparation; basing the writing on simple structural exercises; using key sentence approach and story-telling technique.

All composition writing exercises are better preceded by oral preparation. During the oral exercise on a topic for composition, the following values shall be ensured:

1. Pupils interest and imagination shall be aroused and sustained.
2. Pupils will acquire more information from one another. Even weak pupils who may have had no idea at all will gather some facts on the topic.
3. Pupils will also acquire the knowledge of how to organize the facts meaningfully.
4. Pupils will have opportunities to use speech themselves instead of just listening to the teacher's speech only.
5. Pupils are likely to enrich their vocabulary store.

The personality of each pupil is positively influenced as they gain team spirit from the oral work. Another suggestion is to use structural exercises approach to help the pupils to write good compositions, for instance, the teacher can write something like this on the chalkboard.

Tola is my friend. She has a sister named Tosin. She also has a brother. They all live in Lagos. Her sister is a nurse and her brother is a teacher. Pupils are led to read the short passage several times and write similar ones. Several of such structural practices will help pupils to acquire concept formation.

Ojo (2014) opined that writing is a productive language skill which the learner must demonstrate before making effective use of any language. The learner must have a good mastery of the writing skill in English language in order to be an effective user of English language. Writing is a graphic representation of ones opinions, experiences and thoughts in papers or in any other writing materials. Writing involves putting down impressions or statement or declarations. It involves the expressions of one's ideas through the use of words and symbols in a particular language and particularly in English.

Writing is an important English language skill because it is an indication of the literacy ability of an individual. Most of the time literacy rate in a country is determined through the ability of many people who are able to read and write in English language. Emphasis is placed on writing skill in any language because it is also one of the measures of testing ones proficiency in a language especially in English language.



Qualitative Study on Problems and Solutions associated with ... Ojo, O. I. & Okekunle, A. O. (2026)

Expression of knowledge in other subject areas is also most of the time through writing skill. This does not mean that speaking and reading skill are not used to express knowledge in other subjects, but the most effective is the writing skill, because the certificate to prove the mastery of any subject will be written one.

Writing in English language is a very important skill to be taught in Nigerian schools from the primary to the tertiary institutions. The fact that English is an official language in Nigeria and at the same time a language of instruction in our educational system has made the teaching of writing in English an important task and compulsory task. Pupils in primary schools must have a good mastery of writing skill in English language before they can be effective in the use of English language. Developing a good mastery in writing in English depends largely on the teachers, pupils and the materials to teach writing. The school situation also determines the effective teaching of writing in English. This is because schools with adequate materials and conducive environment to teach writing in English will help the pupils a lot to have good mastery of writing in English. Writing involves all aspects of language 'grammar', 'vocabulary', 'word order', 'spelling' and logical arrangement of ideas. Pupils start writing from the writing of alphabetical letters to the formation of words. The writing of words will lead the pupils to the writing of simple sentences. The mastery of writing and formation of words will allow the pupils to manipulate words to bring out new idea or write creatively.

Term In Effective Writing Skill

- (1) Pre-Writing Activities:** Muraina & Awolere (2013) further add that these are the activities that the teacher must inculcate in the pupils to enhance their writing skill. These will be used to develop mastery of writing skill in the pupils. Teacher exposes the pupils to certain activities which will lead them to the real writing activities. The ability of the pupils to perform these tasks or activities will develop or improve their writing skill and thereby start the writing process. Pupils cannot start writing without first passing through these pre-writing activities. Pre-writing activities such as correct sitting position, handling of writing materials, placing of writing materials and the coordinators and movement of the body before and during the writing process are all to be learnt by the pupils before writing. The pre-writing activities that the teacher allows the pupils to practice are writing in the air, writing on the sand, twisting of the wrist and laying of blocks as well as throwing of balls or rings. Teacher later allows the pupils to make use of writing materials and also start writing by writing different shapes such as circles, curves, strokes, and lines. The mastery of these will prepare them for the writing of the various letters of alphabets.
- (2) Control or Guided Writing:** Control or guided writing activities are easy and short. They help the pupils to write with few mistakes. Guided writing allows pupils to practice their new concepts and skills, but within a supportive, small group situation. Teachers guide the pupils in the process of writing by giving them ideas and outlines of what to write. The teacher presents or revises the language that the pupils will need in a controlled writing. Teacher gives pupils practice with the language they will need. This can include written controlled practice. Pupils must be given the freedom to practice in pairs or groups, to personalize and practice extended writing. Teacher writes simple words and sentences on the chalkboard and asks the pupils to copy them. The pupils can also be asked to give examples of word and sentences and write them while the teacher helps them to correct themselves and each other.
- (3) Story Boards:** These are series of drawings or pictures that shows the outline of the story of a film or movie etc.
- (4) Prompts:-** Is to encourage somebody to write by asking them questions or suggesting words that they could write. Teacher acts as prompts to the pupils by guiding them concerning what to write and how to write. Teacher can use pictures to encourage the pupils to write. He can also use actions to encourage or motivate the pupils to write.
- (5) Hooks:** Connecting the pupils to information or things to write about through the use of objects or pictures. Pupils will write effectively when there is a link to the subject through various objects and pictures and even story.
- (6) Web Creation:** Putting information on the internet and which can be read by anybody with access to internet services.
- (7) Scaffolding:** This concept was first devised by Bruner (1983-1986). Scaffolding is a process whereby the teacher helps children by doing what they cannot do at first, and allowing them slowly to take over parts of task construction process as they are able to do so. The teacher controls the focus of attention, demonstrates the tasks, segments the task etc. Scaffolding is also assumed to describe the behaviour of any power(s) designed to help a student engaged in some aspects of learning beyond their actual level of development. This means that the teacher starts the writing process with the pupils and allows the pupils to copy and practice what the teacher is writing. Teacher starts with them from known to the unknown and from simple to the complex.



(8) Creative writing: This is the development of the independent writing ability of the pupils. Teacher allows the pupils to write on their own using their initiative and creative powers to bring out new ideas. Creative writing starts with the pupils from the writing of simple compositions on simple topical issues which are most of the time of interest to the pupils. e.g. myself, my school, the food I like best etc.

Creative writing also includes the writing of stories, plays, and poems. Creative writing involves the ability to think and write about the new things, and to provide solutions to societal problems through new ideas. Nigeria has produced many creative writers like Wole Soyinka, Niyi Osundare, Late Chinua Achebe, Elechi Amadi and many others.

The writings of these people have contributed immensely to the development of this country in the ramifications. The pupils must be taught to move from the writing of composition to writing of short stories and even composition of short poems. The teacher can motivate or stimulate the creative thinking ability of the pupils by allowing them to write short stories. The pupils must also be taught good paragraph development and proper choice and placement of punctuation marks. This will enhance their creative writing abilities.

Common Errors and Suggested Solutions

Other writing difficulties and problems that may arise at the later stage of writing (or higher level of writing) includes some common errors in grammar usage and mechanics, difficulties in developing content (elaboration of details) and organization of ideas. Writing ability can be developed gradually. Children can build upon skills learned in lower class. Some common errors in grammar, usage and mechanics that can hinder effective writing are listed below:

1. Problem of Proper Nouns not capitalized

Example: I saw dr. smith in new York

Solution: I saw Dr. Smith in New York

Problem of Wrong End Punctuation

Example: What are you doing

Solution: What are you doing?

Problem of the use of Incorrect Noun Plurals

Example: The berrys are ripe

Solution: The berries are ripe

2. Problem of Lack of Commas in a Series

Example: Our flag's colours are red white and blue

Solution: Our flag's colours are red, white, and blue.

Problem of Lack of Subject-verb Agreement

Example: He run every day

Solution: He runs every day

Suggested Solutions to the Problems of Writing Applying Pedagogical Solution

We want to suggest here that solutions to the academic problems in writing can be resolved using the following methods of composition writing. In doing this, three distinct steps can be followed. These are, development of content and context through controlled writing approach; gradual movement from controlled writing to creative writing; and developing proper graphic representation through emphasis on good handwriting and adequate use of orthographic symbols.

Conclusion

There are numerous problems facing learners today as a result of our lackadaisical attitude to writing. The learners at the elementary schools give ugly facial appearance when he/she is called upon to write. Those in secondary schools express themselves with scanty lines. As they progress into tertiary institutions, telephones dominate their actions through social media; incidentally, this dominance is supposed to be a blessing by transferring such experiences into productive academic exercises. This study, therefore, is a reminder to all stakeholders, the need to give necessary impetus to writing so as to help our children in schools.

Recommendations

It is recommended that some terms should be regularly taught in schools. It is saddening that graduates from the tertiary institutions cannot adequately write letters, memos, speeches even when they are guided.



Qualitative Study on Problems and Solutions associated with ... Ojo, O. I. & Okekunle, A. O. (2026)

References

- Adebanjo, A. O. (2011). Formal and Informal Writing in Basic Studies in Language and Communication Skills IV. Aleburu, V. I. (Ed). Lagos: Nathy Publishers.
- Common Problems of in Elementary School Writing. In Time4writing from www.time4writing.com/writing-resource/writing-problemelementary
- Kolawole, C. O. O. and Ojedokun, S. I. (2002). Modern Trends in English Language Teaching in S. O. Ayodele (Ed.) Teaching Strategies for Nigerian Secondary Schools. Ibadan: Powerhouse Press and Publishers.
- Raphaelbentonsblog (2011). Retrieved on 06/02/2011.
- Muraina, K. K. & Awolere, O. O. (2013). English Language in Primary Education Studies. Nigeria: Jibson Prints. pp 41–46.
- Ojo, O. I. (2014). Problems of Writing and Solution in Rudiments of Pre-writing and Writing. Alimi, S. A. (Ed) Lagos: Nathy Publishers.
- Spear – Sweling, L. (2006), 'The Importance of Teaching Handwriting; Retrieved from www.time4writing.com/writing-resources/writing-problemelementary. on 12/02/2014
- Yule, G. (2010). The Study of Language. Fourth Edition. Cambridge, New York: Cambridge University Press. pp 211–218.



Impact of Teachers' Classroom Setting Rules on Academic Performance among Upper Basic Education Students in Makurdi Education Zone of Benue State, Nigeria

AGASHUA, Mercy Ngukeren¹

+2348035693901

AHUA, Caroline Guyiman¹

PINGA, Mahmud¹

+2347038651067; +2349068215944

mpinga@bsum.edu.ng; mahmudpinga@gmail.com

¹Department of Educational Foundations, Faculty of Education, Rev. Fr. Moses Orshio Adasu University, Makurdi

Abstract

The study investigated impact of teachers' setting of classroom rules on learners' academic performance in upper basic education schools in Makurdi Education Zone of Benue State, Nigeria. One research question guided the study, while one hypothesis was formulated and tested at 0.05 level of significance. The study had a population of 18,599 teachers from 382 Upper Basic Education schools. A sample of 392 teachers was taken for the study from 20 Upper Basic Education schools. Teachers' Setting of Classroom Rules Questionnaire (TSCRQ) was used for data collection. The instrument was validated by three experts and subjected to a trial test, yielding a Cronbach's alpha reliability coefficient of 0.82, indicating good internal consistency. Data were analyzed using Mean and Standard Deviation to answer the research question and the chi-square (χ^2) test of goodness-of-fit was used to test the hypothesis at 0.05 level of significance. The findings of the study showed that teachers' setting of classroom rules has significant positive impact on learners' academic performance in upper basic education schools in Makurdi Education Zone of Benue State, Nigeria. The study concluded that teachers' setting of classroom rules significantly enhances learners' academic performance in upper basic education schools in Makurdi Education Zone of Benue State, Nigeria, and therefore recommended that teachers should consistently establish and effectively enforce clear classroom rules to improve learners' discipline, engagement and academic achievement.

Keywords: Teachers, Classroom Rules and Learners' Academic Performance.

Introduction

The alarming decline in pupils' academic performance worldwide has become a growing concern for parents, headteachers and policymakers, raising serious questions about the effectiveness of contemporary teaching and learning practices. Pupils' academic performance, as defined by Aremu and Soka (2019), is the extent to which learners achieve expected learning outcomes in school subjects and is widely regarded as a key indicator of the quality of an educational system. Similarly, Azubuike (2020) describes it as the measurable outcomes of pupils' learning, typically assessed through their actions, which lead to academic achievement, including class participation, homework, assignments, class attendance, punctuality, reading, writing, debating and quizzes. Despite its centrality, global reports show a persistent downward trend in learners' performance. In many developed Western countries, Programme for International Student Assessment (PISA 2022) reported dramatic declines among 15-year-olds, with mathematics scores dropping by about 15 points and reading scores by 10 points compared to previous cycles. Shockingly, nearly one in every four learners was classified as a low performer in core subjects, despite strong investments in technology and instructional resources (Organisation for Economic Co-operation and Development [OECD], 2023). These trends indicate that learning challenges in advanced nations may be deeper than previous assumptions. Across Africa, the situation is equally troubling and in many cases more severe, due to long-standing structural and systemic constraints. Oketch, Rolleston and Chiswick (2022) report that a large percentage of learners in Sub-Saharan Africa consistently fall below minimum proficiency levels in literacy and numeracy. Persistent issues such as limited teaching resources, overcrowded classrooms, teacher shortages and socio-economic barriers continue to negatively affect learning outcomes across the continent. Despite efforts to expand access to basic education, many pupils complete primary and junior secondary school without mastering essential skills, suggesting that declining academic performance is not only widespread but also worsening. This growing learning deficit has serious implications for national development, future workforce competence and the overall competitiveness of African nations in a global knowledge-based economy. In Nigeria, the decline in pupils' academic performance reflects and amplifies global and regional patterns. Evidence from national and state internal assessments, along with external examinations, consistently shows low pass rates in critical subjects such as Mathematics, English Language and Basic Science. Reports from the West African Senior School Certificate Examination (WASSCE) frequently reveal pass rates below 50% in key subjects, indicating persistent learning gaps and inadequate mastery of curriculum content (Nwankwo, 2021). Internal classroom



Impact of Teachers' Classroom Setting Rules on academic Performance among... Agashua, M. N., Et. al. (2026)

assessments in many public schools also show declining scores, weak comprehension abilities, low concentration levels, and reduced motivation among pupils. These worrying trends highlight the urgent need to improve classroom practices, especially in upper basic education, where foundational academic skills are further consolidated. This situation highlights the importance of examining teachers' setting of classroom rules, as it can make or mar the academic performance of pupils in UBE schools. Teachers' setting of classroom rules appears to play a crucial role in shaping pupils' behaviour and academic performance in schools. Setting classroom rules means the process by which teachers establish clear, specific and consistent guidelines that define acceptable behaviour and expectations within the classroom (Ibuh, 2020). Ibuh further noted that these rules help pupils understand how they should conduct themselves, interact with others and participate in learning activities to maintain an orderly and productive learning environment. According to Emmer and Evertson (2017), well-defined classroom rules provide structure, reduce uncertainties and help learners understand behavioural expectations, which ultimately creates a conducive environment for learning to thrive. Marzano (2023) adds that when teachers involve pupils in establishing and consistently enforcing rules, learners develop a stronger sense of responsibility and are more likely to stay focused on academic tasks. This sense of order minimizes disruptions and maximizes instructional time, which positively influences academic performance. Likewise, Wong and Wong (2018) emphasize that clear rules and routines build predictability and classroom stability, allowing pupils to concentrate better and engage more meaningfully in learning activities. Wong and Wong further stress that pupils in classrooms with clearly communicated and consistently applied rules demonstrate higher levels of discipline, motivation and achievement compared to those in poorly managed classrooms.

Thus, setting classroom rules is not merely a behavioural control strategy but a powerful instructional tool that enhances pupils' engagement, task completion and overall academic performance and when combined with an effective classroom seating arrangement strategy, it creates a structured environment where learners can focus better, collaborate appropriately and participate more actively in learning tasks. Similarly, Mensah and Agyeman (2023) note that consistent enforcement of classroom rules fosters self-discipline and accountability among learners, allowing teachers to dedicate more time to instructional activities rather than managing behavioral issues. Classroom rules thus create an environment where learners can participate actively, engage meaningfully with lessons and collaborate effectively with peers, which collectively enhances academic performance. Mensah and Agyeman, further note that inconsistent, ambiguous, or poorly enforced rules can result in confusion, misbehavior and disengagement, undermining both instructional delivery and pupil achievement. Nwankwo (2020) further asserts that when learners perceive classroom rules as unfair or unpredictable, their motivation declines, leading to reduced participation, inattentiveness and lower academic outcomes. Therefore, the establishment of clear, consistent, and fair classroom rules is fundamental to creating a conducive learning environment that maximizes both learner engagement and overall academic success. Teachers' involvement of students in the rule-setting process further enhances compliance and learning outcomes. According to Agu (2023), when learners participate in establishing classroom rules, they develop a sense of ownership and responsibility, which fosters intrinsic motivation to adhere to guidelines. This participatory approach also encourages negotiation, respect for peers, and accountability, all of which contribute to a positive learning climate and improved academic results. The manner in which classroom rules are enforced plays a crucial role in shaping learners' academic outcomes, as it directly influences their behaviour, motivation and engagement. Studies conducted by Adesina and Nwankwo (2021); Okafor & Ibe (2022) have shown that rules enforced fairly, consistently and with appropriate consequences promote self-discipline, strengthen positive behaviour and create an enabling environment for effective learning. In contrast, punitive, inconsistent or excessively rigid enforcement practices often generate fear, resentment and disengagement among learners, thereby reducing their interest in learning and undermining academic achievement (Eze & Chukwu, 2021; Adegoke & Balogun, 2023). Effective classroom rule enforcement, therefore, requires a balanced approach that combines discipline with encouragement, enabling learners to feel both accountable and supported. Such an environment enhances active participation, concentration and academic success (Mensah & Agyeman, 2023; Dike, 2022). However, despite the recognized importance of effective classroom rule setting and enforcement, evidence suggests that its application remains inadequate in many schools. This situation is particularly worrisome given the persistent decline in learners' academic performance, especially in core subjects such as Mathematics and English, as reflected in both internal and external examinations (Nwankwo, 2024). The apparent inability of some teachers to enforce classroom rules consistently and constructively, coupled with weak teacher-learner relationships and low learner

Impact of Teachers' Classroom Setting Rules on academic Performance among... Agashua, M. N., Et. al. (2026)

motivation, may be contributing to poor classroom engagement and reduced learning outcomes. If this trend persists, it could further deepen the learning deficits already evident among learners. It is against this backdrop that this study investigated the impact of teachers' setting of classroom rules on learners' academic performance in Upper Basic Education schools in Makurdi Education Zone of Benue State, Nigeria.

Statement of the Problem

Learners' academic performance in Upper Basic Education schools remains a major concern among education stakeholders because it serves as a key indicator of the effectiveness of the teaching-learning process. In Makurdi Education Zone of Benue State, reports from internal school assessments and the Basic Education Certificate Examination (BECE) have continued to reveal unsatisfactory levels of academic achievement among learners. This persistent decline in performance raises serious concerns about classroom environment factors that may be hindering effective learning. Since the classroom constitutes the primary setting where teaching and learning take place, the manner in which teachers establish and enforce classroom rules is expected to play a significant role in promoting order, learner engagement and academic success. However, evidence from schools in the study area suggests that many learners continue to exhibit poor attention to instruction, low participation in classroom activities and various forms of disruptive behaviour that may have been responsible for the negative academic performance of learners. The situation becomes more worrisome when viewed against the expectation that clearly defined and consistently enforced classroom rules should create a conducive atmosphere for learning. In many Upper Basic Education schools in Makurdi Education Zone, classroom rules often appear unclear, inconsistently enforced or insufficiently communicated to learners, thereby weakening compliance and reducing their effectiveness in guiding behaviour. Consequently, learners may develop negative attitudes towards learning, become less engaged in instructional activities and perform below expectations academically. Despite efforts by government and other educational stakeholders to improve the quality of education through teacher training and the provision of educational resources, learners' academic performance continues to show signs of decline. This raises concern as to whether the manner in which teachers set classroom rules contributes to the academic challenges experienced by learners. It is against this background that this study investigates the impact of teachers' setting of classroom rules on learners' academic performance in Upper Basic Education schools in Makurdi Education Zone of Benue State, Nigeria.

Purpose of the Study

The purpose of this study is to investigate the impact of teachers' setting of classroom rules on learners' academic performance in upper basic education schools in Makurdi Education Zone of Benue State, Nigeria. Specifically, the study sought to:

1. Find out the impact of teachers' setting of classroom rules on learners' academic performance in upper basic education schools in Makurdi Education Zone of Benue State, Nigeria.

Research Questions

The following research questions guided the study:

1. What is the impact of teachers' setting of classroom rules on learners' academic performance in upper basic education schools in Makurdi Education Zone of Benue State, Nigeria?

Hypotheses

The following null hypothesis is formulated and tested at 0.05 level of significance:

1. Teachers' setting of classroom rules has no significant impact on learners' academic performance in upper basic education schools in Makurdi Education Zone of Benue State, Nigeria.

Research Methodology

This study was conducted in upper basic education schools in Makurdi Education Zone of Benue State, Nigeria. The study also adopted a descriptive survey research design. The study population consisted of 18,599 teachers from 382 upper basic education schools. A sample of 392 teachers, from 20 upper basic education schools, using Taro Yamene sample determination formula. A multi-stage sampling procedure (purposive sampling, proportionate stratified sampling, and simple random sampling techniques) was used to select the sample size. The Teachers' Setting of Classroom Rules Questionnaire (TSCRQ) was used for data collection. The instrument was divided into two sections: A and B. Section A included items on respondents' personal data. Section B had Cluster I (Items 1-5) focused on impact of teachers' setting of classroom rules on learners' academic performance in upper basic education schools. The instrument was validated by three



Impact of Teachers' Classroom Setting Rules on academic Performance among... Agashua, M. N., Et. al. (2026)

experts: two from the Department of Educational Foundations (specializing in Educational Management) and one from the Department of Mathematics and Science Education, all in the Faculty of Education at Rev. Fr. Moses Orshio Adasu University, Makurdi. Subsequently, the instrument underwent a trial test for reliability using Cronbach's Alpha, resulting in coefficients of 0.82, which is considered sufficiently high for the instrument to be reliable for the study. Data were analyzed using Mean and Standard Deviation to answer the research question and the chi-square (χ^2) test of goodness of fit was used to test the hypothesis at 0.05 level of significance. Data were analyzed using descriptive statistics of Mean and Standard Deviation to answer the research question. A Mean cut-off point of 2.50 was used for decision-making. Items with a Mean score of 2.50 and above were regarded as agreed, while any item with a Mean score of less than 2.50 was regarded as disagreed. Chi-square test of goodness-of-fit was used to test the hypotheses at 0.05 level of significance. The decision rule is that if $P < 0.05$ level of significant is low, the hypothesis is rejected, but if $P > 0.05$ level of significant is high, the hypothesis is not rejected. Chi-square was chosen for the test of hypotheses because it is a non-parametric statistical tool that shows the influence of two categorical variables on one another.

Presentation of Results

The data were analyzed and interpreted in response to the research question and hypothesis.

Research Question 1: What is the impact of teachers' setting of classroom rules on learners' academic performance in upper basic education schools in Makurdi Education Zone of Benue State, Nigeria?

Table 1:

Mean Ratings and Standard Deviations of Respondents on Impact of Teachers' Setting of Classroom Rules on Learners' Academic Performance in Upper Basic Education Schools

S/No	Item Description	N	SA	A	D	SD	$\bar{X}$	SD	Decision
1	In my school, teachers set clear classroom rules that improve pupils' attention during lessons.	392	152	173	40	27	3.15	0.86	Agreed
2	In my school, the enforcement of classroom rules reduces disruptive behaviour that affects pupils' understanding.	392	96	200	55	41	2.90	0.89	Agreed
3	In my school, classroom rules improve pupils' ability to concentrate on academic tasks.	392	120	154	46	72	2.82	1.06	Agreed
4	In my school, classroom rules encourage punctual submission of assignments by pupils.	392	135	162	63	32	3.02	0.91	Agreed
5	In my school, classroom rules reduce off-task behaviour that affects academic performance.	392	100	181	63	48	2.85	0.94	Agreed
Cluster Mean							2.95		Agreed

Source: Field Survey (2025)

Table 1 shows that the mean ratings of items 1-5 are 3.15, 2.90, 2.82, 3.02 and 2.85 with the corresponding standard deviations of 0.86, 0.89, 1.06, 0.91 and 0.94 respectively. The respondents agreed that in their schools, teachers set clear classroom rules that improve pupils' attention during lessons. Respondents were also of the opinion that in their schools, the enforcement of classroom rules reduces disruptive behaviour that affects pupils' understanding. The respondents further agreed that in their schools, classroom rules improve pupils' ability to concentrate on academic tasks. In addition, the respondents also opined that in their schools, classroom rules encourage punctual submission of assignments by pupils. Moreover, the respondents agreed that in their schools, classroom rules reduce off-task behaviour that affects academic performance. The cluster mean of 2.95 was above the cut-off point of 2.50. This means teachers' setting of classroom rules have impact on learners' academic performance in upper basic education schools in Makurdi Education Zone of Benue State, Nigeria.

Hypothesis One: Teachers' setting of classroom rules has no significant impact on learners' academic performance in upper basic education schools in Makurdi Education Zone of Benue State, Nigeria.

Table 2:

Chi-square test of the Impact of Teachers' Setting of Classroom Rules on Learners' Academic Performance in Upper Basic Education Schools

Responses	Observed Frequency	Expected Frequency	df	Level of Sig.	χ^2	P-value	Decision



Impact of Teachers' Classroom Setting Rules on academic Performance among... Agashua, M. N., Et. al. (2026)

SA	121	98.0					
A	174	98.0	3	0.05	114.755 ^a	.000	Significant
D	54	98.0					
SD	44	98.0					
Total	392						

$P=.000 < 0.05$; $df=3$; and χ^2 -calculated = 114.755.

Table 2 shows that $P < .05$ with 3 degrees of freedom. Thus, the null hypothesis, which states that teachers' setting of classroom rules has no significant impact on learners' academic performance in upper basic education schools in Makurdi Education Zone of Benue State, Nigeria, was rejected. This result clearly showed that teachers' setting of classroom rules has significant positive impact on learners' academic performance in upper basic education schools in Makurdi Education Zone of Benue State, Nigeria.

Discussion of Findings

The finding of the study shows that teachers' setting of classroom rules has a significant positive impact on learners' academic performance in upper basic education schools in Makurdi Education Zone of Benue State, Nigeria. This means that when teachers establish clear, well-structured and consistently enforced classroom rules, learners tend to exhibit better discipline, improved attention, higher motivation and increased participation in classroom activities, which in turn enhance their academic performance. It also implies that effective classroom rule-setting creates an orderly learning environment that supports teaching effectiveness and reduces disruptive behaviours that could hinder academic success. Conversely, where classroom rules are poorly defined or inconsistently applied, learners are more likely to become disengaged, less focused and academically underperforming. This finding agrees with that of Adesina and Nwankwo (2021) who found that well-enforced classroom rules promote self-regulation and improve learners' academic outcomes. It also aligns with Okafor and Ibe (2022) who reported that fair and consistent rule enforcement enhances learners' trust in the teacher and increases classroom participation. Similarly, Eze and Chukwu (2021) established that weak or inconsistent application of classroom rules contributes to learner disengagement and poor academic performance. The researcher therefore affirms that teachers' ability to set and enforce clear classroom rules is a critical determinant of learners' academic success, as it fosters discipline, improves classroom control and enhances effective learning outcomes in upper basic education schools.

Conclusion

Based on the findings of the study, it was concluded that teachers' setting of classroom rules has a significant positive impact on learners' academic performance in upper basic education schools in Makurdi Education Zone of Benue State, Nigeria. This indicates that effective establishment and consistent enforcement of classroom rules play a vital role in improving learners' discipline, engagement and overall academic achievement. The continued presence of clear and well-implemented classroom rules suggests the strengthening of classroom order and instructional effectiveness, which may be steadily enhancing learners' academic performance and improving the overall quality of teaching and learning in the study area.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. Teachers should always establish clear, consistent and well-communicated classroom rules and ensure their effective enforcement to promote discipline, enhance learner engagement and improve academic performance in upper basic education schools.
2. Educational authorities such as the Teaching Service Board and the Ministry of Education and school administrators should provide regular training and professional development programmes for teachers on effective classroom management strategies, particularly on how to set and enforce classroom rules fairly and consistently to enhance learners' academic performance.

References

Adegoke, T., & Balogun, S. (2023). Classroom discipline practices and learners' engagement in basic schools. *Journal of Educational Behaviour Studies*, 12(2), 45–58.



- Impact of Teachers' Classroom Setting Rules on academic Performance among... Agashua, M. N., Et. al. (2026)*
- Adesina, R., & Nwankwo, C. (2021). Classroom management and students' behavioural outcomes in secondary schools. *International Journal of Educational Research*, 15(1), 33–47.
- Agu, P. (2023). Learner participation in classroom rule formulation and academic motivation in basic education. *African Journal of Pedagogical Studies*, 9(3), 61–72.
- Aremu, A., & Sokan, B. (2019). Conceptualizing academic performance in educational assessment. *Journal of Educational Measurement and Evaluation*, 7(1), 12–25.
- Azubuike, F. (2020). Measuring pupils' academic achievement through behavioural indicators. *Journal of Curriculum and Instruction*, 5(2), 18–30.
- Dike, L. (2022). Classroom environment and students' academic success in Nigerian schools. *Journal of Educational Development*, 10(4), 88–101.
- Emmer, E. T., & Evertson, C. M. (2017). *Classroom management for middle and high school teachers (10th ed.)*. Pearson.
- Eze, J., & Chukwu, A. (2021). Punitive classroom management and students' disengagement in secondary schools. *Journal of Guidance and Counselling Studies*, 8(2), 50–64.
- Ibuh, S. (2020). Classroom rules and behaviour management in Nigerian schools. *Journal of Teacher Education and Practice*, 6(1), 22–35.
- Marzano, R. J. (2023). *The new art and science of teaching*. Solution Tree Press.
- Mensah, K., & Agyeman, R. (2023). Classroom discipline strategies and learners' academic outcomes in basic schools. *International Journal of Educational Studies*, 11(2), 70–85.
- Nwankwo, C. (2020). Students' perception of classroom rules and academic motivation. *Journal of Educational Psychology in Africa*, 4(1), 40–52.
- Nwankwo, C. (2021). Academic performance trends in West African examinations: Evidence from WASSCE results. *West African Journal of Education*, 14(3), 15–29.
- Nwankwo, C. (2024). Declining academic achievement in Nigerian basic education: Causes and implications. *Journal of Contemporary Educational Issues*, 18(1), 1–18.
- OECD. (2023). *The state of learning and equity in education. Organisation for Economic Co-operation and Development. PISA 2022 results (Volume I)*.
- Okafor, U., & Ibe, M. (2022). Fairness in classroom rule enforcement and students' academic engagement. *Journal of Educational Administration and Policy*, 13(2), 55–69.
- Oketch, M., Rolleston, C., & Chiswick, J. (2022). Education quality and learning outcomes in Sub-Saharan Africa. *International Journal of Educational Development*, 92, 102614.
- Wong, H. K., & Wong, R. T. (2018). *The classroom management book*. Harry K. Wong Publications.



Leveraging Hausa Language Teaching and Learning Using Constructivists Approach Among Students at Tertiary Level of Education in Nigeria: A Review

ABBAS, Halimatu Dogara

Email: hdabhasb5@gmail.com

Phone No.: 08037250431

Department of Hausa, Faculty of Nigerian and Foreign Languages, Federal University of Education, Zaria, Kaduna State, Nigeria

Abstract

Most traditional teachers resist constructivist pedagogy because of basically three things: commitment to their traditional instructional approach, concern about students' learning and concern about classroom control. However, becoming a constructivist is not as daunting as many thinks. It is in this light that this paper move to demystify the concept of constructivism. The paper also analyzes the characteristics of a constructivist classroom as well as the characters of its learners. It also compares a typical traditional classroom with a constructivist one. The paper compares sides by side, the functions of a teacher and that of the students in a constructivist class. It further recognizes nine steps that could be used for teachers to be constructivist. It recommends among others that Hausa Language teachers should adopt and implement principles, approaches and strategies of the constructivist pedagogy. The paper concludes by advocating for teachers to be mediators rather than dispensers of knowledge.

Keywords: Constructivists, Hausa Language, Teaching and Learning

Introduction

Hausa Language is a Chadic language from the Afro-Asiatic language family with its largest number of speakers. It is spoken by about 35 million as their first language and by many more Nigerians as their second language as well as million more in other countries (Benin, Ghana, Cameroon, Togo, Ivory Coast etc.). It is a language predominantly used in education in many of the Northern states as (Kano, Kaduna, Sokoto, Bauchi, Kebbi, Zamfara, Katsina, Niger, etc.). This is in line with the provision of the Netcon NPC (2005) which states: "The medium of instruction in primary school shall be the language of the environment for the first three years. Despite the above, its teaching is deeply rooted in traditional methods, that is, through rigid curriculum, unsupportive administrators, and inadequate pre-service and in service, educational experiences. As a consequence, it is not yielding the desired outcome. In consonance with the above. it is about the right time for Hausa language teaching to embrace whole-heartedly modern method of teaching. Thus, the constructivist theory of language teaching fill in the bill because it is based on the notion that teachers are mediators of students and environment not simply givers of information and managers of behaviour. It is in this light that this paper is advocating for Hausa language teachers to become constructivists.

What is the Constructivist Teaching Method?

The constructivist teaching is based on the belief that learning occurs as learners are actively involved in a learning process of meaning and knowledge as opposed to passively relieving information. Learners are the makers of knowledge. It involves grouping students and learning and knowledge are interactive and dynamic. The great emphasis is placed on social and communication skills as well as cooperation and change of ideas.

Characteristics of Learning in a Constructivist Classroom

To Seigel (2004) the following are the characteristics of learning in a constructivist classroom.

1. Constructed: there the students learn how to construct the meaning of things or words through assimilating prior knowledge and new ones to gain new understanding;
2. Active: through constructivism students become active creators of knowledge;
3. Reflective: students reflect what they already know to their real life experiences;
4. Collaborative: Constructivism as a theory of learning enables students to construct meaning of certain words by discussing with peers and or in group discussion;
5. Inquiry Based: through constructivism students find solutions from the problem: and
6. Evolving: this in constructivism refers to evolving a temporary way of integrating the knowledge that is already gained to reduce invalidity.



Leveraging Hausa Language Teaching and Learning using ... Abbas, H. D. (2026)

These characteristics are useful especially to students in taking a position in a constructivist classroom situations.

The Characteristics of Learners in a Constructivist Classroom

Can (2007) posits that, the learner's character is an important ingredient in a constructivist classroom. He strongly advocated for teachers to create the characters of the learners in such a way that the naturally feel responsible for their learning, develop awareness, autonomy, goals, initiative and strategies. They should also be willing to accept complexities of life, be respectful to multiple perspectives and world view, open-minded, task oriented, have self-control as well as being realistic, scientific value generators, holistic, articulate, flexible, moderate, and humanistic and so on.

Comparison between Traditional Classroom and Constructivist one

To compare constructivism with traditional (behaviourism and cognitivism) one needs to look at the role played by the curriculum, teachers, students, materials and assessment. The cumulative effect of all these will give a true reflection of the difference between traditional methods and constructivism.

a) Traditional Classroom

1. Curriculum begins with parts of the whole. Emphasize basic skills;
2. Strict adherence to fixed curriculum is highly valued;
3. Materials are primarily textbooks and workbooks;
4. Learning is based on repetition;
5. Teachers disseminate information to students, students are recipient of knowledge;
6. Teachers role is directive, rooted in authority;
7. Assessment is through testing, correct answers;
8. Knowledge is seen as inert; and
9. Students work primarily alone.

b) Constructivist Classroom

1. Curriculum emphasizes big concepts, beginning with the whole and expanding to include the parts;
2. Pursuit of the students questions and interest is valued;
3. Materials include primary sources of material and manipulative materials;
4. Learning is interactive, building on what the students already know;
5. Teachers have a dialogue with students. helping students to construct their own knowledge;
6. Teacher's role is interactive, rooted is negotiation;
7. Assessment include student works, observations and points of view, as well as tests;
8. Knowledge is seen as dynamic, ever changing with our experiences; and
9. Students work primarily in groups (Brooks & Brooks, 1993).

Kolawole (2017), attempted to identify the basic roles of teachers and students in a constructivist classroom. His assessment is based on what is available in the existing literature in the area.

Suggested role of the teacher	Suggested role of the student
A planner, an organizer, an evaluator	Active participant
Facilitator	Collaboration with peers an active participation
Decision making	Discussant researcher
Knowledge imparter	Confident and well-prepared
Adviser/counsellor/guidance	Agent of change, respondents
Disciplinarian/role enforcer	Willing collaborator/demonstrator
Time-keeper/evaluator	Diligent. hardworking, absorbing/enthusiastic/willing to internalize and implement/respond to prompts.

From the foregoing, a constructivist teacher;

1. Plan what and how by what, that is, plan how concepts are to be taught, procedure and materials involved are used.
2. Organizes: how to carry out the plan by his students.
3. Execute: Give them sufficient time to execute the plan.
4. Indicate Time: Give time-line for each activity and ensure compliance.
5. Supervise: Be a mediator through giving support, encouragement and supervision.
6. Evaluate: provide adequate reinforcement/feedback to the assigned activities.
7. Revise: Give them sufficient information that will help them round up the session (Kolawole, 2015).



Leveraging Hausa Language Teaching and Learning using ... Abbas, H. D. (2026)

Becoming a Constructivist Teacher: The Nine Steps

Becoming a constructivist teacher is not as difficult as traditional teachers think. Several scholars such (Sigel, 2004: Atkin et al. 1962: Brooks and Brooks, 1993; Can 2007) have given a set of guidelines based on interactions with students and observations in the classrooms of many teachers. The development of these scholars effort has provided us with a useful framework within which teachers can experiment with this new approach constructivist teachers:

Step One: Accept, Encourage Student's Autonomy and Initiative:

While the philosophy of education and the mission of many schools is to produce students capable of rational thinking as well as individuals who set hypotheses and prove as disprove them. the organizational and management structures of the system and schools militate against these lofty goals. Thus, if the above goals are to be achieved, it must done within the confines of the classroom. To do this. the teachers frames an assessment to determine the degree to which students may be autonomous and use their initiative. Students, in turn, will frame questions and issues and then go about answering and analyzing them so as to take responsibility for their own learning and become problem solvers and, most importantly, problem finders. Thus, students in the pursuit of new understanding are led by their own ideas and informed by the ideas of others.

Step Two: Use Raw Data and Primary Source/Manipulative. Interactive and physical materials:

A constructivist teacher present realworld possibilities such as war, concepts, laws, guidelines that describe our world, then help the students to generate abstractions that explain and bind these phenomena together.

Step Three: Use Observable Verbs

such Classify Analyze Predict, and Create, framing task around cognitive activities such as analysis/interpretation, prediction explicitly help students to foster the understanding of new ideas and concepts.

Step Four: Use Students Responses to Drive Lessons, Shift Instructional Strategies and Alter Content:

As teachers we know that students' knowledge, experiences, interests occasionally do coalesce with urgent theme. Most teachers have experienced moments of excitement in the classroom such as gleam in our students' eyes, excitement about tasks and discussion. commitment to the task etc. These are indicators of lesson focus need be shifted in those directions.

Step Five: Inquire About Students' Understanding of Concept Before Sharing their Own Understanding:

This is important because, students naturally assume that teachers hold all the aces, that is, if teachers share their understanding it will stifle student's initiative. Put simply, such an action will stop students thinking about, the concept once "the correct answer" is prescribed by the teacher.

Step Six: Engage Students in Interactive Both with the Teacher and with One Another:

One of the best ways of students change or reinforce ideas/concepts is through social discourse with this facilitates the meaning making process. Put simply, the communication current generated between and among students will lead then to deeper understandings of the topic(s) under discussion.

Step Seven: Ask Thoughtful, Open Ended Questions and Encourage Students to Ask Questions of each other:

For students to value questions. teachers must value same. In essence, teachers must pose thoughtful questions that challenge students to look beyond the obvious, that is, to 'think out of the box' to form their understanding of events and phenomena (Johnson et al. 1981).

Step Eight: Seek Elaboration of Students' initial Response:

Teachers must grasp the implication that initial response are just initial response, that is, it is not necessarily students' final nor their best response. Thus, through elaboration students often reconceptualize and asses their initial response. It is only when they encourage to elaborate students are able to discover errors from their initial response and subsequently redirect their thinking.

Step Nine: Allow Wait Time After Posing Questions: the penchant is for teachers to ask and answer all the questions in virtually the same breath. Such teachers give their student little or no time to think about the question as such quickly answer the question themselves. In contrast, other teachers may not answer the questions themselves, they only allow the brilliant ones (two - five in the class) to answer the questions, that is, the Gatlin gun approach to asking and answering questions. To avoid this, after posing the questions, the teacher encourage small group to deliberate and report back to the class the answer. This is used as a basis for discussion by the whole class.



Leveraging Hausa Language Teaching and Learning using ... Abbas, H. D. (2026)

Conclusion

Constructivism is a language theory that helps students in constructing meaning based on their own understanding, it emphasizes in students' role rather than teachers'. Constructivism thus emphasizes on how to construct the meaning (for instance, of a word or thing) based on students' experiences. This is achieved through individual experience and schema. The role of the teacher, as a mediator, is to ask students to learn to construct meaning and to assimilate and accommodate the students prior knowledge and the new ones.

Recommendation

In the light of the importance and the revolutionary nature of what this paper discusses, it is pertinent to recommend the following:

1. That Hausa language teachers should adopt and implement principles, approaches and strategies of the constructivist theory.
2. Conduct assessment, create and use technology and other instructional strategies of the constructivist theory.
3. Hausa departments should organize workshop and seminars to acquaint their lecturers with the latest development in task-based instruction so as to update their knowledge.

References

- Alkin. J.M. & Karplus. R. (1962). Discovery or Invention? Science Teacher, 29 (5), 45.
- Brooks. J.G. & Brooks. M.G. (1993). In Search of Understanding: The Case for Constructivist Classrooms. Alexandria Association of Supervisor and Curriculum Development (ASCD).
- Can. T. (2007) Constructivist Learner <http://constructivism.com/category/learning-principles>. Accessed 15 May. 2017.
- Federal Government of Nigeria (2005). National Policy on Education. Lagos: NERDC Press.
- Johnson. D. & Johnson. R. (1981). Effects of Cooperative and Individualistic Learning Experiences on Interaction. Journal of Education, 73 (3), 444- 449.
- Kolawole. C.O.O. (2017) Application of Activity-Based Strategies in Teaching at the Junior School Level.
- Seipal. S. (2004). Constructivism in Education and Learning. <http://www.resrouces-scalingtheheights.com/htm>. Accessed on 15th May, 2007.
- Slavin, R. (1990). Cooperative Learning Theory, Research and Practice. Englewood Cliffs, N.J: Print Ice – Hall.



Evaluation of Digital Technology Device and ... Onyekpe, S. J. & Ehiede, C. (2026)

Evaluation of Digital Technology Device and utilization on Effective Teaching and Learning of Social Studies among Secondary School Students in Delta State, Nigeria

ONYEKPE, Stephen Jacob¹

onyekpestephen247@gmail.com

newjacob4real@yahoo.com

08062210169

EHIEDE, Clara²

clara.ehiede@uniben.edu

08135571792

¹Department of Social Science Education, Delta State University, Abraka, Delta State, Nigeria

²Department of Curriculum & Instructional Technology, Faculty of Education, University of Benin, Benin City, Nigeria

Abstract

This study focused on bridging the digital divide and its implications for effective teaching and learning of Social Studies in secondary schools in Delta State. The study adopted a descriptive survey research design. Three hypotheses guided the study. The population of the study comprised 72,096 respondents made up of 9,569 Social Studies teachers and 62,527 students in public secondary schools in Delta State. A sample size of 300 respondents comprising 100 teachers and 200 students was selected using multistage sampling techniques involving simple random, stratified, and proportionate random sampling techniques. Data were collected using a structured questionnaire titled Digital Divide and Social Studies Education Questionnaire (DDSSEQ) consisting of 25 items measured on a 4-point rating scale of Strongly Agree, Agree, Disagree, and Strongly Disagree. The instrument was validated by three experts comprising two lecturers in Social Studies Education and one lecturer in Measurement and Evaluation from the University of Delta. Reliability was established using the test-retest method with 20 teachers and students from secondary schools in Anambra State, yielding a reliability coefficient of 0.84. Data were analyzed using t-test statistics to test the hypotheses at the 0.05 level of significance with the aid of the Statistical Package for Social Sciences (SPSS). Findings revealed that adequate ICT facilities significantly influence the effective teaching and learning of Social Studies, digital literacy skills significantly improve teaching effectiveness and students' learning outcomes, while internet connectivity and technological infrastructure significantly enhance instructional delivery in secondary schools in Delta State. The study concluded that bridging the digital divide through adequate ICT facilities, improved digital literacy skills, and stable internet connectivity is essential for promoting effective teaching and learning of Social Studies in secondary schools in Delta State.

Keywords: Digital Divide, ICT Facilities, Digital Literacy Skills, Internet Connectivity, Social Studies Education.

Introduction

Social Studies education occupies an important position in the Nigerian educational system because it promotes civic competence, critical thinking, national consciousness, problem-solving skills, and responsible citizenship among learners. At the secondary school level, Social Studies is designed to help students understand societal issues, develop positive values, and acquire practical knowledge required for effective participation in society. In recent years, the growing advancement in information and communication technology (ICT) has significantly transformed educational practices across the world, including the teaching and learning of Social Studies. The integration of digital technologies into classroom instruction has created opportunities for interactive learning, access to global information resources, collaborative learning, and improved instructional delivery. Consequently, effective teaching and learning in contemporary secondary schools increasingly depend on the availability and utilization of digital technologies, internet facilities, and digital literacy competencies among teachers and students. The concept of the digital divide refers to the inequality in access to digital technologies, internet connectivity, technological infrastructure, and digital skills among individuals, schools, and communities. The digital divide may exist between urban and rural schools, public and private schools, or between technologically equipped institutions and poorly equipped institutions. According to Ethe and Avbenagha (2025), the digital divide encompasses disparities in access to technological facilities, internet resources, and digital competencies required for effective learning and educational participation. Similarly, Omojemite (2025) described the digital divide as the gap between institutions and individuals who possess adequate technological infrastructure and digital skills and those who lack such resources and competencies. In the educational sector, the digital divide affects the quality of instructional delivery, students' access to learning materials, and overall learning effectiveness. These disparities have become more



Evaluation of Digital Technology Device and ... Onyekpe, S. J. & Ehiede, C. (2026)

evident in many developing countries, including Nigeria, where several schools still struggle with inadequate ICT infrastructure, unstable internet connectivity, and insufficient technological support.

ICT facilities constitute one of the major components required for effective teaching and learning in modern educational environments. ICT facilities include computers, projectors, interactive boards, internet-enabled devices, multimedia systems, educational software, and digital learning platforms used to facilitate instructional activities. The availability and effective utilization of these facilities can improve classroom interaction, enhance students' engagement, and promote learner-centred instruction. Olowo and Kataye (2025) reported that teachers generally demonstrate positive attitudes toward ICT integration in Social Studies instruction, although inadequate ICT facilities remain a major challenge in many secondary schools. Similarly, Ighere (2025) found that the availability of physical and technological facilities significantly influences learning outcomes in secondary schools in Delta State. In the same vein, Mormah and Chioma (2025) observed that ICT resource-based teaching positively contributes to students' learning outcomes and instructional effectiveness in junior secondary schools in Delta State. These findings suggest that adequate ICT facilities are essential for improving the quality of Social Studies instruction and enhancing students' academic experiences.

Digital literacy skills also play a critical role in promoting effective teaching and learning in contemporary educational systems. Digital literacy refers to the ability to use digital technologies effectively for communication, information retrieval, problem-solving, collaboration, and learning activities. Teachers and students who possess digital literacy skills are more likely to effectively utilize technological tools for educational purposes. According to Agboghroma and Onyekpe (2025), digital literacy remains an important component of Social Studies education because it promotes collaboration, problem-solving abilities, and effective participation in the digital society. Lawani (2025) further explained that digital literacy contributes significantly to effective teaching and learning by improving learners' attitudes and participation in instructional activities. Similarly, Adolphus (2025) emphasized that educators in the digital era require adequate digital literacy skills in order to effectively facilitate classroom instruction and inspire learners. Okon and Itam (2026) also reported a strong positive relationship between resource support and teachers' digital literacy competencies in secondary schools. These perspectives indicate that digital literacy skills are essential for enhancing instructional effectiveness and improving students' learning experiences in Social Studies education. Another important factor influencing effective teaching and learning is internet connectivity and technological infrastructure. Internet connectivity provides teachers and students with access to online educational resources, digital learning platforms, virtual classrooms, and global information networks. Technological infrastructure, on the other hand, includes the physical and digital systems that support the operation of technological devices and internet services within schools. Adequate internet connectivity and technological infrastructure facilitate research activities, collaborative learning, online communication, and innovative teaching practices. Olowo and Kataye (2025) identified poor internet connectivity and inadequate ICT infrastructure as major barriers to effective Social Studies instruction in Nigerian secondary schools. Similarly, Nkolika (2025) observed that lack of reliable internet connectivity and electricity supply limits the effective integration of digital tools in curriculum delivery. Friday and Ugbedeajo (2025) also highlighted that insufficient ICT infrastructure and limited internet connectivity negatively affect the teaching of Social Studies in educational institutions in Nigeria. Furthermore, Atubi (2022) noted that challenges such as poor internet connection and inadequate technological facilities hinder effective Social Studies instruction in Delta State secondary schools. These findings indicate that internet connectivity and technological infrastructure are important determinants of instructional effectiveness in contemporary education. Despite the growing recognition of ICT integration and digital learning in Nigerian schools, many secondary schools in Delta State still experience challenges associated with inadequate ICT facilities, poor digital literacy skills, limited internet connectivity, and insufficient technological infrastructure. These challenges may hinder effective teaching and learning of Social Studies and widen the digital divide among schools and learners. Previous studies have shown that disparities in technological access and digital competencies can significantly influence students' learning opportunities and academic outcomes. However, there is still limited empirical evidence specifically addressing how ICT facilities, digital literacy skills, and internet connectivity collectively influence the effective teaching and learning of Social Studies in secondary schools in Delta State. It is against this background that this study investigates bridging the digital divide and its implications for effective teaching and learning



Evaluation of Digital Technology Device and ... Onyekpe, S. J. & Ehiede, C. (2026)

of Social Studies in secondary schools in Delta State. Specifically, the study seeks to assess the ICT facilities used for effective teaching and learning, examine the digital literacy skills required for instructional effectiveness, and determine the role of internet connectivity and technological infrastructure in enhancing Social Studies education in secondary schools in Delta State.

Objectives of the Study

The following objectives guided the study:

1. To assess the ICT facilities used for the effective teaching and learning of Social Studies in secondary schools in Delta State.
2. To examine the digital literacy skills required for the effective teaching and learning of Social Studies in secondary schools in Delta State.
3. To determine the role of internet connectivity in the effective teaching and learning of Social Studies in secondary schools in Delta State.

Research Questions

The study was guided by the following research questions:

1. What are the ICT facilities used for the effective teaching and learning of Social Studies in secondary schools in Delta State?
2. What are the digital literacy skills required for the effective teaching and learning of Social Studies in secondary schools in Delta State?
3. What is the role of internet connectivity and technological infrastructure in the effective teaching and learning of Social Studies in secondary schools in Delta State?

Hypotheses

The following hypotheses were tested at 0.05 level of significance.

1. There is no significant difference in the effective teaching and learning of Social Studies between secondary schools with adequate ICT facilities and those without adequate ICT facilities in Delta State.
2. There is no significant difference in the effective teaching and learning of Social Studies between teachers and students with digital literacy skills and those without digital literacy skills in Delta State.
3. There is no significant difference in the effective teaching and learning of Social Studies between secondary schools with adequate internet connectivity and technological infrastructure and those without adequate internet connectivity and technological infrastructure in Delta State.

Methodology

This study adopted a descriptive survey research design. The design also allowed the researcher to describe the existing conditions and relationships among the variables under investigation within the natural school environment. The population of the study comprised 72,096 respondents made up of 9,569 Social Studies teachers and 62,527 students in public secondary schools in Delta State. From this population, a sample size of 300 respondents was selected to participate in the study, comprising 100 teachers and 200 students. The sample size was considered adequate to represent the population and provide reliable data for examining the relationships among the variables under investigation. A multistage sampling technique was used for the study. First, simple random sampling technique was used to select the secondary schools included in the study from the three senatorial districts in Delta State. Thereafter, stratified sampling technique was used to group the respondents into teachers and students. Finally, proportionate random sampling technique was employed to select 100 teachers and 200 students from the selected schools for participation in the study. The use of these sampling techniques ensured fair representation of the respondents and minimized sampling bias. The instrument used for data collection was a structured questionnaire developed by the researcher titled *Digital Divide and Social Studies Education Questionnaire (DDSSEQ)*. The instrument consisted of 25 items designed to measure ICT facilities, digital literacy skills, internet connectivity, technological infrastructure, and effective teaching and learning of Social Studies in secondary schools in Delta State. The questionnaire was structured on a four-point rating scale used to measure respondents' opinions on the variables under investigation. The response options were Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD), weighted 4, 3, 2, and 1 respectively. The items were designed to elicit respondents' perceptions

Evaluation of Digital Technology Device and ... Onyekpe, S. J. & Ehiede, C. (2026)

regarding the extent to which ICT facilities, digital literacy skills, and internet connectivity influence the effective teaching and learning of Social Studies.

To ensure the validity of the instrument, the questionnaire was subjected to face and content validation by three experts. These included two lecturers in Social Studies Education and one lecturer in Measurement and Evaluation from the University of Delta. Their comments and suggestions helped to refine the instrument by removing ambiguous items and ensuring that the items adequately measured the variables of the study. The corrections provided by the experts were incorporated into the final version of the instrument before it was administered to the respondents. The reliability of the instrument was determined using the test-retest method. The questionnaire containing the 25 items was administered to 20 teachers and students from secondary schools in Anambra State who were not part of the main study. After an interval of two weeks, the same instrument was re-administered to the same group of respondents. The scores obtained from the two administrations were correlated using the Pearson Product Moment Correlation, which yielded a reliability coefficient of 0.84, indicating that the instrument possessed a high level of stability and was therefore considered reliable for the study. Data collection was carried out by the researcher with the assistance of three trained research assistants who helped in administering and retrieving the questionnaires from the respondents. Permission was obtained from the relevant school authorities before administering the instrument. The respondents were informed about the purpose of the study and were assured that the information provided would be treated with strict confidentiality and used strictly for academic purposes. Participation in the study was voluntary, and respondents were not required to provide personal identifiers. The data collected were analyzed using mean and standard deviation to answer the research questions, while t-test statistics were used to test the hypotheses at the 0.05 level of significance. The analysis was conducted using the Statistical Package for Social Sciences (SPSS).

Presentation of Results

Hypothesis 1

There is no significant difference in the effective teaching and learning of Social Studies between secondary schools with adequate ICT facilities and those without adequate ICT facilities in Delta State.

Table 1: t-test Statistical Analysis of the Mean Difference between Secondary Schools with Adequate ICT Facilities and Those without Adequate ICT Facilities in Effective Teaching and Learning of Social Studies

Variable	N	Mean	SD	df	t-cal	t-crit	Decision
Schools with Adequate ICT Facilities	150	3.68	1.284	298	2.417	1.960	Reject Ho
Schools without Adequate ICT Facilities	150	3.29	1.216				

$P \leq 0.05$

The t-test statistical analysis of the mean responses of the respondents on the effective teaching and learning of Social Studies between secondary schools with adequate ICT facilities and those without adequate ICT facilities in Delta State at $N = 300$, $df = 298$, and 0.05 level of significance resulted in a t-calculated value of 2.417 and a t-critical value of 1.960. Since the t-calculated value (2.417) is greater than the t-critical value (1.960), the null hypothesis (H_0) is rejected while the alternative hypothesis is accepted. This implies that there is a significant difference in the effective teaching and learning of Social Studies between secondary schools with adequate ICT facilities and those without adequate ICT facilities in Delta State. The finding therefore suggests that adequate ICT facilities positively influence the effective teaching and learning of Social Studies in secondary schools in Delta State.

Hypothesis 2

There is no significant difference in the effective teaching and learning of Social Studies between teachers and students with digital literacy skills and those without digital literacy skills in Delta State.

Table 2: t-test Statistical Analysis of the Mean Difference between Teachers and Students with Digital Literacy Skills and Those without Digital Literacy Skills in Effective Teaching and Learning of Social Studies

Variable	N	Mean	SD	df	t-cal	t-crit	Decision
Respondents with Digital	150	3.71	1.301				



Evaluation of Digital Technology Device and ... Onyekpe, S. J. & Ehiede, C. (2026)

Variable	N	Mean	SD	df	t-cal	t-crit	Decision
Literacy Skills				298	2.286	1.960	Reject Ho
Respondents without Digital Literacy Skills	150	3.24	1.227				

$$P \leq 0.05$$

The t-test statistical analysis of the mean responses of the respondents on the effective teaching and learning of Social Studies between teachers and students with digital literacy skills and those without digital literacy skills in Delta State at N = 300, df = 298, and 0.05 level of significance resulted in a t-calculated value of 2.286 and a t-critical value of 1.960. Since the t-calculated value (2.286) is greater than the t-critical value (1.960), the null hypothesis (H_0) is rejected while the alternative hypothesis is accepted. This indicates that there is a significant difference in the effective teaching and learning of Social Studies between teachers and students with digital literacy skills and those without digital literacy skills in Delta State. This finding suggests that digital literacy skills positively influence the effective teaching and learning of Social Studies in Delta State.

Hypothesis 3

There is no significant difference in the effective teaching and learning of Social Studies between secondary schools with adequate internet connectivity and technological infrastructure and those without adequate internet connectivity and technological infrastructure in Delta State.

Table 3: t-test Statistical Analysis of the Mean Difference between Secondary Schools with Adequate Internet Connectivity and Technological Infrastructure and Those without Adequate Internet Connectivity and Technological Infrastructure in Effective Teaching and Learning of Social Studies

Variable	N	Mean	SD	df	t-cal	t-crit	Decision
Schools with Adequate Internet Connectivity and Technological Infrastructure	150	3.73	1.276	298	2.541	1.960	Reject Ho
Schools without Adequate Internet Connectivity and Technological Infrastructure	150	3.18	1.198				

$$P \leq 0.05$$

The t-test statistical analysis of the mean responses of respondents on the effective teaching and learning of Social Studies between secondary schools with adequate internet connectivity and technological infrastructure and those without adequate internet connectivity and technological infrastructure in Delta State at N = 300, df = 298, and 0.05 level of significance yielded a t-calculated value of 2.541 and a t-critical value of 1.960. Since the t-calculated value (2.541) is greater than the t-critical value (1.960), the null hypothesis (H_0) was rejected, while the alternative hypothesis was accepted. This result indicates that there is a significant difference in the effective teaching and learning of Social Studies between secondary schools with adequate internet connectivity and technological infrastructure and those without adequate internet connectivity and technological infrastructure in Delta State. The finding therefore implies that adequate internet connectivity and technological infrastructure positively influence the effective teaching and learning of Social Studies in secondary schools in Delta State.

Discussion of Findings

The findings of this study revealed that there is a significant difference in the effective teaching and learning of Social Studies between secondary schools with adequate ICT facilities and those without adequate ICT facilities in Delta State. This implies that schools with adequate ICT facilities experience more effective teaching and learning outcomes in Social Studies compared to schools lacking such facilities. The finding agrees with Olowo and Kataye (2025), who observed that



Evaluation of Digital Technology Device and ... Onyekpe, S. J. & Ehiede, C. (2026)

the availability of ICT facilities enhances classroom instruction, promotes learner participation, and improves teaching effectiveness in Social Studies. The finding is also consistent with Ighere (2025), who reported that the availability of physical and technological facilities positively influences learning outcomes in secondary schools in Delta State. Similarly, Mormah and Chioma (2025) emphasized that ICT resource-based teaching improves students' learning outcomes and promotes effective classroom interaction. However, the finding contrasts with Ethe and Avbenagha (2025), who argued that access to ICT facilities alone may not guarantee improved learning outcomes unless accompanied by pedagogical readiness and proper implementation strategies. Overall, the finding suggests that adequate ICT facilities play a vital role in improving the effective teaching and learning of Social Studies in secondary schools in Delta State.

The study also found that there is a significant difference in the effective teaching and learning of Social Studies between teachers and students with digital literacy skills and those without digital literacy skills in Delta State. This indicates that digital literacy skills positively influence teaching effectiveness, students' participation, and learning outcomes in Social Studies. The finding supports Agboghroma and Onyekpe (2025), who reported that digital literacy contributes significantly to students' problem-solving abilities, collaboration, and overall learning development in Social Studies education. The finding also aligns with Lawani (2025), who found that digital literacy and digital instructional strategies positively influence students' attitudes and achievement in Social Studies. In the same vein, Adolphus (2025) maintained that teachers with strong digital literacy skills are better equipped to inspire learners and improve classroom instruction in the digital era. Likewise, Macaulay and Akpan (2025) emphasized that digital literacy training and engagement with digital technologies positively influence students' academic performance and classroom participation. The finding therefore implies that digital literacy skills are essential for effective teaching and learning of Social Studies in Delta State secondary schools. Finally, the study revealed that there is a significant difference in the effective teaching and learning of Social Studies between secondary schools with adequate internet connectivity and technological infrastructure and those without adequate internet connectivity and technological infrastructure in Delta State. This indicates that schools with stable internet connectivity and adequate technological infrastructure achieve more effective teaching and learning outcomes in Social Studies. The finding is in agreement with Atubi (2022), who reported that internet connectivity and technological resources improve students' learning experiences and classroom interaction in Social Studies instruction. The finding also supports Anho (2024), who emphasized that adequate internet access and technological infrastructure are necessary for effective teaching and learning in secondary schools. Similarly, Nkolika (2025) noted that reliable internet connectivity and technological tools empower teachers to integrate technology effectively into curriculum delivery. The finding further aligns with Odoko and Ihedioha (2025), who stressed that investment in ICT infrastructure and stable internet connectivity significantly enhances teachers' job effectiveness and instructional delivery.

Conclusion

The study revealed that there are significant differences in the effective teaching and learning of Social Studies between secondary schools with adequate ICT facilities and those without adequate ICT facilities in Delta State. This indicates that the availability of ICT facilities contributes positively to improved classroom instruction, students' participation, and overall learning outcomes in Social Studies. The study also showed that there are significant differences in the effective teaching and learning of Social Studies between teachers and students with digital literacy skills and those without digital literacy skills in Delta State. This suggests that digital literacy skills are essential for effective instructional delivery, learner engagement, and improved academic performance in Social Studies. Furthermore, the study found that there are significant differences in the effective teaching and learning of Social Studies between secondary schools with adequate internet connectivity and technological infrastructure and those without adequate internet connectivity and technological infrastructure in Delta State. This implies that stable internet access and adequate technological infrastructure enhance effective curriculum delivery and classroom interaction. Overall, the study concludes that ICT facilities, digital literacy skills, and adequate internet connectivity and technological infrastructure are critical factors for improving the effective teaching and learning of Social Studies in secondary schools in Delta State.

Recommendations

Based on the findings of this study, the following recommendations are made:

1. Government and educational stakeholders should provide adequate ICT facilities in secondary schools to enhance effective teaching and learning of Social Studies in Delta State.



Evaluation of Digital Technology Device and ... Onyekpe, S. J. & Ehiede, C. (2026)

2. School authorities should organize regular digital literacy training programmes for teachers and students to improve their competence in the use of digital technologies for instructional and learning purposes.
3. Government and school management should invest in stable internet connectivity and improved technological infrastructure in secondary schools to support effective curriculum delivery and classroom

References

- Adolphus, T. (2025). Science educators and digital literacy in the 21st century. *Proceedings of the Association of Science Educators of Nigeria*, 16(1), 55–68.
- Agboghroma, S., & Onyekpe, S. J. (2025). The role of Social Studies education in youth skills acquisition and development in upper basic schools in Delta State. *FUO Journal of Educational Research*, 8(2), 74–89.
- Anho, R. O. (2024). The role of technology in teaching and learning of history education in public secondary schools in Delta State. *Rivers State University Journal of Education*, 27(1), 88–101.
- Atubi, O. F. (2022). Information communication technology and Social Studies instruction in Delta State, Nigeria. *Jurnal Penelitian dan Pengkajian Ilmu Pendidikan: E-Saintika*, 6(2), 112–124.
- Ethe, N., & Avbenagha, E. A. (2025). Digital divides and learning outcomes in online education efficacy for bridging socioeconomic gaps in Delta Central Senatorial District during COVID-19. *International Journal of Educational Technology Research*, 7(1), 44–59.
- Friday, A. O., & Ugbedeajo, A. J. (2025). The impact of digital technologies in teaching Social Studies in colleges of education in Nigeria. *Journal of Arts and Social Science Studies*, 5(2), 90–106.
- Ighere, E. S. (2025). Availability of physical facilities for effective learning outcomes in basic secondary schools in Delta Central Senatorial District. *SEAHI Publications Journal of Educational Development*, 4(1), 66–81.
- Lawani, E. (2025). Effects of two modes of digital storytelling instructional strategies on pupils' achievement and attitude towards Social Studies in Osogbo, Osun State, Nigeria. *International Journal of Educational Innovation*, 9(2), 101–118.
- Macaulay, M. O., & Akpan, U. E. (2025). Influence of digital-based instructional technologies utilization on academic achievement of business education students in tertiary institutions in Delta State. *SEAHI Publications Journal of Educational Development*, 11(3), 52–67.
- Mormah, F. O., & Chioma, A. (2025). Managing ICT resource-based teaching and students' learning outcomes in public junior secondary schools in Delta State. *Journal of Education and Educational Development*, 11(3), 52–70.
- Nkolika, C. J. (2025). The impact of digital tools on curriculum delivery in public and private secondary schools in Awka South Local Government Area. *Journal of Educational Management and Innovation*, 3(1), 88–104.
- Odoko, K., & Ihedioha, E. (2025). Capacity for secondary school teachers: Understanding the influence of information and communication technology on job effectiveness in Bayelsa State, Nigeria. *Social Facts: FUOTUOKE Journal of Social Sciences and Humanities*, 7(2), 101–116.
- Okon, O., & Itam, C. (2026). School-community involvement and teachers' digital literacy in public secondary schools in Cross River State, Nigeria. *Impact International Journal of Educational Studies*, 6(1), 33–49.
- Olowo, O. O., & Kataye, T. O. (2025). ICT integration in Social Studies instruction: Teachers' attitudes, challenges, and classroom strategies in junior secondary schools in Ondo State, Nigeria. *International Journal of Education, Technology and Social Sciences*, 7(2), 115–132.
- Omojemite, M. D. (2025). Digital infrastructure and transition challenges in Social Studies instruction in Southwestern Nigerian public universities. *Scientific Culture and Educational Development Journal*, 4(2), 93–110



Correlation Between Teachers' Workload and Training on Instructional Delivery among Public Primary Schools in Talata Mafara Education Zone, Zamfara State, Nigeria

MUSA, Ibrahim Yanware¹

ibrahimyanware@gmail.com

08136310480

ABUBAKAR, Kabiru Mohammed²

Kabir.muhd@udusok.edu.ng

08037492683

¹Department of Primary Education, Federal College of Education (Technical) Gusau, Zamfara State, Nigeria

²Department of Adult Education and Extension Services, Usmanu Danfodiyo University Sokoto, Sokoto State, Nigeria

Abstract

The study investigated the relationship between Teachers workload and Training on instructional delivery among primary schools in Talata Mafara education zone of Zamfara state, Nigeria. The study has two specific objectives, two research questions and two null hypotheses. A correlational survey research design was used. A sample size of 48 respondents was purposively selected to represent the population of 985. Two instruments designed by the researchers and titled: Human Resource Management Scale (HRMS) and Teacher Instructional Delivery Observation Checklist (TIDOCL) were used for data collection. The instruments were validated by experts in educational research, test and measurement from the Faculty of Education and Extension Services, Usmanu Danfodiyo University, Sokoto. The reliability of the two instruments was determined through a trial testing using five primary schools that were not included in the main sample. The test re-test method was applied and the data obtained was subjected to Pearson Product Moment of Correlation Coefficient (PPMCs) analysis, yielding a reliability value of 0.81 and 0.87 respectively. The frequency and percentage as well the PPMC statistics were used in answering the research questions and testing of the null hypotheses respectively at a 0.05 level of significance. The findings revealed among others, that the teachers perceived workload as being excessive due to overload of teaching subjects in public primary schools. The study recommended among others that, the need for Zamfara state government to expedite action in ensuring that adequate teachers are hired for all the public primary schools in the state, so as to make the workload for teachers less excessive.

Keywords: Human resource, Instructional delivery, Management, Primary School.

Introduction

Primary education is critical in building cognitive skills that foster a child's ability to learn effectively in subsequent educational levels and promotes social, emotional, and intellectual development (United Nation Educational Scientific and Cultural Organization, 2016). Primary education in Nigeria is a foundational stage with far-reaching implications for personal, societal and national development. In Nigeria, the government emphasizes the importance of primary education in the National Policy on Education, which identifies it as the bedrock and foundation of the entire educational system in the country (FRN, 2013). Quality primary education is seen as instrumental for reducing poverty, enhancing social equity, and supporting economic development, given that it prepares children to participate effectively in the society and contributes to a skilled workforce in the country. Instructional delivery, encompasses the methods and strategies teachers use to engage learners in learning (Adejumo, 2025). Instructional delivery in Nigerian primary schools is especially important because of the wide disparities in educational access and quality across regions and socioeconomic groups. Effective instructional delivery, characterized by active teaching methods, structured curriculum content, and learner-centered learning, positively impacts pupils' engagement and learning outcomes (Olayinka & Oladejo, 2019). Instructional delivery at the primary education level involves the use of culturally relevant teaching materials and approaches, which can help foster a sense of identity and social cohesion among pupils. However, it should be noted that, in contexts where instructional materials reflect the learners' cultural backgrounds and experiences, learners are more likely to engage with the content, ultimately improving learning outcomes. In view of this, to ensure effective instructional delivery, proper human resource management is paramount important.

Human Resource Management in schools particularly at primary education level is measured through teachers' workload status and professional development status, while instructional delivery is equally measured through observation of teachers engage in actual teaching in the classroom and pupils' learning outcomes. In this regard, provision of adequate



Correlation Between Teachers' Workload and Training on ... Musa, I. Y. & Abubakar, K. M. (2026)

and qualified human resource as well as their effective management certainly influences qualitative teaching. Some recent studies that established the influence of HRM practices on instructional delivery, referred to HRM as the processes of planning, recruiting, developing, motivating, and retaining employees to achieve institutional goals (Sharma & Pandey, 2021; Dlamini, Du Plessis & Markham, 2023). In the educational context, HRM integrates both teaching and non-teaching staff to enhance productivity and ensure quality instruction.

Teachers' workload is the task or responsibility given to a professional teacher aim at educating the learners and making sure that the organizational objective is achieved. Okiridu & Godpower (2021) described teachers' workload as tasks performed in the teaching environment exceeding personal capabilities and resulting in threats, and the reactions of nervousness, anxiety, frustration, pressing, or annoyance. In this respect, workload is considered to be as all overload/personal work extended from single item to multiple duties, and the risk of overload resulted in emotional exhaustion of employees, delaying work, low team spirit, and not obeying rules, which could have negative impact on the overall teachers' instructional delivery, pupils' learning outcome as well as school effectiveness. This has therefore underscored the essence of ensuring that teachers carry out their work effectively and this makes teachers training and professional development to be paramount important.

Training and Development refers to the process of providing teachers with the knowledge and skills they need to do their jobs effectively. Training and development can take many forms, such as classroom training, online training, mentoring, and job shadowing. Teachers need to receive ongoing training and development throughout their careers to keep their skills up to date. This helps to ensure that learners receive the best possible education. Esie (2023) posits that training and development are aspects of human resource management that help in enhancing teachers' skills, knowledge and competence capable of improving teachers' ability to perform more effectively. The current study is underpinned to the Strategic Human Resource Management (SHRM) theory which was proposed by scholars such as Wright and McMahan (1992), who viewed human resource management (HRM) as strategic partner in achieving organizational goals, rather than just an administration (i.e. the goal of the school as an educational organization). In the light of this, the school as an educational organization is covered by this theory because it uses human resource (i.e. both teaching and non-teaching). These personnel are very crucial to overall function of the organization because all other resources (materials, financial, physical, time etc.) are directly or indirectly manipulated by the school personnel.

Empirical study abounds establishing the effect, impact or relationship which Human Resource Management has with other areas in education. For instance, Okiridu, & Godpower (2021), discovered that teachers will not perform better if they are given many subjects to handle. The study by Mwirigi and Muthaa (2015), found that teacher shortages in primary schools led to overworked teachers and reduced instructional quality. Safrancova and Skyr, (2018), found that responsibilities for managing teaching and non-teaching staff, lies not only on headmasters, but also on other managers at schools' administrative machinery. Osiesi, Ayanwale, Akomolafe, Olayiwola-Adedaja, Olatunbosun and Ariya, (2024), revealed that professional development significantly enhances teaching effectiveness and equally positive attitudes towards the teaching profession and this significantly influence teaching effectiveness. Ibiene and Eberechi (2024) in a study, discovered that teacher training and development significantly enhanced instructional delivery in primary schools. Also, Rabi (2017) established that poor facilities, irregular payment of salaries, and inadequate teacher training and development reduced instructional effectiveness. Moshi (2024) also established the existence of a positive correlation between the frequencies of teachers' participation in TPD and pupils' numeracy performance. This indicates that the more teachers engage in TPD, the higher the pupils' numeracy performance. Regardless of the volume of studies on both HRM and instructional delivery, there remained a gap in understanding the direct relationship between HRM and instructional delivery. For instance, while many studies on HRM viewed it as a discipline, limited works existed on relationship between HRM and other aspects of academic discourse bordering on teachers or learners related variables. To this end therefore, the current study focused on investigating the relationship between human resource management and instructional delivery in primary schools in Talata Mafara education zone of Zamfara State, Nigeria. By identifying and addressing the existing gap, the study aims to provide practical recommendations for policymakers, educational administrators, and teacher development programs to foster a more efficient and impactful education system.



Statement of the Problem

The Nigerian education system is characterized by managerial issues including the management of human resources at the primary education level. However, in Zamfara state, Nigeria, based on the researcher's observation, the quality of teachers in public primary schools has not really matched up with the state government investment at that level. Some of the problems bedeviling the public primary schools in relation to human resource management in the state, might be connected with issues and challenges on teachers' workload, training, and orientation of newly employed teachers. This situation has led to decline in the quality of teachers in the public primary schools in the state; and impeding their instructional performance. Many teachers at the primary school level lacked the proficiency to effectively deliver instructions needed in the 21st century classroom (Elenwo & Oteyi, 2024). For instance, the researcher observed that in the Talata Mafara education zone of Zamfara state, primary education system is facing a lot of challenges in the management of human resource for achieving quality instructional delivery in primary schools in the education zone in the state. Also, the researcher (being a stakeholder in primary education) observed that there are issues bordering on teachers' work load and teachers' training and development. It is obvious that, the failure on the authorities concerned with primary education to address these challenges has led to poor learning environment; low education quality and increase in dropout rates. Equally, poor instructional delivery negatively impacted on learners' ability to engage meaningfully with curriculum content. Therefore, addressing the issues of human resource management is essential for creating a more equitable and effective educational system that can support all learners at primary education level to realize their potentials. Based on the researcher's review of available literature, there are a lot of issues and challenges that posed a wide gap in the allocation, availability, adequacy and management of human resource. Also, researches carried out in Talata Mafara education zone of Zamfara state with regards to the prevailing issues and challenges, in primary schools appeared to be very scarce. Hence, parents in Talata Mafara education zone of Zamfara state and other stakeholders in primary education, are not certain whether primary education is likely to meet the desired objectives due to the above problems and challenges. Therefore, the current study was carried out to examine the relationship between human resource management and instructional delivery in primary schools in Talata Mafara education zone of Zamfara state.

Objectives of the Study

The objectives of the study are as follows;

1. To examine the status of teachers' workload in primary schools in Talata Mafara education zone of Zamfara State, Nigeria.
2. To find out the status of teachers' training and professional development in primary schools in Talata Mafara education zone of Zamfara State, Nigeria.
3. To examine the relationship between teachers' workload status and instructional delivery in primary schools in Talata Mafara education zone of Zamfara State, Nigeria.
4. To find out the relationship between teachers' training and professional development status and instructional delivery in primary schools in Talata Mafara education zone of Zamfara State, Nigeria.

Research Questions

The study has the following research questions:

1. What is the status of teacher's workload in primary schools in Talata Mafara education zone of Zamfara State, Nigeria?
2. What is the status of teachers' training and professional development in primary schools in Talata Mafara education zone of Zamfara State, Nigeria?

Research Hypotheses

The following null hypotheses were formulated and tested to guide the study:

- H₀₁. There is no significant relationship between teachers' workload status and instructional delivery in primary schools in Talata Mafara education zone of Zamfara State, Nigeria.
- H₀₂. There is no significant relationship between teachers' training and professional development and instructional delivery in primary schools in Zamfara State, Nigeria.



Correlation Between Teachers' Workload and Training on ... Musa, I. Y. & Abubakar, K. M. (2026)

Research Methodology

The design of the study was correlational survey design and the population comprised of 1108 teachers in the primary schools located within the three Local Government Areas that formed the Talata Mafara education zone of Zamfara state, Nigeria (ZSUBEB, 2023). Using multi stage sampling procedure, the researcher has in the first stage deliberately selected one local government area out of the three LGAs constituted Talata Mafara education zone and the selected LGA was Talata Mafara. However, Maradun and Bakura were excluded due to security challenges. Also, in the second stage, a total of 12 public primary schools were selected based on random sampling technique. Equally, in the third stage, a total of 48 teachers were drawn from the selected schools using purposive sampling technique (on the basis of number of years of teaching experience) and used as the sample size for this study. Two instruments were used for data collection in this study. The first one was designed by the researcher titled “Human Resource Management Scale (HRMS). The second instrument was tagged ‘Teacher Instructional Delivery Observation Checklist (TIDOCL)’ and it was an adapted version of the Faculty of Education and Extension Services Students’ Teaching Practice (TP) Assessment Report Form. The first instrument (HRMS) was subjected to validation by 3 validates who are specialist in Test and Measurement, Educational Management and Primary Education respectively, from the Faculty of Education and Extension Services, Usmanu Danfodiyo University, Sokoto. While the second instrument (TIDOCL) was an adapted version of the Faculty of Education and Extension Services student Teaching Practice (TP) assessment report form and was subjected to revalidation by three validates who are members of the teaching practice committee. A reliability testing was carried out using 30 classroom teachers from the schools which were not part of the main sample of the study. The Cronbach's Alpha was used and a coefficient value of 0.81 and 0.87 were obtained, which indicated that the instruments (HRMS) and (TIDOCL) are reliable.

Presentation of Results

Research Question One: What is the status of teacher’s workload in primary schools in Talata Mafara education zone of Zamfara State, Nigeria?

This research question was answered using items 11-15 on the Human Resource Management Scale (HRMS) and the result is shown in Table 1.

Table 1: Status of teachers’ workload in public primary schools in Talata Mafara education zone of Zamfara State, Nigeria

S/N	Status of teachers (staff) workload	Agree	%	Disagree	%	Total	%	Decision
1.	Teachers are overloaded with teaching subjects in primary schools in Talata Mafara education zone of Zamfara state.	33	69	15	31	48	100	Accepted
2.	Too many roles and responsibilities upon delegated to teachers in primary schools affects their performance.	37	77	11	23	48	100	Accepted
3.	Administrative tasks of head teachers affect the quality of their performance in the schools.	30	63	18	37	48	100	Accepted
4.	Large class size places additional work for teachers in public primary schools.	38	80	10	20	48	100	Accepted
5.	A Teacher teaches many classes in the primary schools in Talata Mafara education zone of Zamfara state.	37	77	11	23	48	100	Accepted

Source: Fieldwork, 2025.

Table 1 shows the status of teachers' workload in primary schools in Talata Mafara education zone of Zamfara State, Nigeria. The results shows that majority of the respondents have agreed with all the five items of research question number one as indicators of teachers’ workload in public primary schools. Specifically, an aspect of the results showing greater percentage (80%) of response, is the respondent’s agreement that large class size places additional work for teachers in public primary schools.

Research Question Two: What is the status of teachers’ training and professional development in primary schools in Talata Mafara education zone of Zamfara State, Nigeria?



Correlation Between Teachers' Workload and Training on ... Musa, I. Y. & Abubakar, K. M. (2026)

This research question was answered using items 16-20 on the Human Resource Management Scale (HRMS) and the result is shown in Table 2.

Table 2: Status of teachers' training and Professional development in public primary schools in Talata Mafara education zone of Zamfara State, Nigeria

S/N	Status of teachers' staff development	Agree	%	Disagree	%	Total	%	Decision
1.	Teachers in the primary schools in Talata Mafara education zone of Zamfara state are given equal chance to further their education through in-service training.	39	82	9	18	48	100	Accepted
2.	Teachers allowed to further their education through In-service training in your school reflect the training received in discharging their duties.	42	88	6	12	48	100	Accepted
3.	Series of Workshops are frequently organized to build the capacity of teachers on the job in primary schools in Talata Mafara education zone of Zamfara state.	45	93	3	7	48	100	Accepted
4.	Participation in seminars enable teachers to update their knowledge leading to their ability to deliver effectively.	46	96	2	4	48	100	Accepted
5.	Participation in conferences equip teachers with current knowledge with a view to improve their teaching skills.	45	94	3	6	48	100	Accepted

Source: Fieldwork, 2025.

Table 2 presents the findings on the status of teachers' professional development in primary schools in Talata Mafara education zone of Zamfara State, Nigeria. The results shows that majority of the respondents have agreed with all the five items of research question number two as indicators of teachers' professional development. Specifically, an aspect of the results showing greater percentage (94%) of response is the respondents' agreement that participation in seminars enable the primary school teachers to update their knowledge leading to their ability to deliver effectively.

Testing Null Hypotheses

The null hypotheses formulated in this study were tested and the results were presented at a 0.05 level of significance using PPMC as follows:

H₀₁. There is no significant relationship between teachers' workload status and instructional delivery in public primary schools in Talata Mafara education zone of Zamfara State, Nigeria.

Table 3: Relationship between teachers' workload status and instructional delivery

Variable	N	Mean	Std. Deviation	Df	r-Cal	p-value	Decision
Teachers' workload	48	16.662	2.608	46	-.074	.021	H ₀₁ (Rejected)
Instructional Delivery	48	80.2099	6.556				

Source; Fieldwork, 2025.

From Table 3, it can be seen that the relationship between teachers' workload and teachers' instructional delivery is negative and significant, r-Cal = -.074, p-value (.021) is less than 0.05 level of significance. This indicates the existence of a negative but significant relationship between teachers' workload status and instructional delivery in public primary schools in Talata Mafara education zone of Zamfara State, Nigeria. Therefore, the null hypothesis that says there is no significant relationship between teachers' workload status and instructional delivery in primary is rejected. This means that as teachers' workload increases, the teachers' instructional delivery quality reduces.

H₀₂. There is no significant relationship between teachers' training and professional development and instructional delivery in primary schools in Talata Mafara education zone of Zamfara State, Nigeria.



Correlation Between Teachers' Workload and Training on ... Musa, I. Y. & Abubakar, K. M. (2026)

Table 4: Relationship between teachers' training and Professional development and instructional delivery

Variable	N	Mean	Std. Deviation	Df	r-Cal	p-value	Decision
Teachers' professional Development	48	16.832	2.304	46	.046	.040	H ₀₂ (Rejected)
Instructional Delivery	48	68.742	6.556				

Source; Fieldwork, 2025.

From Table 4, it can be seen that the relationship between staff development and teachers' instructional delivery is positive and significant, r-Cal = .046, p-value (.040) is less than 0.05 level of significance. Therefore, the null hypothesis that says there is no significant relationship between teachers' training and professional development status and instructional delivery in primary schools in Talata Mafara education zone of Zamfara State, Nigeria is rejected. This indicates that the better the teachers' training and professional development the better the instructional delivery by teachers.

Discussion of Findings

The first finding of this study established that primary school teachers in Talata Mafara education zone of Zamfara State-Nigeria, agreed that there is excessive workload that was driven by an overload of teaching subjects, numerous roles and responsibilities, large class sizes, and a high volume of both classes and administrative tasks. These testimonies are provided in figures on Table 1 as opinion of majority of the respondents. Equally, the result of testing hypothesis number one which corresponded the research question number one (i.e. testing relationship between teachers' staff workload and instructional delivery in primary schools) also statistically the existence of a negative and significant relationship having r-Cal= .-074, p-value (.021) which is less than 0.05 level of significance which led to the rejection of the null hypothesis that says there is no significant relationship between teachers' staff workload and teachers' instructional delivery in primary schools in Zamfara state, Nigeria. This finding of the study supports the work of Mwirigi and Muthaa (2015) in which it was established that high enrolment trends in primary schools led to overworking of the teachers. Also, this finding of the study agreed with work of Safrancova and Skyr (2018) which revealed that responsibilities for managing teaching and non-teaching staff in schools belong not only to headmasters, but also to others such as teacher who are heads of subject, heads of school clubs etc. By implication, assigning too much responsibilities on the teacher apart from his teaching task, will make him to perform below expectation. Similarly, this finding lends support to the claim of Kyereh, Addai-Amoah and Owusu-Addo (2023) where they opined that there are certain factors' that highly affect the smooth implementation of human resource management practices and these included handling of increase in students'/pupils' population in the school. In view of the above findings, it is quite logical that, if this issues of teachers' workload have not been properly addressed, there is no doubt about the fact that it will negatively affect the performance of the teachers concerned. The finding also confirmed the work of Okiridu and Godpower (2021) which reveals that the null hypothesis tested shows that there is a significant relationship between teachers' workload and instructional delivery. As such, the need to employ more teachers becomes of paramount importance so as to be in line with teacher's workload policies to enable them work better and achieve organizational goals. Also, the finding of this study supported the work of Arop, Owan and Agunwa, (2019) which states that there is a significant composite influence of teachers' training, placement, and supervision on the attitude to work. Thus, the kind of training teachers received, their placement and engagement in their place of work and supervision all have greater influence on their attitude to work. In view of this, it is important to note that, as teachers' workload increases, the teachers' instructional delivery quality reduces.

The second finding of this study established that in Talata Mafara education zone of Zamfara State, teachers in public primary schools are expose to high level of participation in staff development through frequent access to various in-service training opportunities. The details provided in Table 2, clearly indicates the agreement of majority of the respondents regarding the indicators of teachers' training and professional development as provided in the Table. Equally, the result of testing hypothesis number two which corresponded with research question number two (i.e. testing relationship between teachers' training/professional development and instructional delivery in primary schools) also statistically the existence of a positive and significant relationship having r-Cal = .046, p-value (.040) led to the rejection of the second null hypothesis which says there is no significant relationship between teachers' training/professional development and instructional delivery in primary schools in Talata Mafara education zone of Zamfara State, Nigeria. This finding of the current study is



Correlation Between Teachers' Workload and Training on ... Musa, I. Y. & Abubakar, K. M. (2026)

in agreement with the work of Ibiene and Eberechi (2024) reveals that teachers' training and professional development enable teachers get more developed through exposure to impact better on the learners. Thus, it helps teachers to develop their knowledge, skills, and abilities. Also, the finding of the study confirms the work of Osiesi, Ayanwale, Akomolafe, Olayiwola-Adedaja, Olatunbosun and Ariya (2024) states that there are practical benefits of professional development and fostering positive attitudes which are crucial for enhancing teaching effectiveness. This imply that educational stakeholders should prioritize these factors to improve educational outcomes. Furthermore, this finding equally, corroborates the work of Ollor (2021) in which it was found that attendance in workshops and conferences is very significant and vital means for updating teachers with current and efficient teaching methods, tools, and experiences. This process aims to improve teachers' general attitudes, effectiveness, professional experiences, skills, knowledge, and ultimately, learners' outcomes. In view of these findings, it is pertinent to note that, teachers' professional development occupies a prominent position in the teaching and learning process as it helps to keep teachers active, versatile, and current, particularly in this fast-paced scientific and technological era, thereby increasing their efficacy with a view to enhancing better classroom interactions. In view of the above, it is worthy to note that, attendance and participation in teachers' professional development like: workshops, conferences, seminars and other organize educational gatherings are very significant and vital in enhancing quality instructional delivery by the teachers as it will promote their ability to develop teaching methods, knowledge and skills. In conclusion, this implies that the better the teachers' staff development, the better the instructional delivery process by the teachers.

Conclusion

The study concluded that there was a clear manifestation of the fact that, teachers perceived their workload as excessive. This resulted from an overload of teaching subjects, numerous roles and responsibilities, large class sizes, and a high volume of both classes and administrative tasks. Even though, another finding of the study overwhelmingly confirms that high level of participation in teachers' training and professional development through frequent access to various in-service training opportunities helps in promoting teachers' instructional delivery in primary schools in Talata Mafara education zone of Zamfara state, Nigeria. This has been observed from the responses of 48 respondents on the twenty (20) item statements which were premises of the two (2) research questions raised and two (2) null hypotheses formulated earlier in this study.

Recommendations

Based on the findings of this study, the following recommendations were made:

1. There is the need for Zamfara state government to go an extra-mile to ensure that adequate teachers are made available to primary schools there by reducing the excessive nature of the workload. Meaning that, there is need for more teachers' recruitment at primary schools in Zamfara state.
2. The Zamfara state government should also not relent on her effort in organizing training and re-training of teachers in this direction. Also, Non-Governmental Organizations (NGOs) should continue to complement the efforts of the state government through partnership in the area of teachers' professional development and capacity building for the improvement of teaching skills at the primary education level in the state.

References

- Adejumo, T. (2025). *Literacy Instruction in Nigerian Primary Schools: An Observational Study* (Doctoral dissertation, Middle Tennessee State University).
- Arop, F.O., Owan, J. V. and Agunwa, N. J. (2019). Teaching Personnel Management and Attitude to Work in Secondary Schools of Calabar Education Zone of Cross River state, Nigeria. *Prestige Journal of Education, Vol. 2, No. 1*. A publication of the Association for the Promotion of Innovation in Education (APIE).
- Dlamini, J., DuPlessis, A. R. and Markham, L. (2023). Staffing and Retention Challenges of Teachers in Rural Schools of Eswatini: The Case of the Lubombo Region. *International Journal of Rural Management* 19(3) 361–378.
- Elenwo, P.M. & Oteyi, J.V. (2024). Perceived influence of human resource management on instructional delivery in primary schools in Rivers State. *European Journal of Arts, Humanities and Social Sciences*, 1(1), 3-11. DOI: 10.59324/ejahss.2024.1(1).01.
- Esie, R. W. (2023). Personnel Management and Teachers' Job Performance: *International Journal of Scientific Research in Education, (IJSRE) Vol. 16(3)*, 356-367. Retrieved on 24th, April, 2024.
- Federal Republic of Nigeria. (2013). National Policy on Education. NERDC Press: Yaba, Lagos-Nigeria.

Correlation Between Teachers' Workload and Training on ... Musa, I. Y. & Abubakar, K. M. (2026)

- Gladys, S., Nicholas, Z., & Crispen, B. (2016). Undergraduate students' views on their learning of research methods and statistics programme: Challenges and alternative strategies. *International Journal of Social Science Tomorrow* 1 (3): 1-9.
- Hornby, A. S. (2015). Oxford Advanced Learner Dictionary, (8th Ed.). Oxford University press.
- Ibiene, K. G. & Eberechi, O. (2024). Management of Human Resources for Instructional Delivery in Public and Private Primary Schools in Port Harcourt Metropolis. *International Journal of Innovative Education Research* 12(1):53-66, Seahi Publications, www.seahipaj.org. Retrieved on 23rd, April, 2024.
- Kyereh, M. O., Addai-Amoah, A. K. & Owusu-Addo, A. (2023). Human resources management practices and the effectiveness of school management: Lessons for leadership. *Educational Research: Theory and Practice*, 34(3), 73-85. <https://www.researchgate.net>.
- Moshi, E. G. (2024). The Influence of Teachers' Participation in Professional Development on Pupils' Attainment of Numeracy Skills in Public Primary Schools in Arusha City. *European Journal of Research and Reflection in Educational Sciences Vol. 12 No. 5, 2024 ISSN 2056-5852*.
- Mwirigi, S.F. and Muthaa, G. M. (2015). Impact of Staffing on The Quality of Learning in Primary Schools in Imenti Central District, Kenya. *Impact Factor 3.582 Case Studies Journal, Volume 4, Issue (6)*. <http://www.casestudiesjournal.com>.
- Napocao, A. (2016). Instructional competence of pre-service teachers in relationship with their academic performance. Thesis for: Bachelor of Elementary Education.
- Okiridu, O. S. F. & Godpower, Y. J. (2021). Teachers' Workload and Effective Instructional Delivery of Business Education Courses in Rivers State Universities. *International Journal of Innovative Social & Science Education Research* 9(1):60-66, Jan.-Mar., 2021 © SEAH PUBLICATIONS, 2021 www.seahipaj.org.
- Olayinka, A. & Oladejo, M. (2019). Impact of Resource Management on Learning Outcomes in Nigerian Primary Education. *Nigerian Journal of Educational Research*.
- Ollor, A. N. (2021). Teachers' Participation in Workshop and Seminar for Quality Instructional Delivery in Secondary Schools in Rivers State. *International Journal of Innovative Social & Science Education Research* 9(1):1-8, Jan.-Mar., 2021 © SEAH PUBLICATIONS, 2021 www.seahipaj.org.
- Osiesi, M. P., Ayanwale, M. A., Akomolafe, O. D., Olayiwola-Adedola, T. O. Olatunbosun, S. O. & Simeon Oluniyi, S. A. (2024). Transforming classrooms: How professional development and teacher attitudes drive primary school teaching effectiveness. *Social Sciences & Humanities Open journal homepage: www.sciencedirect.com/journal/social-sciences-and-humanities-open*.
- Rabi'u, M. I. (2017). Assessment of the Provision and Management of Facilities and Personnel in the Early Childhood Care Classes in Sokoto State, Nigeria: An unpublished Thesis Submitted to the Post Graduate School, Usmanu Danfodiyo University, Sokoto, Nigeria. In Fulfillment for the Degree of Doctor of Philosophy (Educational Administration and Planning). Department of Educational Foundations.
- Šafránková, J. M., & Šikýř, M. (2018). Responsibilities and competencies in personnel management at Czech schools. *Oeconomia Copernicana*, 9(3), 529–543. jana.safrankova@ambis.cz, Institute of Regional Development and Banking Institute – AMBIS, Národní 2600/9, 158 00 Praha 5, Czech Republic.
- Sharma, N. and Pandey, M. P. (2021). Role of Human Resource Management in Education. *Journal of Research in Humanities and Social Science Volume 9 (11)*, pp: 27-31: www.questjournals.org. IFTM University, Moradabad U.P. India.
- UNESCO. (2016). Teaching and Learning: Achieving Quality Education for All; EFA Global Monitoring Report. UNESCO Publishing.
- Wright, P. M., & McMahan, G. C. (1992). Theoretical perspectives for strategic human resource management. *Journal of management*, 18(2), 295-320.



Impacts of Concept Mapping Strategy on Achievement and Attitude in Social Studies among Secondary School Students in Delta State, Nigeria

ESEGBUE, Edith¹

edith.esegbue@unidel.edu.ng

08035460942

ONYEKPE, Stephen Jacob²

onyekpestephen247@gmail.com

newjacob4real@yahoo.com

08062210169

¹Department of Art & Social Science Education, Faculty of Education, University of Abakeliki, Ebonyi State, Nigeria

²Department of Social Science Education, Delta State University, Abraka, Delta State, Delta State, Nigeria

Abstract

This study examined the impact of concept mapping strategy on students' achievement and attitude in Social Studies in Delta State. The study adopted a pretest–posttest non-equivalent control group design, which is a subtype of quasi-experimental design structured into a 2 × 2 factorial matrix involving instructional strategies (concept mapping strategy and conventional instructional method) and sex (male and female). Four research questions and four hypotheses guided the study. The population comprised 72,096 Junior Secondary School students in public secondary schools in Delta State. A sample of 300 students was selected using a multistage sampling technique from four public secondary schools in two local government areas. Data were collected using two instruments titled Social Studies Achievement Test (SSAT) and Students' Attitude towards Social Studies Questionnaire (SASSQ), both developed by the researcher. The SSAT consisted of 40 multiple-choice items designed to measure students' achievement in selected Social Studies concepts, while the SASSQ consisted of 20 structured questionnaire items used to measure students' attitudes towards Social Studies concepts. The instruments were validated by three experts in Social Studies Education and Measurement and Evaluation from the University of Delta. A pilot study was conducted using 30 students outside the sampled schools. Reliability of the SSAT was determined using Kuder–Richardson Formula 20 (KR-20), which yielded a coefficient of 0.82, while the SASSQ yielded a Cronbach Alpha reliability coefficient of 0.86. Data collection lasted six weeks and involved pretest, treatment, and posttest administration. Mean and standard deviation were used to answer the research questions, while paired sample t-test and Analysis of Covariance (ANCOVA) were used to test the hypotheses at the 0.05 level of significance. The findings revealed that students taught using concept mapping strategy achieved significantly higher achievement and attitude scores than those taught using the conventional instructional method. The findings also showed significant interaction effects of concept mapping strategy and sex on students' achievement and attitude towards Social Studies concepts. The study recommended that Social Studies teachers should adopt concept mapping strategy to improve students' academic achievement and positive attitudes towards Social Studies concepts in secondary schools.

Keywords: Concept Mapping Strategy, Academic Achievement, Attitude, Social Studies, Gender Differences.

Introduction

Social Studies is an important school subject that equips learners with the knowledge, attitudes, values, and skills necessary for responsible citizenship and effective participation in society. The subject emphasizes the study of human beings and their interactions with the social, political, economic, cultural, and physical environments. According to Mezieobi (2016), Social Studies is an integrated field of study designed to develop civic competence, social responsibility, and functional knowledge for national development. Similarly, Kiskeya (2018) defined Social Studies as a programme of study that prepares learners to become informed and active citizens through the acquisition of democratic values, social skills, and problem-solving abilities. These definitions suggest that Social Studies plays a significant role in promoting civic consciousness, national unity, and responsible behaviour among secondary school students. In Nigerian secondary schools, Social Studies also serves as a medium for teaching civic concepts such as democracy, leadership, civic responsibility, human rights, patriotism, and national integration. One of the major factors influencing effective teaching and learning in Social Studies is the instructional strategy adopted by teachers during classroom interaction. Instructional strategy refers to the methods, techniques, and organized teaching procedures used to facilitate learning and improve students' academic outcomes. Effective instructional strategies promote active participation, collaboration, inquiry, and critical thinking among learners. According to Abdulrahim et al. (2026), instructional strategies are organized teaching approaches designed



Impacts of Concept Mapping Strategy on Achievement and Attitude in ... Onyekpe, S. J. (2026)

to improve students' understanding and academic performance through active classroom engagement. Similarly, Lawani (2025) explained that instructional strategies involve learner-centred teaching practices that encourage participation, interaction, and meaningful learning experiences among students. These perspectives indicate that the effectiveness of teaching and learning in Social Studies largely depends on the appropriateness of the instructional strategy used by the teacher.

Among the learner-centred instructional approaches recognized in contemporary education is scaffolding instructional strategy. Scaffolding instructional strategy refers to the temporary support, guidance, and assistance provided by teachers to learners to help them understand concepts and accomplish learning tasks successfully. The support provided is gradually withdrawn as learners gain mastery and become independent in the learning process. Scaffolding instructional strategy encourages guided participation, classroom interaction, and collaborative learning among students. According to Awoyale and Olajide (2025), interactive instructional strategies help students to actively engage with learning tasks and improve their understanding of concepts through guided classroom activities. Similarly, Wokocha and Harcourt (2025) observed that instructional approaches involving interaction, discussion, and teacher guidance enhance students' achievement and facilitate effective learning outcomes. These views suggest that scaffolding instructional strategy may improve students' understanding and academic performance in civic concepts in Social Studies through guided instruction and collaborative learning experiences. The relevance of scaffolding instructional strategy in Social Studies teaching lies in its ability to simplify abstract civic concepts and encourage meaningful classroom interaction. Civic concepts such as democracy, constitutional rights, civic obligations, leadership, and national unity often require explanation, demonstration, questioning, and guided learning experiences for effective comprehension. Studies have shown that learner-centred instructional strategies improve students' achievement more effectively than conventional teaching methods. For instance, Abdulrahim et al. (2026) found that students exposed to innovative instructional strategies recorded higher posttest achievement scores than those taught using lecture methods. Similarly, Omosor and Andrew (2025) reported that students taught using concept mapping instructional methods achieved better academic performance than those taught through conventional instructional approaches. Likewise, Ibrahim and Tukur (2025) found that mind-mapping instructional strategy significantly improved students' academic performance and retention compared with traditional teaching methods. These findings indicate that innovative instructional approaches such as scaffolding may improve students' understanding and academic performance in Social Studies classrooms.

Another important variable in this study is students' understanding. Understanding refers to the extent to which learners are able to comprehend, interpret, explain, and apply learned concepts meaningfully in different situations. It goes beyond memorization and involves deep cognitive processing of knowledge. Students' understanding of civic concepts can be reflected in their ability to explain civic responsibilities, analyze societal issues, and apply civic values appropriately in daily life situations. According to Awoyale and Olajide (2025), students' understanding is enhanced when instructional activities promote active engagement, interaction, and guided learning experiences. Similarly, Lawani (2025) observed that learner-centred instructional approaches improve students' comprehension and participation in Social Studies lessons more effectively than conventional teaching methods. These perspectives imply that scaffolding instructional strategy may significantly improve students' understanding of civic concepts in Social Studies. Academic performance is another important concept examined in this study. Academic performance refers to the measurable level of achievement attained by students in learning activities, usually determined through tests, examinations, assignments, and other assessment procedures. Academic performance reflects the extent to which educational objectives have been achieved by learners. According to Omosor and Andrew (2025), academic performance refers to students' achievement in learning tasks as measured through pretest and posttest assessments. Similarly, Ikoroha (2025) explained that academic performance involves the level of success students attain in classroom learning activities as reflected in assessment outcomes. Studies have consistently shown that innovative instructional strategies improve students' academic performance more effectively than conventional teaching methods. For example, Abdulrahim et al. (2026) reported that students taught using learner-centred instructional strategies achieved higher posttest mean scores than those taught through lecture methods. Likewise, Agada-Adeleye et al. (2025) found that concept mapping instructional strategy significantly improved students' academic achievement in Biology. These findings suggest that scaffolding instructional strategy may positively influence students'



Impacts of Concept Mapping Strategy on Achievement and Attitude in ... Onyekpe, S. J. (2026)

academic performance in civic concepts in Social Studies. Another variable considered in this study is school location. School location refers to the geographical setting in which a school is situated, commonly classified as urban or rural. School location may influence students' access to instructional resources, teacher quality, classroom interaction, and learning opportunities. Studies have shown that school location may interact with instructional strategies to influence students' academic achievement. For instance, Ogar et al. (2025) found that instructional strategy and school location significantly influenced students' academic achievement in Biology. Similarly, Ikorooha (2025) observed that the interaction effect of instructional strategy and school location significantly influenced students' achievement in difficult Biology concepts. In the same vein, Maikano and Simon (2025) reported that teaching strategies could interact with moderating variables to influence students' academic achievement. These findings indicate that the effectiveness of scaffolding instructional strategy may vary across urban and rural secondary schools in Delta State.

Despite the importance of Social Studies in promoting civic competence and responsible citizenship, students' understanding and academic performance in civic-related concepts in secondary schools in Delta State appear to remain unsatisfactory. This situation may be attributed to the persistent use of conventional teaching methods that encourage passive learning, rote memorization, and limited classroom participation. Conventional instructional methods often reduce opportunities for interaction, guided learning, and collaborative engagement among students. Researchers have therefore advocated for learner-centred instructional approaches capable of improving students' understanding and academic achievement. Studies conducted by Hassan et al. (2025), Agada-Adeleye et al. (2025), Lawani (2025), and Awoyale and Olajide (2025) revealed that innovative instructional strategies significantly improved students' learning outcomes and classroom participation compared with conventional methods. However, it appears limited studies have specifically examined the effect of scaffolding instructional strategy on students' understanding and academic performance in civic concepts in Social Studies in secondary schools in Delta State. Therefore, this study seeks to examine the effect of scaffolding instructional strategy on students' understanding and academic performance in civic concepts in Social Studies in secondary schools in Delta State.

Objectives of the Study

The main objective of this study is to examine the effect of concept mapping strategy on students' achievement and attitude towards Social Studies concepts in secondary schools in Delta State. Specifically, the study sought to:

1. Determine the difference between the pretest and posttest mean achievement scores of students taught Social Studies concepts using concept mapping strategy and those taught using conventional instructional methods in secondary schools in Delta State.
2. Determine the difference between the pretest and posttest mean attitude scores of students taught Social Studies concepts using concept mapping strategy and those taught using conventional instructional methods in secondary schools in Delta State.
3. Examine the interaction effect of concept mapping strategy and sex on students' achievement in Social Studies concepts in secondary schools in Delta State.
4. Examine the interaction effect of concept mapping strategy and sex on students' attitude towards Social Studies concepts in secondary schools in Delta State.

Research Questions

The following research questions guided this study:

1. What is the difference between the pretest and posttest mean achievement scores of students taught Social Studies concepts using concept mapping strategy and those taught using conventional instructional methods in secondary schools in Delta State?
2. What is the difference between the pretest and posttest mean attitude scores of students taught Social Studies concepts using concept mapping strategy and those taught using conventional instructional methods in secondary schools in Delta State?
3. What is the interaction effect of concept mapping strategy and sex on students' achievement in Social Studies concepts in secondary schools in Delta State?



Impacts of Concept Mapping Strategy on Achievement and Attitude in ... Onyekpe, S. J. (2026)

4. What is the interaction effect of concept mapping strategy and sex on students' attitude towards Social Studies concepts in secondary schools in Delta State?

Hypotheses

- H₀₁: There is no significant difference between the pretest and posttest mean achievement scores of students taught Social Studies concepts using concept mapping strategy and those taught using conventional instructional methods in secondary schools in Delta State.
- H₀₂: There is no significant difference between the pretest and posttest mean attitude scores of students taught Social Studies concepts using concept mapping strategy and those taught using conventional instructional methods in secondary schools in Delta State.
- H₀₃: There is no significant interaction effect of concept mapping strategy and sex on students' achievement in Social Studies concepts in secondary schools in Delta State.
- H₀₄: There is no significant interaction effect of concept mapping strategy and sex on students' attitude towards Social Studies concepts in secondary schools in Delta State.

Methodology

This study adopted the pretest–posttest non-equivalent control group design, which is a subtype of quasi-experimental design structured into a 2×2 factorial design matrix. The design consisted of two instructional strategies (Concept Mapping Strategy and Conventional Instructional Method) and sex (male and female). The design enabled the researcher to determine the main effects of concept mapping strategy and sex, as well as their interaction effect on students' achievement and attitude towards Social Studies concepts in secondary schools in Delta State. The population of the study comprised all Junior Secondary School II (JSS II) students offering Social Studies in public secondary schools in Delta State. A total of 300 students participated in the study. The sample was selected using a multistage sampling technique. First, four public secondary schools were randomly selected from two local government areas in Delta State. Intact classes were used to avoid disrupting the normal classroom setting. The selected students were assigned into two groups: the experimental group (150 students) exposed to the concept mapping strategy, and the control group (150 students) taught using the conventional instructional method. The primary instruments used for data collection were the Social Studies Achievement Test (SSAT) and the Students' Attitude towards Social Studies Questionnaire (SASSQ), both developed by the researcher. The SSAT consisted of 40 multiple-choice items based on selected Social Studies concepts, while the SASSQ consisted of 20 structured items designed to measure students' attitudes towards Social Studies concepts. The questionnaire items were structured on a four-point Likert scale ranging from Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). The instruments were designed to measure students' achievement and attitude towards Social Studies concepts taught during the study. To ensure validity, the instruments were subjected to face and content validation by three experts: two specialists in Social Studies Education and one expert in Measurement and Evaluation from the University of Delta, Agbor Delta State. Their suggestions led to the modification of ambiguous items and proper alignment of the instruments with the curriculum objectives, research questions, and hypotheses. A pilot study was conducted using 30 students from a school outside the sampled schools. The reliability of the SSAT was determined using the Kuder-Richardson Formula 20 (KR-20), which yielded a reliability coefficient of 0.82, while the reliability of the SASSQ was determined using Cronbach Alpha statistics, which yielded a reliability coefficient of 0.86. The coefficients indicated that the instruments possessed high internal consistency and were suitable for the study. Data collection lasted for six weeks and was carried out in three phases. In the first phase, the SSAT and SASSQ were administered as pretests to both the experimental and control groups to determine their baseline equivalence in achievement and attitude. In the second phase, treatment was administered. The experimental group (150 students) was taught selected Social Studies concepts using the concept mapping strategy, which involved the use of diagrams, hierarchical organization of concepts, linking words, and graphical representation of relationships among concepts to facilitate meaningful learning. The control group (150 students) was taught the same

Impacts of Concept Mapping Strategy on Achievement and Attitude in ... Onyekpe, S. J. (2026)

concepts using the conventional instructional method. Both groups were taught by qualified Social Studies teachers under the supervision of the researcher to ensure uniformity in instructional delivery and content coverage. In the third phase, the SSAT and SASSQ were re-administered as posttests to both groups to measure students' achievement and attitude after the treatment. Ethical approval was obtained from the Delta State Ministry of Education, and permission was granted by the principals of the selected schools. Students were informed about the purpose of the study and assured of confidentiality and anonymity. Participation was voluntary, and no personal identifiers were collected from the respondents. Data collected from the pretest and posttest were analyzed using descriptive and inferential statistics. Mean and standard deviation were used to answer the research questions. Paired sample t-test statistics were used to test hypotheses one and two, while Analysis of Covariance (ANCOVA) was used to test hypotheses three and four on the interaction effect of concept mapping strategy and sex on students' achievement and attitude towards Social Studies concepts. All hypotheses were tested at the 0.05 level of significance using SPSS version 23. Through this methodological framework, the study rigorously examined the effectiveness of concept mapping strategy on students' achievement and attitude towards Social Studies concepts in secondary schools in Delta State compared to the conventional instructional method.

Table 1: Design of the Study

Groups (Instructional Strategies)	Pretest	Treatment	Posttest
Concept Mapping Group	O ₁	X ₁ (Concept Mapping Strategy)	O ₂
Conventional Group	O ₁	X ₂ (Conventional Instructional Method)	O ₂

Key:

O₁ = Pretest observation for both groups

O₂ = Posttest observation for both groups

X₁ = Concept Mapping Strategy (Experimental Group – 150 students)

X₂ = Conventional Instructional Method (Control Group – 150 students)

Table 2: Sample Distribution by Group and Sex

Instructional Strategy	School	Male	Female	Total
Concept Mapping	A	38	37	75
	B	36	39	75
Total (Concept Mapping)		74	76	150
Conventional	C	35	40	75
	D	38	37	75
Total (Conventional)		73	77	150
Grand Total		147	153	300

Source: Delta State Post Primary Education Board (2025 Census).

Hypothesis One

There is no significant difference between the pretest and posttest mean achievement scores of students taught Social Studies concepts using concept mapping strategy and those taught using conventional instructional methods in secondary schools in Delta State.

Table 1: Mean and Standard Deviation of Pretest and Posttest Achievement Scores of Students



Groups	N	Pretest Mean	SD	Posttest Mean	SD	Mean Gain
Concept Mapping Strategy	150	51.84	7.92	69.35	6.88	17.51
Conventional (Control)	150	50.97	7.64	56.40	7.18	5.43

The data in Table 1 revealed the mean and standard deviation of pretest and posttest achievement scores of students taught Social Studies concepts using concept mapping strategy and conventional instructional method. The result showed that the concept mapping group had a pretest mean score of 51.84 and standard deviation of 7.92, while the posttest mean score was 69.35 with a standard deviation of 6.88, resulting in a mean gain of 17.51. The conventional group had a pretest mean score of 50.97 and standard deviation of 7.64, while the posttest mean score was 56.40 with a standard deviation of 7.18, resulting in a mean gain of 5.43. The result indicated that students taught using concept mapping strategy achieved higher mean gain scores than those taught using the conventional instructional method. To determine whether the observed difference was statistically significant, paired sample t-test statistics was used as presented in Table 2.

Table 2: Paired Sample t-test Summary of Pretest and Posttest Achievement Scores of Students

Strategies	Achievement	N	Mean Gain	Standard Deviation	df	t-cal	Sig. (2-tailed)
Concept Mapping	Pretest/Posttest	150	17.51	9.82	149	9.18	.000
Conventional	Pretest/Posttest	150	5.43	8.21	149	1.87	.063

Table 2 showed that the concept mapping strategy group at 149 degree of freedom had a calculated t-value of 9.18 and a significance value of .000 which is significant at 0.05 alpha level. The conventional group had a calculated t-value of 1.87 and significance value of .063 which is not significant at 0.05 alpha level. Therefore, the null hypothesis was rejected for the concept mapping strategy group and accepted for the conventional group. This implies that there is a significant difference between the pretest and posttest mean achievement scores of students taught Social Studies concepts using concept mapping strategy, while there is no significant difference among those taught using conventional instructional methods.

Hypothesis Two

There is no significant difference between the pretest and posttest mean attitude scores of students taught Social Studies concepts using concept mapping strategy and those taught using conventional instructional methods in secondary schools in Delta State.

Table 3: Mean and Standard Deviation of Pretest and Posttest Attitude Scores of Students

Groups	N	Pre-Attitude Mean	SD	Post-Attitude Mean	SD	Mean Gain
Concept Mapping Strategy	150	54.62	6.84	66.28	5.97	11.66
Conventional (Control)	150	53.91	6.42	57.14	6.11	3.23

The data in Table 3 showed the mean and standard deviation of pre-attitude and post-attitude scores of students taught Social Studies concepts using concept mapping strategy and conventional instructional method. The concept mapping group had a pre-attitude mean score of 54.62 and standard deviation of 6.84, while the post-attitude mean score was 66.28 with a standard deviation of 5.97, resulting in a mean gain of 11.66. The conventional group had a pre-attitude mean score



Impacts of Concept Mapping Strategy on Achievement and Attitude in ... Onyekpe, S. J. (2026)

of 53.91 and standard deviation of 6.42, while the post-attitude mean score was 57.14 with a standard deviation of 6.11, resulting in a mean gain of 3.23. The findings revealed that students taught using concept mapping strategy developed more positive attitudes towards Social Studies concepts than those taught using the conventional instructional method. To determine whether the observed difference was statistically significant, paired sample t-test statistics was used as presented in Table 4.

Table 4: Paired Sample t-test Summary of Pretest and Posttest Attitude Scores of Students

Strategies	Attitude	N	Mean Gain	Standard Deviation	df	t-cal	Sig. (2-tailed)
Concept Mapping	Pretest/Posttest	150	11.66	8.56	149	7.84	.000
Conventional	Pretest/Posttest	150	3.23	7.92	149	1.69	.093

Table 4 revealed that the concept mapping strategy group at 149 degree of freedom had a calculated t-value of 7.84 and significance value of .000 which is significant at 0.05 alpha level. The conventional group had a calculated t-value of 1.69 and significance value of .093 which is not significant at 0.05 alpha level. Therefore, the null hypothesis was rejected for the concept mapping strategy group and accepted for the conventional group. This implies that there is a significant difference between the pretest and posttest mean attitude scores of students taught Social Studies concepts using concept mapping strategy, while there is no significant difference among those taught using conventional instructional methods.

Hypothesis Three

There is no significant interaction effect of concept mapping strategy and sex on students' achievement in Social Studies concepts in secondary schools in Delta State.

Table 5: Mean and Standard Deviation of Interaction of Concept Mapping Strategy and Sex on Students' Posttest Achievement Scores

Instructional Strategy	Sex	N	Posttest Mean	SD
Concept Mapping	Male	74	68.92	4.32
	Female	76	69.77	4.05
Conventional	Male	73	55.88	4.86
	Female	77	56.91	4.64

Table 5 showed the mean and standard deviation of interaction effect of concept mapping strategy and sex on students' achievement in Social Studies concepts. The result revealed that students in the concept mapping group recorded higher posttest mean scores among both male and female students when compared with those in the conventional group. To determine whether the observed interaction effect was statistically significant, ANCOVA statistics was used as presented in Table 6.

Table 6: Analysis of Covariance (ANCOVA) Showing Interaction Effect of Concept Mapping Strategy and Sex on Students' Achievement

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	2488.416a	5	497.683	20.364	.000	.298
Intercept	60115.224	1	60115.224	2459.635	.000	.893



Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Strategy	1168.540	1	1168.540	47.811	.000	.140
Sex	12.428	1	12.428	.509	.476	.002
Strategy*Sex	548.632	2	274.316	11.226	.000	.071
Error	7164.973	294	24.371			
Total	146200.000	300				
Corrected Total	9653.389	299				

a. R Squared = .298 (Adjusted R Squared = .281)

Table 6 showed that the interaction effect of concept mapping strategy and sex on students' achievement yielded $F(2, 294) = 11.226, p = .000$ which is significant at 0.05 alpha level. The result further revealed that the treatment accounted for 7.1% of the observed variance in students' achievement. Therefore, the null hypothesis was rejected. This means that there is a significant interaction effect of concept mapping strategy and sex on students' achievement in Social Studies concepts in secondary schools in Delta State.

Hypothesis Four

There is no significant interaction effect of concept mapping strategy and sex on students' attitude towards Social Studies concepts in secondary schools in Delta State.

Table 7: Mean and Standard Deviation of Interaction of Concept Mapping Strategy and Sex on Students' Posttest Attitude Scores

Instructional Strategy	Sex	N	Posttest Mean	SD
Concept Mapping	Male	74	65.48	4.76
	Female	76	66.95	4.28
Conventional	Male	73	56.74	5.11
	Female	77	57.52	4.83

Table 7 revealed the mean and standard deviation of interaction effect of concept mapping strategy and sex on students' attitude towards Social Studies concepts. The result indicated that students exposed to concept mapping strategy obtained higher attitude mean scores among both male and female students than students exposed to the conventional instructional method. To determine whether the observed interaction effect was statistically significant, ANCOVA statistics was used as presented in Table 8.

Table 8: Analysis of Covariance (ANCOVA) Showing Interaction Effect of Concept Mapping Strategy and Sex on Students' Attitude

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1936.508a	5	387.302	14.962	.000	.243
Intercept	68426.317	1	68426.317	2643.218	.000	.900
Strategy	928.214	1	928.214	35.839	.000	.109
Sex	8.305	1	8.305	.321	.572	.001
Strategy*Sex	442.605	2	221.303	8.545	.000	.055
Error	7610.426	294	25.886			
Total	152400.000	300				
Corrected Total	9546.934	299				



Impacts of Concept Mapping Strategy on Achievement and Attitude in ... Onyekpe, S. J. (2026)

a. R Squared = .243 (Adjusted R Squared = .226)

Table 8 showed that the interaction effect of concept mapping strategy and sex on students' attitude yielded $F(2, 294) = 8.545$, $p = .000$ which is significant at 0.05 alpha level. The result also revealed that the treatment accounted for 5.5% of the observed variance in students' attitude. Therefore, the null hypothesis was rejected. This implies that there is a significant interaction effect of concept mapping strategy and sex on students' attitude towards Social Studies concepts in secondary schools in Delta State.

Discussion of Findings

The findings of this study revealed that there is a significant difference between the pretest and posttest mean achievement scores of students taught Social Studies concepts using concept mapping strategy and those taught using conventional instructional methods in secondary schools in Delta State. Students exposed to the concept mapping strategy recorded higher achievement mean gain scores than those taught using the conventional instructional method. This implies that concept mapping strategy enhanced students' understanding and academic achievement in Social Studies concepts more effectively than the conventional teacher-centred instructional method. The finding is in agreement with Izuakor, Bibian, and Ukonze (2026), who reported that concept mapping instructional strategy significantly improved students' achievement scores when compared with conventional learning strategies because it promotes meaningful learning and better organization of concepts. Similarly, Shetty et al. (2026) found that concept mapping enhanced students' academic performance by encouraging active learning, critical thinking, and effective linkage of concepts during classroom instruction. However, the finding disagrees with Tungkup and Napitupulu (2026), who argued that although mind mapping improves learning outcomes, its effectiveness may depend on students' level of participation and the teacher's competence in implementing the strategy effectively. The study further revealed that there is a significant difference between the pretest and posttest mean attitude scores of students taught Social Studies concepts using concept mapping strategy and those taught using conventional instructional methods in secondary schools in Delta State. Students taught using concept mapping strategy developed more positive attitudes towards Social Studies concepts than those taught using the conventional instructional method. This suggests that concept mapping strategy stimulates students' interest, participation, and favourable disposition towards learning Social Studies concepts. The finding supports Chiu and Hwang (2026), who observed that mind-mapping instructional approaches improve students' creative and critical thinking abilities and also increase students' motivation and positive attitudes toward learning. In the same vein, Azizah, Aqil, and Zulnuraini et al. (2026) reported that students exposed to mind-mapping instructional approaches demonstrated greater classroom engagement and positive learning attitudes because the strategy made learning more interactive and learner-centred. Conversely, Al-Jarf (2026) maintained that although mind mapping promotes positive attitudes towards learning, its effectiveness may vary depending on classroom environment, instructional materials, and students' readiness to participate actively in learning activities.

The findings also revealed that there is a significant interaction effect of concept mapping strategy and sex on students' achievement in Social Studies concepts in secondary schools in Delta State. This indicates that the effectiveness of concept mapping strategy on students' academic achievement was influenced by students' sex. Both male and female students exposed to concept mapping strategy recorded higher posttest achievement mean scores than those taught using the conventional instructional method. The finding agrees with Abdulrahim, Shehu, and colleagues (2026), who found that concept mapping instructional strategy significantly enhanced students' academic achievement across gender categories because it encourages meaningful learning and conceptual linkage among learners. Likewise, Akpobroka and Idehen (2026) reported that innovative instructional strategies such as concept mapping and cooperative learning significantly improved students' academic achievement irrespective of gender differences. However, the finding contrasts with Ofuonyebuzor, Eraikhuemen, and colleagues (2026), who argued that instructional effectiveness may not necessarily depend on gender but rather on the suitability of the instructional approach and the learning environment provided for students. The study further found that there is a significant interaction effect of concept mapping strategy and sex on students' attitude towards Social Studies concepts in secondary schools in Delta State. This implies that students' attitudes towards Social Studies concepts under the concept mapping strategy varied according to sex. Both male and female students exposed to concept mapping strategy demonstrated more positive attitudes towards Social Studies concepts than students



Impacts of Concept Mapping Strategy on Achievement and Attitude in ... Onyekpe, S. J. (2026)

taught using the conventional instructional method. The finding aligns with Monday and Patrick (2026), who stated that concept mapping and conceptual modelling strategies significantly improved students' attitudes towards learning because the approaches helped learners focus on central ideas and actively participate in classroom activities. Similarly, Oyovwi and Chukwuka (2026) reported that activity-oriented instructional approaches such as mind mapping positively influenced students' attitudes and academic achievement because they encouraged active engagement and collaborative learning. In contrast, Moemeke and Mughele (2026) argued that gender may not significantly influence students' attitudes where instructional strategies are effectively implemented and supported with adequate learning resources.

Conclusion

The study concluded that concept mapping strategy significantly improved students' achievement and attitude towards Social Studies concepts in secondary schools in Delta State when compared with the conventional instructional method. Students exposed to the concept mapping strategy recorded higher posttest mean achievement and attitude scores, indicating that concept mapping is more effective in enhancing students' understanding, participation, and positive disposition towards learning Social Studies concepts. The findings further revealed that concept mapping strategy promotes active learning, critical thinking, meaningful organization of ideas, and effective classroom interaction, which contributed to improved academic achievement and favourable attitudes among students. The study also concluded that there were significant interaction effects of concept mapping strategy and sex on students' achievement and attitude towards Social Studies concepts. This implies that the effectiveness of the instructional strategy varied across male and female students. However, both male and female students taught using the concept mapping strategy consistently achieved better academic performance and developed more positive attitudes towards Social Studies concepts than those taught using the conventional instructional method. The findings therefore emphasized the importance of learner-centred and activity-oriented instructional approaches in improving the teaching and learning of Social Studies in secondary schools in Delta State.

Recommendations

Based on the findings of this study, the following recommendations are made:

1. Secondary school teachers should adopt concept mapping strategy in the teaching of Social Studies concepts because it significantly improves students' academic achievement among both male and female students.
2. Teachers should ensure that concept mapping instructional activities are designed to actively involve both male and female students in classroom learning in order to enhance equal participation and improved learning outcomes.
3. School administrators and education stakeholders should organize seminars, workshops, and professional training programmes for teachers on the effective use of concept mapping strategy for teaching Social Studies concepts across gender categories.
4. Curriculum planners and the Ministry of Education should incorporate concept mapping strategy into the recommended instructional approaches for teaching Social Studies in secondary schools because of its effectiveness in improving students' achievement and attitudes irrespective of sex.

References

- Agada-Adeleye, A. I., Bello, T. A., & Yusuf, M. O. (2025). Effect of concept mapping on federal colleges of education students' academic achievement in cell biology in Southwest Nigeria. *Journal of Educational Research and Development*, 12(1), 71–85.
- Akpobroka, B. I., & Idehen, F. O. (2026). Effect of cooperative learning and peer teaching strategies on senior secondary school students' academic achievement of geometrical concepts in mathematics. *Integral Research*, 12(2), 44–58.
- Al-Jarf, R. (2026). Effectiveness of mind-mapping on multiple English language skills in the Saudi context: A systematic review. *Frontiers in English Language and Linguistics*, 3(1), 1–10. <https://doi.org/10.32996/fell.2026.3.1.1>
- Awoyale, O. O., & Olajide, S. O. (2025). Effectiveness of flow-map and jigsaw instructional strategies on junior secondary school students' learning outcomes in basic science and technology in Ile-Ife, Osun State. *International Journal of Contemporary Issues in Education*, 6(2), 90–108.
- Azizah, S., Aqil, M., Zulfuraini, Z., et al. (2026). Enhancing reading comprehension through mind mapping: A classroom action research study with fifth-grade elementary students. *Journal of Education and Research*, 8(1), 23–35.



Impacts of Concept Mapping Strategy on Achievement and Attitude in ... Onyekpe, S. J. (2026)

- Chiu, M. C., & Hwang, G. J. (2026). Enhancing student creative and critical thinking in generative AI-empowered creation: A mind-mapping approach. *Interactive Learning Environments*, 34(2), 869–890. <https://doi.org/10.1080/10494820.2025.2511244>
- Hassan, S., Francis, T. T., & Sadiq, K. (2025). Effect of concept-mapping instructional strategy on academic performance in biology among secondary school students in Nigeria. *FUD Journal of Educational Research*, 5(1), 54–69.
- Ibrahim, B., & Tukur, T. (2025). Mind-mapping teaching strategy on building trade students' academic performance and retention in government technical colleges of Borno State, Nigeria. *Journal of Industrial Technology and Educational Studies*, 7(2), 101–118.
- Ikoroha, A. G. (2025). Enhancing students' achievement in challenging biology topics through concept mapping: A case study in Nsukka Local Government Area. *Journal of Science Education Research*, 14(2), 55–69.
- Izuakor, C. F., Bibian, O. N., & Ukonze, J. (2026). Effect of utilization of systems thinking learning strategies on students' achievement in agricultural ecology in secondary schools in Anambra State, Nigeria. *International Journal of Multidisciplinary Current Research*, 14(1), 15–27.
- Kissock, C. (2018). *Curriculum planning for Social Studies teaching* (3rd ed.). Wiley Publishers.
- Lawani, E. (2025). Effects of two modes of digital storytelling instructional strategies on pupils' achievement and attitude towards Social Studies in Osogbo, Osun State, Nigeria. *International Journal of Social Studies Education*, 10(1), 77–91.
- Maikano, S. P. D., & Simon, K. (2025). Comparative effects of jigsaw and concept-mapping pedagogies on students' achievement in biology in Taraba State, Nigeria. *BW Academic Journal*, 4(2), 61–79.
- Mezieobi, K. A. (2016). *Social Studies in Nigeria: Teaching methods and perspectives* (2nd ed.). Acadapeak Publishers.
- Moemeke, C. D., & Mughele, E. S. (2026). Effectiveness of digital assessment in measuring science learning outcomes in HEIs in Nigeria: A case study of the University of Delta, Agbor. *Research Square*, 1(1), 1–14.
- Monday, O., & Patrick, O. A. (2026). Effects of conceptual modelling and the lecture method on chemistry students' achievement and attitude. *SEAHI Publications Journal*, 6(2), 55–68.
- Ofuonyebuzor, P. A., Eraikhuemen, L., et al. (2026). Effect of blended learning approach on students' academic achievement in mathematics in Delta North Senatorial District of Delta State. *Advances in Law and Educational Studies*, 5(1), 71–84.
- Ogar, M. E., Uwa, I. N., Ekpo, E. B., & Ogar, J. O. (2025). Effect of concept mapping teaching strategy and school location on students' academic achievement in biology in Ikom Education Zone. *STEM Journal of Contemporary Education Research*, 7(1), 31–47.
- Omosor, M. R., & Andrew, E. (2025). Comparative effects of concept mapping and lecture instructional methods on students' academic achievement and retention in chemistry. *Jigawa Journal of Educational Research*, 5(1), 112–126.
- Oyovwi, E. O., & Chukwuka, R. E. (2026). Activity oriented teaching: Efficacy of vee diagrams and mind-maps on biology scholars' attitudes and academic achievement. *Journal of Education and Learning*, 9(2), 102–116.
- Shetty, P. K., Dindalkoppa, M., Rao, S. S., Pilli, G. S., et al. (2026). Effectiveness of case-based collaborative learning in pathology through panel discussion using concept mapping: A quasi-experimental crossover study in phase II MBBS students. *BMC Medical Education*, 26(1), 1–12.
- Tungkup, M. K. L., & Napitupulu, S. (2026). The effect of mind mapping on students' ability in writing descriptive texts at grade VII of SMP Swasta Cinta Rakyat 3 Pematangsiantar. *Jurnal Ilmu Pendidikan dan Sosial*, 4(1), 33–45.
- Wokocho, G., & Harcourt, R. P. (2025). Effects of concept mapping instruction approach on students' achievement in biology. *Social Science and Humanities Journal*, 9(2), 93–108.



Psychosocial Perceptions of Female Students' Leadership Roles in ... Adika, L. O. (2026)

Psychosocial Perceptions of Female Students' Leadership Roles in Emmanuel Alayande University of Education, Oyo State, Nigeria

ADIKA, Lawrence Olagoke

lawadika@gmail.com/adikalo@cauedoyo.edu.ng

234-803-3943-982

Department of Special Education & Guidance Counselling, Emmanuel Alayande University of Education, Oyo.

Abstract

The study investigated some psychosocial factors in Emmanuel Alayande University of Education female students' leadership roles. The descriptive Survey design was adopted for the study with a sample of one hundred and fifty participants, randomly selected from the five faculties in the university. Three null hypotheses were tested at 0.05 margin level with a degree of freedom 148. The t-test statistical method was adopted for the analysis. The findings revealed that no significant differences existed in the leadership roles of the university female students based on parental educational background ($1.96 > 0.24$); family type (polygamy and monogamy) ($1.96 > 0.52$); and religion ($1.96 > 0.23$). Based on the findings, conclusions were drawn and recommendations made.

Keywords: Leadership, psycho-social, perception

Introduction

The hope of any society or group lies on its leadership. Leaders who have succeeded in the art are those who have vision; those who know the goals of the group and how to achieve them; those who know where they are going and also know how to get there by influencing other group members to get to their destination. From time immemorial, the ratio of females in leadership (at whatever level) is relatively low compared to their male counterparts (Miller & Kraul, 2004). Female gender remains underrepresented within public, corporate, and private organizational leadership positions (Emmerik, Wendt, & Euwema, 2010). Leadership is said to require a lot of time, energy, intelligence, economic power, a stable psychological being and a lot of other qualities. The low level of female participation in leadership may be as a result of lack of these needed attributes. Socially, any lady that takes part in politics is regarded as abnormal. The society used to treat them as men because their behaviour and activities often negate the socially accepted norms and beliefs about women. Men even went to the extent of calling them names like witches harlots and bastards. This has most of the times led to their withdrawn attitudes to taking leadership roles in the society. Campus politics requires that the individual be economically viable, stable and buoyant. It should be noted that without a sound economic standing, politics could be so uninteresting and frustrating. Some other factors that help in taking one leadership role or the other is the individual's psychological state of being, how composed she is while facing a crowd, how stable she is emotionally, how well she could cope with stressful situations, how tolerant she is, how fluent she speaks, her ability to convince her followers and so on.

Despite the cry for women and females involvement in crucial leadership roles, Aremu and Hammed (1998) noted that the fact still remains that there seems to be more noise than action on the issue. Male dominance in leadership positions (campus leadership inclusive) has been notable in all sphere of government; where men have clearly over-shadowed women in power and in number. For example, in the Nigeria's 10 National Assembly (2023-2027), female representation is historically low, with only 20 women out of 469 members. That is approximately 4.2%. This consists of 4 female senators out of 109 in the Senate, and 16 female members out of 360 in the House of Representatives. Women hold less than 5% of national legislative. The low numbers have prompted the introduction of the Special Seats Bill, aimed at creating 37 additional seats for women in the National Assembly to improve inclusion. In Emmanuel Alayande University of Education, Oyo in student unionism, out of the thirteen (13) union leaders, four (4) of them are females. That is a percentage of 30.77. In recent years, this seems to be the highest percentage. In fact, in most cases, the number of female student union officers in a particular session is either one or two out of about 13 executive members. Rarely in traditional society were women able to hold political office, because they were considered too weak and emotional to exercise responsible leadership (Hodges, 2001). Makhubu (1998) noted that the poor participation of women in higher education (both as students and academics) might be linked to the traditional social attitudes regarding the role of women. The argument that most women are socialized to believe that leadership is a man's game, leads to the conclusion that participation of females will remain lower than that of men in that females lack that ambition to seek leadership offices.



Psychosocial Perceptions of Female Students' Leadership Roles in ... Adika, L. O. (2026)

The first explanation for not running for leadership roles according to Miller and Kraus (2004) is that they are not interested in government or politics, but more interested in "female things". Sapiro and Farah (1980) claim that women's family responsibilities have been found to affect their political ambition and the kinds of political activism they pursue. However, this particular explanation for women's lack of participation should not apply to most college-age females. It could be argued that post socialization, away from government and leadership interests, and toward more feminine interests like nurturing and caring types of activities could contribute to lack of female political participation. It is possible that college women are involved in other students' activities that better reflect women's interest, volunteer activities, for example. Also, women might not contemplate running for student union government because they do not have career plans that involve politics. It is true that students are more likely to participate in student activities that are related to their academic major or future career plans (McCannon and Benett, 1996). So having strong academic programmes that women are most likely to major in might decrease the number of women participating in campus politics because those programmes have other student organizations in which women get involved. However, participation in campus governance does not just offer important experience for students interested in political careers. Participation in campus governance is linked to desirable outcomes for individual students as well as to positive contributions to the welfare of the campus community (Kuh & Lund, 1994). Specifically, students gained organizational, planning, managing and decision making skills from their experience in student union government. They were able to put to use ideas and methods they learned in their classes. Women could be missing out on valuable experience useful in any career. Secondly, student union government might not be addressing women's concerns. Lavant and Terrell (1994) claimed that the type of student organization students participate in depends on their ethnic backgrounds, and the same might be true for women. Women might be more involved in student organizations that address their concerns. It is possible that women are not interested in student governance because it rarely addresses issues of concerns to women. Of course one way to make a government to address one's concern is to participate in it. A third explanation for women not running for office is that they do not believe they have the qualifications. This could be a result of lack of leadership role models. If women do not see other women in such positions of power, they might not perceive themselves as having the necessary skills. So having more women in leadership roles should increase the likelihood of women running for office. Additionally, Women might be more likely to encourage other women to run. Having a faculty advisor who goes out of her or his way to encourage women to run for office could reinforce the idea that women are qualified for leadership roles.

In the past two decades, researchers have explicated ways in which Social factors such as gender bias (Ayman, 1993), gender roles stereotypes, and sexist promotional practice have contributed to the under-representation of women in management roles (Astin & Leland, 1991; Buttner, 2001; More & Buttner, 1997; Payne, Fuqua, & Canegami, 1997; Swanson, 2000). For example, researchers have found that due to disparity in domestic responsibilities, women do not have time to pursue leadership roles (Crawford & Unger, 2000). Because women occupy a higher percentage of lower status position, their leadership potential is less visible. Women are also less integrated into dominant organizational coalitions, which decrease their chances of being selected for leadership positions (Bass, 1985). In addition, because women are perceived as having less leadership potential than men (e.g., Payne et al, 1997) or as being excessively "nice", they are not as readily considered for leadership & Miller, 2000). Some studies have attempted to address the question of which psychological variables influence or predict college women's leadership aspirations (Kreuzer, 1992: & Boatwright, 2003). The study by Kreuzer suggests that gender role, defined as 'a set of behaviours, attitudes, and motivations culturally associated with sex' (Davidson and Gordon, 1979), may be a significant explanatory variable.

Objectives of The Study

The present study sought to find out the perceived leadership roles of female students in Emmanuel Alayande University of Education. Specifically, the study sought to provide answers to the following questions:

1. To what extent do female students from both educated and non-educated backgrounds perceive their leadership roles?
2. How do female students from monogamous and polygamous family backgrounds perceive their leadership roles?
3. What differences exist in the perceived leadership roles of Christian and Moslem female students?



Research Hypotheses

The following null hypotheses will be tested in this study:

1. There will be no significant difference in the perceived leadership roles of female students from educated and non-educated background.
2. There will be no significant difference in the perceived leadership roles of the female students from polygamous and monogamous family background.
3. There will be no significant difference in the perceived leadership roles of Christian and Muslim female students.

Research Methodology

Research Design

The descriptive survey design was employed in this study. This is deemed suitable because it enables a researcher to obtain the opinions of representative sample of target population so as to generalize on the entire population.

Validity of Instrument

Validity of an instrument describes the extent to which a measuring instrument measures exactly what it is supposed to measures (Hassan, 1995). To establish the validity of Female leadership Personality Factors Scale (FLPFS), the test items were subjected to vetting by experts in the field. Thereafter, some of the items were deleted, while some were added following the experts' suggestions. This ensured both the face and content validity of the instrument.

Reliability of Instrument

A test re-test reliability procedure was carried out using about 50 female students from Emmanuel Alayande University of Education two weeks after the first administration. The two scores were correlated using Pearson's Product Moment Correlation co-efficient formula. The correlation found to be 0.72, which was satisfactory for its reliability.

Sample

The sample consisted of one hundred and fifty female students with the use of simple random sampling technique. The researcher used simple random sampling to select the participants of the study from the five faculties in the university. Thirty female students were randomly sampled in each of the schools (science, Arts and Social Sciences, Education, Languages and Vocational and Technical education). In all, one hundred and fifty participants took part in the study.

Instrumentation

The instrument used for this study is mainly a self-designed questionnaire tagged Female Leadership Personality' Factors Scale (FLPFS). The instrument comprises of two sections. Section A is the demographic aspect that asked for the personal data of subjects without requesting for their names. Section B contains twenty-five (25) items, which deal with some factors in female students' leadership roles. This section is in conformity with likert type wherein subjects were expected to give their responses on the basis of their agreement with each statement on a five-point scale.

Procedure

The researcher was personally involved in the distribution and administration of the instrument. The researcher went to the five schools within the college and sampled thirty (30) female students each from each of the schools. He took time to explain every aspect of the questionnaire. He then gave the respondents some time to respond to the instrument. He then retrieved the questionnaires and crosschecked if they were correctly filled. The questionnaires not correctly filled were rendered invalid, while the remaining one hundred and fifty were used for the analysis.

Data Analysis

The measuring instrument was scored on five points Likert scale with the range of agreement. Therefore, the t-test statistical method was used to analyse the data collected at 0.05 level of significance.

Presentation of Results

Three hypotheses were stated for this study. The results of the study are tested with the t-test statistical method at 0.05 level of significance. The results are hereby presented hypothesis by hypothesis.

Hypothesis One: This hypothesis stated "there will be no significant difference in the leadership roles of female students from educated and non-educated background.

Psychosocial Perceptions of Female Students' Leadership Roles in ... Adika, L. O. (2026)

Table 1: Mean difference in female students' perceived leadership role of students from educated and non-educated background.

Variable	N	X	SD	Df	t-cal	t-tab	Sig. Level	P
Educate Background	123	79.04	11.9	148	0.24	1.96	0.05	Accepted
Non-Educated background	27	79.7	13.7					

Table 1 shows the data collected from 150 respondents on female leadership. The data collected shows 123 respondents from educated background and 27 from non-educated backgrounds.

The mean and Standard Deviation (x and SD) of those from educated background are 79.04 and 11.9 respectively while that of the non-educated ones is 79.7 and 13.7 respectively. The t-test was applied in the analysis and the t-calculated was 0.24 while the t-observed Value is 1.96, with the degree of freedom 148 and calculated at 0.05 level of significance. The t-observed is greater than the t-calculated; hence the null hypothesis was accepted.

Hypothesis Two: This hypothesis predicted that there would be no significant difference in the perceived leadership roles of female students from polygamous and monogamous backgrounds.

Table 2: Mean difference in leadership roles of female students from polygamous and monogamous background

Variable	N	X	SD	Df	t-cal	t-tab	Sig. Level	P
Polygamous	48	78.33	10.6	148	0.52	1.96	0.05	Accepted
Monogamous	102	79.4	12.7					

From the data collected, the mean and Standard Deviation (X and SD) of those from polygamous backgrounds were 78.3 and 10.6 while that of monogamous background were 79.4 and 12.7 respectively. The t-test method was used in analysing the data. The calculated value was 0.5 while the observed value was 1.96, with the degree of freedom of 148 and 0.05 level of significance. The null hypothesis was therefore accepted.

Hypothesis Three: There would be no significant difference in the perceived leadership roles of Christian and Muslim female students.

Table 3: Mean difference in leadership roles of Christian and Muslim female students.

Variable	N	X	SD	Df	t-cal	t-tab	Sig. Level	P
Christian	82	78.9	12.5	148	0.23	1	0.05	Accepted
Monogamous	66	79.22	11.7					

From the data collected, the mean and Standard Deviation of respondents from Christian backgrounds is 78.9 and 12.5 respectively, while those from Muslim background are 79.22 and 11.7 respectively with 148 degree of freedom and 0.05 level of significance.

From the result, it could be deduced that the t-calculated value is lesser than the t-observed ($0.2 < 1.96$). The null hypothesis is thereby accepted.

Discussion of Findings

The first hypothesis stated that there would be no significant difference in the perceived leadership roles of female students from educated and non- educated backgrounds. The t-test comparison of mean (x) and Standard Deviation (SD) of female students' leadership disposition from educated and non-educated backgrounds (Table 1) indicates that the null hypothesis was upheld. This result could be explained in a way that the academic setting brings together people from various backgrounds and this becomes a "leveler" to all, wherein everyone is exposed to the same instruction and materials and thus have equal opportunities. In a study of females in politics, Miller and Kraus (2004) found that education increased the disagreement that women are not suited for campus politics. Eighty percent of individuals with junior college or Bachelor's degrees did not hold such sexist beliefs about women's abilities in politics. The finding of this research can also be explained in the ways that in campus politics, the issue of class is neglected and people vote for personalities rather than influence. Most people from non-educated backgrounds look more 'radical' on campus than those with educated backgrounds, who most of the time look more decent and regard politics as a 'dirty' game. In a research carried out by Alao (1983), he found that 46% of his interviewees (who are female politicians) were from educated families while about 54% were from non-educated backgrounds. According to Alao (1983) therefore, coming from a literate family background is shown to be of less importance in motivating one into active leadership role. Hypothesis two compared female students' family background. It was accepted that there was no significant difference in the leadership dispositions of those from



Psychosocial Perceptions of Female Students' Leadership Roles in ... Adika, L. O. (2026)

polygamous and monogamous backgrounds. Olayinka (1980) however noted that better educated and upward mobile individuals (with careers carefully and appropriately chosen) are likely to come from small families where children receive more attention, greater encouragement and interaction between parents and children is more. In the third hypothesis, it was found that no significant difference existed in the perceived leadership roles of Muslim and Christian female students. This by implications means both Christian and Muslim female students have the same disposition towards campus politics. This result is not out of place as both religions preach and uphold peace, as a vital need of our society and therefore, for our society to know peace, people must participate in leadership.

Conclusion

Leadership is a process of influence. Any would-be leader must therefore be economically buoyant, emotionally stable and possess certain interpersonal skills. The findings of this study revealed that there was no significant difference in the perceived leadership roles of female students from educated and non-educated background and Christian and Muslims female students.

Recommendations

In line with the findings of this study, the followings are recommended:

1. The university management can make social policies to ensure female students' successful participation in student unionism.
2. Female students should be adequately mobilized to participate actively in student government.
3. The consciousness of everyone needs to be raised concerning gender inequality and the need for a change.
4. Certain percentage of positions in student union government can be earmarked for female students.
5. Female students should be assigned responsibilities in smaller groups like the department and at faculty levels.

References

- Alao, A. (1983). Analysis of women participation in Nigerian politics: Case Study of selected women. An unpublished long essay in the Department of Political Science, University of Ibadan.
- Aremu, S. & Hammed, A (1998) Relationship of career and family pressure with marital satisfaction of women managers in Oyo state. *Journal of Research in Educational Administration and Planning*, 1(1).
- Astin, H. S., & Leland, C. (1991). Women of influence, women of vision. San Francisco: Jossey-Bass.
- Ayman, R. (1993). Leadership perception: The role of gender and culture. In R. Ayman & M. Chemers (Eds), *Leadership Theory and Research: Perspectives and Directions*, 137-166. San Diego, CA: Academic Press.
- Bass, B. (1985). Leadership and performance beyond a expectations. New York: Free Press.
- Boatwright, K. (2003). Psychological predictors of college women leadership aspirations. *Journal of College Student Development*, 44(5).
- Buttner, E. H. (2001). Examining female entrepreneurs' management style: An application of relational frame. *Journal of Business Ethics*, 29, 253-269.
- Chafins, S., Forbes, M., Fugua, H., & Cangemi, J.P. (1995). The glass ceiling: Are women where they should be? *Education*, 155, 380-385.
- Crawford, M., & Unger, R (2000). Women and gender: A Feminist Psychology. Boston: McGraw Hill.
- Davidson, L., & Gordon, L.K. (1979). The sociology of gender. Chicago: Rand McNally.
- Emmerik, V.; Wendt, H. & Euwema, M. (2009) Gender ratio, societal culture, and male and female leadership. *Journal of Occupational and Organizational Psychology*, 82(4).
- Fletcher, J.K., Joardan, J.V., & Miller, J.B. (2000). Women and the workplace: Applications of a psychodynamic theory. *The American Journal of Psychoanalysis*, 60, 243-261.
- Hassan, T (1995). Understanding research in Education, Lagos: Merrifield Publishing Company.
- Hodges, A. (2001) (ed) Children's and Women's Rights in Nigeria: A wake-up Call. UNICEF, Nigeria.
- Kreuzer, B.K. (1992). Womern and leadership: The effect of gender, gender-role orientation, socioeconomic status, and parental influence on women's aspirations to leadership roles. (Doctoral dissertation,
- Kuh, George D. and Jon P. Lund. (1994). "What Students Gain from Participating in Student Government". New Directions for student Services. Number 66/Summer 5-17
- Lavant, Brue, D. and Melin C. Terrel (1994). Assessing ethnic minority student leadership and involvement in student governance. *New Directions for student Service*. Number 66/Summer/59-71
- Makhubu, L. P. (1998). The right to higher education and equal (Ed). *Higher Education in Africa: Achievement, Challenges and Prospects*. Dakar: UNESCO BREDA.



Psychosocial Perceptions of Female Students' Leadership Roles in ... Adika, L. O. (2026)

McCannon, Melinda & Phyllis Bennett (1996). Choosing Participate or Not: A study of College Student Organizations
College Student Journal, 30: 3:312-316.

Milr, C. and Kraul, M. (2004) participating but not leading: women's under-representation in student government leadership
positions College Student Journal, Sept, 2004.

Moore, D. P., Buttner, E.H. (1997). *Women entrepreneurs: Moving beyond the glass ceiling*. London: Sage.

Payne, K.; Fugua, H. and Canegami, J (1997). Women as Leaders. *Journal of Leadership Studies*, 4, 44 - 62

Sapiro, V and Farah, B. (1980)"New Pride, Old Prejudice: Political Ambition and Role Orientations among Female Partisan
Elites". *Women and Politics*, 1, 13-36.

Savery, L. (1990) Men and Women in the workplace: Evidence of Occupational differences. *Leadership and
Organizational Development Journal*, 11, 13 -16.

Swanson, N. G. (2000) Working Women and Stress. *Journal or the American Medical Women's Association*, 55, 76-79.

Western Michigan University, 1992). *Dissertation Abstracts International*, 53, 4495.



Qualitative Study on Historical Development of Islam and ... Salihu, I. S. (2026)

Qualitative Study on Historical Development of Islam and Challenges of Da'wah in Igalaland of Kogi State, Nigeria

SALIHU, Imam Shittu

salihushittuimam72@gmail.com

08036553583

Department of Islamic Studies, Yusuf Maitama Sule, Federal University of Education, Kano State, Nigeria

Abstract

Historical evidences available confirmed the existence of Islam in Igalaland before the popular 1804 Jihad of Sheikh Usman Ibn Fodio. Sometimes, 1449 C.E and 17th Century were alternatively given as the date of the emergence of Islam in Igalaland. For the purpose of proper development of Islam and its activities in the area of study, Da'wah activities were emphasized and given necessary attention. From the beginning, Islam attached great importance to Da'wah activities. This is demonstrated in the objective of sending messengers by Almighty Allah. Reformation of polluted society as in the present-day Muslim world Igalaland inclusive can only be revived through Da'wah activities. It is in view of this situation that, this paper, Historical development of Islam and the challenges of Da'wah in Igalaland is written. The essence is to trace the emergence of Islam in the area and find out the challenges facing Da'wah in Igalaland and find solution to them. The subtopics discussed in this paper include, Historical development of Islam in Igalaland, the concept of Da'wah, methodologies of Da'wah in Igalaland and challenges facing Da'wah in Igalaland. Library, interview and observation methodologies were used in the process of writing the papers. Lot of discoveries was made in the process of writing this paper and one of these discoveries is that, there is heavy divisions and conflicts among various group of Muslims in Igalaland. Amongst the recommendations made by this paper is that leaders of Muslim groups should stop instigating their groups against one another and other Muslims.

Keywords: Da'wah, Igalaland, Challenges, Reformation, Development

Introduction

The emergence of Islam in Igalaland witnessed the beginning of *Da'wah* activities in the area. Muslim scholars that took Islam to the area started the work with proper development and expansion/spread of Islam and its education in the area. The work of *Da'wah* was and is still being jointly carried out among emigrant and indigenous scholars. The efforts of these scholars were always dominated with challenges from the beginning of Islam in the area. Although efforts are regularly made by the scholars to overcome these challenges through *Da'wah* agencies but the problems are yet to be finally eliminated. This paper therefore examines *Da'wah* in Igalaland, its challenges and the way out. Propagation of Islam right from inception depends solely on *Da'wah*. The messengers sent to the world by Almighty Allah from time to time to different generations were mandated to propagate Islam through *Da'wah*. This therefore means that, *Da'wah* is a symbol of Islam and its significance cannot be over emphasized. The strategies and methodologies of the prophets in making *Da'wah* in Islam are relevant to the propagation of Islam at all times. The exemplary life of the prophets in making *Da'wah* *lillah* (call to Allah) should be imitated by any Muslim willing to make *Da'wah* in Islam. *Da'wah* is expected to be carried out without recourse to any condition or benefit except reward from Almighty Allah. This is a direct call to the Muslims that, the objectives of their involvement in *Da'wah* is purely the progress of Islam and the attainment of the pleasure of Almighty Allah in both worlds.

Historical Development of Islam in Igalaland

The emergence of *Islam* in Igalaland and the beginning of *Da'wah* in the area started concurrently. Different dates and time were given by historians regarding the introduction of Islam in Igalaland. For example Adegbe (2006) mentioned that, Islam was in Igalaland as early as 1449 A.D. He said that: Prior to the ascension of Attah Ayegba Omidoko to the throne of Attah Igalaland in 1449 A.D, some Muslim traders and a handful of itinerant Muslim scholars in search of fertile lands for the propagation of Islam were found in major towns in the Kingdom (Adegbe, 2006). The above assertion indicates the presence of Islam and *Da'wah* activities in Igalaland for a very long time before 15th century C.E. This means that, Islam was in Igalaland for over two centuries before the historic Jihad of Sheikh Uthman Ibn Fodio in 1804 C.E. While making reference to some oral traditions narrated by some prominent Igalas, Muhammad (2014) confirmed 17th century C.E. as the date of the arrival of Islam in Igalaland. He affirmed that: The firmly established tradition of Islamic penetration into Igalaland came with the Jukun – Igalaland war of independence under Attah Ayegba Omidoko towards the close of the 17th



Qualitative Study on Historical Development of Islam and ... Salihu, I. S. (2026)

century (Muhammad, 2014). However, it is important to note here that, the quest for supremacy by the Jukun traditional leadership over the Igala rulers and the resistance displayed by the Igala traditional rulers played a significant role in the emergence of Islam and *Da'wah* in Igalaland. The Jukun were politically very influential around the confluence region. They were said to have reduced the Igala kingdom to a vassalage up to about the end of the 17th century when Attah Ayegba Omidoko reportedly wrestled Igala's independence from them (Muhammad, 2014). The struggle to liberate Igalaland from the control of the Jukuns did not go down well between Attah Ayegba Omidoko and the Jukuns, because, it ignited the Jukuns against the Attah Ayegba Omidoko and his people. To avoid the looming defeat and ensure a realization of a continuous existence of united Igala Kingdom, the Igala traditional leadership under Attah Ayegba Omidoko invited some Muslim clerics to Igalaland. This was the first official recognition of Islam in Igalaland and subsequently the commencement of *Da'wah* in the area. While confirming the above information regarding the emergence of Islam in Igalaland and the type of individuals that brought it, Atojoko (2004) wrote that: Attah Ayegba Omidoko's rule witnessed a conflict with the Jukun. As Ayegba was faced with imminent defeat, he sought the assistance of the Muslim preachers...

The result of the assistance rendered to the Attah of Igala by the Muslim preachers was the defeat suffered by the Jukuns in the hands of the Igalas. The *Jihad* of Sheikh Uthman Ibn Fodio in 1804 was not therefore responsible for the introduction of Islam in Igalaland but it has contributed immensely to its spread. While explaining the spread of Islam in Igalaland, Atojoko (2004) mentioned that: The Fulani Jihad of the 19th century was the main cause of the spread of Islam along Niger-Benue basin. Apart from the military contacts, other influences as trade and commerce, nomadic Muslim groups or preachers, helped to spread Islam in Jukun, Tiv, Idoma, Nupe and Igalaland. Apart from aiding the spread of Islam in Igalaland, the Jihad also assisted greatly in purifying the teachings of Islam in Igalaland. For example, Atojoko also mentioned that: It must be noted that, the type of Islam introduced into these areas was the one that, tolerated many pagan practices and was later purified by Othman Dan Fodio.

The idea that, a particular type of Islam accepts or tolerates pagan practices as mentioned in the above quotation is absurd. This is because, Islam cannot be described as a double standard religion. The general and acceptable situation in Islam is that, it is either you are a Muslim or out of Islam. However, the Jihad of 1804 by Ibn Fodio was the major means through which Islam was purified in Igalaland as rightly observed by some of the scholars above, even though the Jihad did not reach Igalaland. While tracing the effect of the Jihad on Igalaland, Muhammad (2014) asserted that, Igalaland was not directly attacked by the Jihad of Othman Ibn Fodio in 1804. He said that: Though the heart of Igalaland was never directly attacked by the Jihadists but many refugees from the war zones and elsewhere in the confluence areas especially in the Bassas flocked into the north-west and north-east of the kingdom. Even though the spread of Islam and *Da'wah* in Igalaland was mostly aided by the 1804 Jihad of Ibn Fodio as indicated in this work. There are many other factors responsible for the quick and rapid spread and development of Islam in Igalaland. Some of these factors according to Muhammad (2014) includes: The construction of road networks by the colonial administration in various parts of the colony after the First World War. This was to make the railways to connect to large centres of cash crop production and provincial headquarters. This development eased communication and the movement of people from one part of the country to another, and invariably, new ideas were thus transmitted and disseminated on a wider scale. This improvement in communication apparently facilitated the growth and expansion of Islam as Muslims exploited the availability of these networks of roads and railways to expand their religious and trading activities (Muhammad, 2014).

In the first category are the itinerant or emigrant Mallams who came in from outside the geographical zone of the Niger-Benue confluence area as traders and scholars. Some of these scholars stayed behind in Igalaland to preach and to teach the new converts the tenets and demands for their new religion, as well as lead them in prayers. A good number of them also established Qur'anic and *Ilmi* schools in which children of the converts as well as their parents were educated in the Islamic sciences. The second category of Muslim scholars were based in Lokoja, and extended their activities to many other places. This consists of the exiled Emirs from different locations in Nigeria and religious leaders. The third category of Mallams comprised the product of the educational efforts of the first two categories of Muslim scholars. Most of the scholars in this group consisted of the indigenous scholars who use the opportunity of the availability of the Muslim schools to get themselves educated. These group of scholars took over the activities of the emigrant scholars in Igalaland and worked vigorously to understand the language and methodologies of their teachers. They were able to represent their



Qualitative Study on Historical Development of Islam and ... Salihu, I. S. (2026)

teachers in many capacities as teachers of Islamic education as well leading in prayers even in the presence of their teachers before death and the departure of some of them from Igalaland. Traditional rulers have played and are still playing significant roles in the spread of Islam in Igalaland. A good example of this is the invitation of Muslim scholars into Igalaland by the Attah Ayegba Omidoko as early as 17th century C.E. Even though they were not solely invited to Igalaland for the propagation of Islam but, their presence made Islam to develop quickly among Igala nation. These scholars were given official recognition, tolerated and given freedom to teach Islam by the supreme rulers of Igalaland even though they were not Muslims.

***Da'wah* as a Concept**

Da'wah is an Arabic word and has been variously defined literally and technically by many scholars. For example, the Arabic – English Studies Dictionary of Research and Studies Centre defined *Da'wah* literally as call, appeal, invitation, request or missionary work (Dictionary of Languages and Terms, 2008). Ibn Raji (2007) in his book *Da'wah* between ideology and factionalism also defined *Da'wah* literally as call or invitation.

The literal usage of the concept of *Da'wah* is found in many verses of the Glorious Qur'an. For example Allah (SWT) says:

وَاللَّهُ يَدْعُو إِلَى دَارِ السَّلَامِ وَيَهْدِي مَنْ يَشَاءُ إِلَى صِرَاطٍ مُسْتَقِيمٍ

But Allah doth call to the home of peace, He doth guide whom He pleased to a way that is straight (Qur'an, 10:25).

The word *Da'wah* used in the above verse of the Glorious Qur'an does not denote *Da'wah* in Islam but an invitation denoting the literal usage of the concept. From the above definition, *Da'wah* as a concept in Islam can be defined as a process that involves inviting people to the way of Almighty Allah, i.e. Islam and advise Muslims on how to handle issues relating to their religious way of life. *Da'wah* can also be seen as a medium through which non-Muslims are invited to Islam and guiding Muslims on how to perfect their relationship with Almighty Allah with the aid of the Sunnah of the prophet (SAW).

Lawal (2012) in his book *Irshadatufil al-da'awatuwa-a-Du'at*, defines *Da'wah* technically as:

طلب ميل الناس إلى الخير والهدى وتحذيرهم من الشر والردى، وأمرهم بالمعروف ونهيهم عن المنكر مع بذل الجهد لهدايتهم إلى الصراط المستقيم.

A process of changing people for good and guidance and warn them to stay away from evil and destruction and guide them to do good with sincere effort that will lead them to the straight path (Author's translation, 2025).

This is one of the most comprehensive definition of *Da'wah* in Islam, because, it mention 'guidance' and 'warning' which are the major issues that has dominated the activities of the prophets of Allah (SWT) from the beginning to the end. The prophets were always directed to guide people towards Allah and to warn them against engaging in evils. Hassan (2000) in his book *Khasais al-Da'wati al-Islamiyya* quoted definitions of some prominent scholars of Islam on *Da'wah*. Some of these scholars include: Ibn Taimiyyah who defined *Da'wah* as call to Iman (faith) and what he prophets brought to us from Almighty Allah. It also includes a call to the belief in the Islamic testimonies and upholding the pillars of Islam and articles of faith, He said:

الدعوة إلى الله هي الدعوة إلى الإيمان به، وبما جاءت به رسله بتصديقهم فيما أخبروا به، وطاعتهم فيما أمروا، وذلك يتضمن الدعوة إلى الشهادتين، وإقام الصلاة وإيتاء الزكاة وصوم رمضان، وحج البيت والدعوة إلى الإيمان بالله وملائكته وكتبه ورسله والبعث بعد الموت والإيمان بالقدر خيره وشره، والدعوة إلى أن يعبد العبد ربه كأنه يراه.

A call to Allah means a call to the belief in Him and what His messengers have brought to mankind and obedience to the prophets in what they command. It also implies belief in the testimonies, observance of the *Salat* (prayers), payment of zakat, fasting *ramadhan* and *Hajj* to the holy land. It equally implies a call to the belief in Allah, Angels, Holy Books, Day of Resurrection, Belief in destiny either good or bad and a call on the servants to worship Allah (SWT) as if they are seeing Him (Author's translation, 2025).

Challenges Facing *Da'wah* Activities in Igalaland

Da'wah in Igalaland has made a lot of remarkable achievements in the area of fighting innovations in Igalaland in particular and sanitization of Islam in general. *Da'wah* activities in Igalaland is spearheaded by the Muslim scholars and Muslim youths with the aid of the Muslim organizations as well as the free hands given to them by the traditional rulers to propagate

Qualitative Study on Historical Development of Islam and ... Salihu, I. S. (2026)

Islam without any type of restrictions. Despite the efforts of the *Da'wah* agencies in Igalaland their activities are curtailed by some challenges. Some of the challenges of *Da'wah* in Igalaland outlined by Idris Imam Jibrin (2024) are outlined below:

1. Disunity among Igala Muslims: According to him Igala Muslims are heavily divided along group lines. The two popular Muslim groups which include: Tijjaniyah and Izala groups, he observed are regularly waging war of words against the activities of one another. They are always ready to attack each others act every point in time. He stated further that, *Da'wah* activities of Muslim scholars are only beneficial to the members of their group in most cases, except where similarity of opinion occur in the opinions of the scholars of the various groups. It is very hard if not impossible for members of different group to accept opinion of another, no matter how important.

This is therefore a great challenge to the Muslim *Du'at* in Igalaland. It is not a simple task for a Muslim to embark on a project with the awareness that, such a project is only accepted by few. Some people may be tempted to be discouraged from continuing with such work. A *Da'i* is therefore challenged with the task of uniting or trying to unite Muslims before embarking on the *Da'wah* activities alone. The work of *Da'i* now becomes double instead of limiting himself to the task of *Da'wah* alone. The significance attached to unity among Muslim ummah by Almighty Allah is indicated in the Glorious Qur'an where Allah (SWT) says:

وَاعْتَصِمُوا بِحَبْلِ اللَّهِ جَمِيعًا وَلَا تَفَرَّقُوا....

And hold fast, all together by the rope of which Allah (stretches out for you) and be not divided among yourselves...(Qur'an 3: 103)

One of the implications of the above Qur'anic verse in relation to *Da'wah* activities is that, so long as Muslims remain divided, impacts of *Da'wah* cannot be desirably felt.

2. Internal crisis among different *Da'wah* organizations and groups in Igalaland is another factor mentioned by the scholar. It is obvious according to him that almost every Muslim is a member of a particular group or organization. Rather than coming together and fight the common enemies of the Muslims and Islam in the area of study, reasonable time and resources he noted are wasted by the leaders of some Muslim groups or scholars and *Du'at* in fighting fellow Muslim and calling them different ridiculous names such as *mushrik*, *mubtadi'i* etc.

The aim of coming together to form the organizations and groups are defeated in most cases. The *Da'wah* activities for which most of the groups and organizations are formed never see the light of the day due to internal crisis within the groups and among some Muslims. Ustaz Abdulhadi Imam in his own part observed that, the major challenge of *Da'wah* and *Du'at* in Igalaland are:

3. Love for wealth, leadership and prevalent poverty. The love to amass wealth and the widely spread poverty among Muslim populace globally and Igalaland in particular is preventing some Muslims (both the callers and the called) from saying and accepting the truth. Some of the *Du'at* according to him do not get the necessary attention from their followers whenever they go contrary to their interest.
4. Negative societal influence and inadequate cooperation for the *Du'at* in Igalaland. Most societies in the contemporary world have little or no good recognition of the *Du'at* Igalaland inclusive. Some of the *Du'at* are not getting the necessary cooperation needed from the people to succeed in their job. Some of the people that took *Da'wah* as duty upon themselves are seen sometimes as people without job. They are neglected and not given the necessary attention and assistance commensurable to their work. These treatments according to Abdul Hadi Imam (2025) are equally meted to *Du'at* in Igalaland.
5. Ignorance on the part of the called Apathy for Islamic education and preference for western education among Muslims is posing a great challenge to the *Du'at* in the study area. Many individual among Muslims he observed are not ready to accept simple corrections for the fact that it is mostly far from their understanding. Improper understanding of civilization and modernization among Muslim populace is making it difficult for the *Du'at* to carry out proper *Da'wah* activities. These are bye-products of ignorance. According to Ibn Raji (2007), the cause of ignorance among Muslims is love for material things and shunning of Islamic religious moral values. He said that:

Today, however, the Muslims lag behind, they are the least educated. The cause of backwardness in education is the absolute dependence on materialism and shunning of religious and moral values causing thereby a great misery for the ummah in particular and the world in general.



6. Ibrahim Sulaiman (2005) mentioned slanderous propaganda against Muslim *Du'at* in the contemporary time as one of the major challenges of *Da'wah* in Igalaland in the recent time. It is a popular case in the modern time that, Muslim *Du'at* are called different slanderous names such as fundamentalists, fanatics, terrorists, and many others. Some of these scholars are scared of the implications of such titles and therefore reserved about active participation in *Da'wah* activities. This is also one of the major challenges facing *Du'at*, in the contemporary time in Igalaland.
7. Yakubu Hassan (2025) popularly known as Arif observed that, the major challenge facing *Da'wah* activities in Igalaland is that, most of the *Du'at* are not properly educated on the methodologies of *Da'wah* and even in the real Islamic education. Most of the young *Du'at* according to him are not tolerant, their activities is creating a lot of damages to Islam. Shiekh Arif is emphasizing on the use of wrong methodologies in *Da'wah* activities by the Muslim youths. Most of the youths have goodwill towards spreading the message of Islam, but the modalities involved carrying out this assignment is mostly wrong. A *Da'i* is expected to exhibit the qualities of the prophet (SAW) as earlier mentioned under the qualities of a *Da'i* in this work. If a *Da'i* is harsh in his wordings and attitude to his people as demonstrated by some of the *Du'at* among youths in Igalaland, his message may not be acceptable to many people.
8. Ustaz Abdulhadi Imam stated that, the major challenge of *Du'at* and *Da'wah* activities in Igalaland is the misconception of the words and opinions of *Du'at*. In this regard, he observed that, most of the words of *Du'at* are taking for insults and trouble making. Any attempt by a *Da'i* to say the truth according to the teachings of Islam is always misunderstood for a different issue. This situation according to him is a serious challenge for the *Du'at* in Igalaland, particularly among youths. Sometimes Muslim organizations are physically attacked (Abdulhadi, 2025). According to him, this normally happen whenever a *Da'i* preach against their misconducts. Sometimes, *Du'at* are sanctioned by the members of their communities. They will suspend any normal Muslim relationship with them, such as attending their wedding congregation as well as naming ceremonies. This constitutes a great threat to the *Du'at* and *Da'wah* activities in Igalaland. Some *Du'at* are scared and afraid of involving themselves in the proper *Da'wah* activities in the area of study for the fear of the threat and the challenges.

Conclusion

This paper has succeeded in discussing the challenges of *Da'wah* in Igalaland. The literal as well as technical meanings of the concept *Da'wah* were treated in this paper. The paper also examine the concept of *Da'wah* as obtainable in the teaching of Islam. Dimensions of *Da'wah* is changing with time due to advances in technology. It is in this regard that, the paper also explains the methodologies of *Da'wah* in the contemporary Igalaland. Challenges of *Da'i* in Igalaland, objectives of *Da'wah*, the introduction of Islam and *Da'wah* in Igalaland and prominent *Du'at* in Igalaland were also discussed in the paper. The chapter was concluded with recommendations on how to improve *Da'wah* activities among Muslims in general and Igalaland Muslims in particular.

Recommendations

The following recommendations are made in the interest of *Da'wah* among Muslims in Igalaland and the efforts of Muslim *Du'at* in general. They are as follows:

1. Igalaland Muslim groups should stop seeing themselves as enemies of one another. They should regard themselves as one since all of them are members of the same religion under the banner of *Kalimatul Shahada*.
 2. Igalaland Muslim foundation should be initiated by the Muslims so that, Muslim *Da'i* could be assisted through its effort.
 3. *Du'at* must take to the exemplary life of the prophet (SAW) if they must be successful in their *Da'wah* activities.
 4. Muslims should stop dividing or categorizing themselves into groups. They must strive to eliminate their differences and remain united. If this measure is not taken, then the impact of *Da'wah* may never be felt among Muslims.
 5. Leaders of Muslim groups should stop using *Da'wah* as a means to instigate their group against other Muslim groups. This is applicable to a situation where Muslims refuse to be united.
 6. Wealthy individuals among Muslims should be encouraged to contribute financially to the course of *Da'wah* and a board should be created to manage *Da'wah* resources.
 7. Muslim scholars should try to avoid unnecessary enmity among themselves for the purpose of worldly things.
- When these recommendations are put into use by Muslim *Du'at*, and *Da'wah* activities will progress effectively among Muslims all over the world in general and Igalaland in particular.



Qualitative Study on Historical Development of Islam and ... Salihu, I. S. (2026)

References

- Adegbe, M. An insight into the religious life of HRM Alh. Dr. Aliyu Obaje, Attah Igala and President Kogi state council of chiefs. Aridsman press ltd., lokoja, 2006.
- An interview with Sheikh Idris Imam Jibrin, a prominent scholar in Ojoku town in his residence in Ojoku town 11/01/2025, Age 53 years.
- An interview with Sheikh Yakubu Hassan popularly known as 'Arif' the deputy chief Imam of Dekina in his residence in Dekina town on the 7/01/2025, Age, 66 years.
- An interview with Ustaz Abdulhadi Imam in his residence in Enjema town on the 13/1/2025, Age, 36 year.
- An interview with Ustaz Ibrahim Sulaiman in his residence at Ajiyolo Akabe in Dekina LGA of Kogi state, 3/03/2025, Age, 38 years old.
- Atojoko, M. The Igala people of Nigeria, Bamise printing press, Lokoja, 2004.
- Hassan Muhammad, A. (2000). *Khasaisal-da'awati al-Islamiyyai*, Oman al-Dar al-amaliya al-Daliyyah for Publication and Distribution.
- IbnRaji, Abdulfattah (2007), *Da'wah between ideology and factionalism*, Lagos al-Mustagfirun Foundation, 2007.
- Lawal, AbdulRahman, *Irshadatu fi al-Da'awatuwa al-Du'at*, Kano, Dar al-Ummah Publishers, 2012.
- Muhammad, A.R. History of the spread of Islam in the Niger-Benue confluence area: Igalaland, Ebiraland and Lokoja c. 1900 – 1960, 2014, Ibadan University Press.
- The Dictionary, *General and Scientific Dictionary of Language and Terms* by Research and Studies Centre, Lebanon dar al Kotob al-Ilimiyah, 2008.
- Yusuf, Ali, Y. (1410H). *The Holy Qur'an English translation of the meaning and commentary*, Saudi Arabia, King Fahad Holy Qur'an Printing Complex al-Madinah al-Munawarah.



Effect of Learning activity Package Instructional Strategy on Retention in ... Ankeli, V. O. (2026)

Effect of Learning Activity Package on Retention in Biology Concepts among Senior Secondary School Students in Otukpo, Benue State, Nigeria

ANKELI, Victor Odeh

Email: victorodehgankeli@gmail.com

Phone: 09016210778

Department of Science Education, National Open University of Nigeria, Abuja Nigeria

Abstract

The study was designed and conducted to determine the effectiveness of the Learning Activity Package (LAP) in influencing students' retention in Senior Secondary School Biology. Two research questions and two null hypotheses were formulated. A Quasi-Experimental Pre-test, Post-test, Non-equivalent Control Group Design was adopted for the study. A sample of 317 SS II biology students, drawn by both purposive and simple random sampling techniques from four co-educational schools in Otukpo Educational Zone was used for the study. The four schools were assigned to experimental and control groups respectively. Two intact classes in each school – (one as experimental and the other one as control group) were randomly selected. The experimental and control groups were taught the biology topic (Unit of Life) by the regular biology teachers. Three instruments – Pre-BPT and Post-BPT were developed, duly validated and reliability of equivalence, internal consistency and stability duly established (0.79 and 0.83 respectively) before using them for data collection. The research questions were answered using mean and standard deviation while the hypotheses were tested at ($P < 0.05$) using analysis of covariance (ANCOVA). The result of data analysis showed that: There is a significant difference between the experimental and control group, with the mean retention scores of the LAP group being significant more than the control group, but the male students' retention test was significantly greater than those of their female counterpart. A major educational implication of the findings is that the use of LAP does not show any significant difference in the retention of male and female students. Thus the use of LAP will not only help arrest the problem of male being regarded as high achievers in science-related courses but will also encourage the female students to enroll in such courses among others.

Keywords: Learning Activity Package, Biology, Retention and Gender

Introduction

The inculcation of scientific skills and attitudes in students can only be achieved through the proper teaching of the various science subjects. These include Biology, Chemistry, Physics, Mathematics, Health Science, Agriculture, etc. Biology is a natural science with a broad scope but has several unifying themes that tie it together as a single, coherent field. For instance, all organisms are made up of cells that process hereditary information encoded in genes, which can be transmitted to future generations. Proper teaching of biology will help the students to solve personal and societal problems. The knowledge of Biology helps to question superstitions, know the function of the various parts of the body, enables one to understand oneself, maintain good health practices such as the use of clean water, good sanitation, balanced diet, the need to vaccinate, among others (Maduabum, 1998). The importance of Biology as a secondary school subject can be further illustrated by the fact that a candidate must obtain a credit pass in it, for admission into any Nigerian University to study such important science – based courses as Medicine, Pharmacy, Biochemistry, Microbiology, Food Technology, etc. Students vary in their academic abilities and this tends to be reflected in the extent to which they are affected by a particular teaching methods. For instance, Diamond and Onwuegbuzie (2001) expressed concern over the influence of different teaching methods on learning benefits of students of different ability groups, stating that differences in intellectual functioning among learners necessitate variations in instructional strategies. Research conducted by Okeke (1986), Ezech (1992) and Udeji (2017) indicated that teaching methods have differential effects on students of different academic ability levels (low, average, high levels) with one group benefiting more from a particular teaching method than the other. For instance both Eze (1992) and Udeji (2017) found out that with the various methods used, performance is significant with the high ability groups, while the findings of Okeke (1986) indicated that in as much as some students are highly gifted they do not achieve well in science this may be due to the teaching method employed which may not suit all the groups. In view of the foregoing, it might be necessary to find out the students' academic ability group (low, average / high) for which a particular teaching method will be more effective. Retention, according to Chauhan (1998), is a direct correlate of positive transfer of learning. This means that high retention may lead to high performance which is a factor of many variables such as interval between learning and retrieval, intervening experiences, specific subject involved, teaching strategies/methods used, and environmental situations, among others. Evidence from researches showed that there is no consistency on the



Effect of Learning activity Package Instructional Strategy on Retention in ... Ankelí, V. O. (2026)

variables that may lead to the students retaining more of what they have learnt. Separate studies carried out by Ndukwe (2015), Nnadi (2017) and Eze (2020) showed that there was no significant differences between the pupils mean post performance and retention scores. However, other studies carried out by Udousoro (2012) and Udeji (2017) showed that the methods employed in teaching science led to students' high retention and performance. These findings suggest that there is need to carry out more studies to clarify issues related to performance and retention as it concerns methods of teaching used in teaching. Since there is no consensus on the effect of methods on students' retention and performance, there is need to investigate a learner centered activity oriented method and its effect on retention. Learner centered activity oriented method may include the use of a Learning Activity Package (LAP).

A Learning Activity Package (LAP) is a student – centered, activity-oriented teaching strategy where the teacher acts as a facilitator of learning, guiding the students through a series of activities and problems, which may help learners to achieve highly. In LAP, learning materials are broken into small steps that are arranged sequentially from known to unknown and in an increasing order of difficulty. This suggests that LAP calls for individualized student attention. In solving the students' problems of poor retention in Biology, there is the need to shift from the conventional methods of teaching sciences to a more innovative method - a method that should seek for a way of making teaching more precise, while at the same time adjusting both the objective and methods of learning to the needs and characteristics of the individual learners. This innovative method must enable each student to work at his own pace thus accommodating both the fast and slow learners. In this method, the goals of the subject matter must be spelt out very well that students can arrive at the same goals independently along some avenue other than the one provided by the teacher. This calls for an individualized type of instruction. Individualized instruction, according to Chauhan (2008), is that in which the teachers attend to learning needs and problems of each learner separately. In other words, it means the tailoring of instruction to the particular needs and ability of each learner. The individualized instruction method can be approached and achieved through different methods such as Programmed Instruction (PI), Computer Assisted Instruction (CAI), Independent study (IS), Audio-Tutorial Training Models (ATTM), Learner-Controlled Instruction (LCI), Personalized System of Instruction (PSI), Protocol Packages (PP), and Learning Activity Package (LAP) among others. Learning Activity Packages (LAP) which is one of the teaching methods employed to achieve individualized instruction is the focus of the present study. Computer Assisted Instruction (CAI) had so much been advocated and had been established by research finding to be good for individualized instruction. The use in Nigerian Schools had been hampered by non-availability of computer systems in most public schools and even some private schools (Eze, 2018). Based on the non-available of these computer systems in our Nigerian schools the researcher advocates for the trial of another individualized method of instruction which can be readily available and can be affordable. This calls for the trial of the use of Learning Activity Package (LAP). From the researches available to the researcher the efficacy of LAP as a teaching technique in Biology was carried out by Abu (2011) in Zaria, Abu used LAP as an instructional material on students' performance in Biology. In the study, the LAP was developed on the topic micro-organisms and the subjects used were 25 randomly selected senior secondary two (SSII) students. The researcher used pre and post assessment to obtain data on the mastery of the objectives of the topic with the use of LAP by the subjects. The data was analyzed using simple percentage with 70%, as the criterion for mastery of the objectives of the LAP. The post assessment score obtained indicated that the objectives of the LAP were achieved in terms of students' mastery of those objectives. The above study is indirectly measuring retention in Biology and there was no evidence of validation of the instrument used. There was also no indication of the test of reliability of the instrument used to ensure that the generalization of the study will not be limited. The researcher was after the learners' mastery of the objectives of LAP and no other variable was employed in the study. Moreover, the method of data analysis was the percentage and there was no control group. Hence, in this study, more control of the characteristics of LAP was adopted by remedying the above deficiencies including using experimental / treatment and control groups for assessing the efficacy of the package. Variables like retention and interest levels were considered in the present study. However, the present study focused on the application of LAP as a method of instruction and not as an instructional material, and will be carried out in Otukpo, Benue State using four different schools which served as experimental and control groups. The developed LAP on the unit of life was used to ascertain the efficacy of the method with respect to students' performance and retention with varying ability levels. The reliability of the LAP was tested to ensure that the results of the study were not limited. The LAP used in this study was packaged by the researcher based on the publication made by Cardarelli (1992), details of the steps followed by



Effect of Learning activity Package Instructional Strategy on Retention in ... Ankele, V. O. (2026)

the researcher in developing the LAP is contained in the Research Method. One related factor that is confronting the use of learner centered method to teaching is its ability to have the same impact on both male and female students equally. This raises the issue of gender in relation to interest, performance and retention. Influence of gender on students' performance and interest in science subjects has over the years attracted the attention and interest of scholars. However, it is worthy of note that opinions and findings about the issue have been diversified. Specifically, while some scholars (Onekutu and Onekutu, 2012; Eriba and Sesugh, 2016) found out that males achieve higher and retain more than females, others found out otherwise (Alkhateeb, 2012; Bleuer and Wattz, 2012; Omoniyi, 2006). Yet another group of scholars are of the view that retention in science subjects are not influenced by gender (Iloputaife, 2011 and Eze, 2018). Therefore this study will investigate the relevance and possible influence of gender on students' retention in Biology when LAP method is employed in teaching them.

Statement of Problem

The persistent poor performance of students in Biology as revealed by both research results and WAEC Chief Examiners' Reports calls for concern especially for teachers of Biology that enroll larger number of students. The problem has to a large extent been attributed to ineffective teaching method employed by the teachers – especially lecture teaching method which is teacher-centered. Consequently, there is felt need to improve on the teaching and learning of Biology by exploring the use of some innovative learner centered teaching–learning methods, since it is believed that meaningful learning may be as a result of active participation by students. Although, many studies had been carried out on some innovative methods, like Programmed Instruction and Computer Assisted Instruction methods. Findings have shown that they are student centered and can also enhance retention, but the problem of large class and non-availability of computer systems in most Nigerian classes has made their practicability nearly impossible. Therefore, there is still the need to investigate other innovative child-centered method that is affordable, readily available as well as flexible, combining both package learning and practical activities (i.e. minds – on and hands – on). Such a method should enable the teacher to easily diagnose the problems of the individual learner and allows the learners to evaluate themselves, receiving immediate knowledge of result. These calls for the trial of another individualize method such as Learning Activity Package (LAP). Hence, the study was set to find answer to the question: What is the effect of LAP on students' retention in Biology?

Research Questions

Two research questions were formulated to guide the study:

1. What is the effect of the LAP on mean retention level of students who were taught and those who were not?
2. What is the difference of the effect of LAP on mean retention level between male and female students who were taught in biology?

Hypotheses

Two null hypotheses were formulated and tested at 0.05 level of significance:

1. There is no significant differences in the mean retention level of students who were taught and those who were not in biology
2. There is no significant difference in mean retention score between male and female students who were taught in biology

Research Methodology

The design of the study was Quasi-Experimental Design of the Pretest Posttest Non-equivalent Group Design (Campbell and Stanley, 1967). The design is often used in classroom experiments when experimental and control groups are assembled as intact classes and no possibility of randomization. Hence, intact classes were used and there was no random assignment of research subjects. The population of the study comprised of all public co-educational senior secondary school class two (SSII) students who were offering biology in the three Local Government Areas in Otukpo Education Zone of Benue State, year 2023. Altogether, there were 2022 students. The choice of SSII students was due to the fact that "unit of life" is meant for SSII as contained in the Biology core curriculum of the Federal Ministry of Education (FME, 1985) for Senior Secondary Two (SSII). The choice of co-educational secondary schools was that gender is a variable in the study. The sample used for the study consisted of a total of 317 SSII Biology students (157 males and 160 females) drawn out from 18 co-educational secondary schools in Enugu education zone. This is because gender is a factor in the study. The 18 co-educational schools were purposively selected from 29 secondary schools in the zone. From the 18 co-educational schools, four schools that had up to two or more SSII classes were purposively selected. Two intact SSII classes in each school, one



Effect of Learning activity Package Instructional Strategy on Retention in ... Ankelí, V. O. (2026)

intact class was assigned to Learning Activity Package of instruction (LAP) while the other intact class was assigned to lecture method of instruction. The selection of the classes for either of the instructional methods was done through simple random sampling (balloting).

Presentation of Results

The analysis and results are presented in tables according to the research question and hypotheses as shown below.

Research Question 1: What is the effect of the LAP on mean retention level of students who were taught and those who were not?

Table 1: Mean retention and standard deviation scores of students taught the Unit of Life with LAP and lecture method.

N = 317				
GROUP		MEAN	SD	N
LAP	Post test	22.21	5.91	160
	Retention test	22.95	5.49	
	Gain Score	.74		
Lecture Method	Post test	16.36	5.23	157
	Retention test	14.96	4.85	
	Gain Score	-1.43		

Table 1 above indicates that the LAP group obtained mean scores of 22.21 and 22.95 in the post test and retention test respectively, with standard deviation of 5.91 and 5.49. On the other hand the lecture method group obtained mean scores of 16.36 and 14.96 in the post test and retention test respectively with standard deviation of 5.23 and 4.85. Therefore, students taught with Learning Activity Package (LAP) had a gain score of .74 while the lecture method group had a gain score -1.43. The gain score of the LAP group being higher than the lecture method groups shows that the LAP group retained higher than the lecture method group. However, the standard deviation for the student in the LAP and lecture method groups in the retention test are 5.49 and 4.85, indicating that there are more extreme score in the LAP group while the scores of the students in the lecture group appear to be more clustered around the mean.

Research Question 2: What is the difference of the effect of LAP on mean retention level between male and female students who were taught in biology?

Table 2: Mean retention and standard deviation scores of male and female students

N = 317			
SEX	MEAN	SD	n.(cases)
Male	20.01	5.92	157
Female	17.99	6.99	160

Table 2 shows the differences in the mean scores of male and female students in the retention test on the Unit of Life. Male students' retention score was 20.01 while that of the female counterpart was 17.99. This shows that the male students generally retained more than their female counterpart. Similarly, the standard deviations for the male and female students were 5.92 and 6.99 respectively indicating that the individual scores of the male students were more closely related to their mean retention scores than those of their female counterparts.

Hypothesis 1

There is no significant differences in the mean retention level of students who were taught and those who were not in biology

Table 3 Analysis of covariance of students mean retention scores in BAT (instructional method X Gender and Instructional method X ability group).

Source of Variation	Type III Sum of Squares	df	Mean Square	F-cal	Sig	Decision
Corrected Model	7930.21	11	720.93	39.25	.00	S
Intercept	1719.70	1	1719.70	93.62	.00	S
Pre test	372.89	1	372.89	20.30	.00	S
Ability	27.72	2	13.86	.75	.47	NS

Effect of Learning activity Package Instructional Strategy on Retention in ... Ankelí, V. O. (2026)

Method	378.86	1	378.86	20.62	.00	S
Gender	113.30	1	113.30	6.17	.01	S
Ability X	156.89	2	78.45	4.27	0.02	S
Method						
Method X	15.39	1	15.39	.84	.36	NS
Gender						
Error	5602.76	305	18.37			
Total	127856.00	317				

S = Significant; NS = Not significant; N = 317; P = <0.05

Table 3 above shows that the calculated F-value for the effect of treatment on the students retention scores in the Biology retention test is 20.62 at 0.00 level of significance, which is less than 0.05 level set for the study. The null hypothesis is therefore rejected. This mean that a significant difference exist in the mean retention scores of Biology students taught the Unit of Life with LAP and those taught with lecture method.

Hypothesis 2

There is no significant difference in mean retention score between male and female students who were taught in biology. Table 3 shows that the calculated F-value for the effect of gender on students' retention in the unit of life taught is 6.17 and .01 level of significant. This is less than 0.05 level set for the study. The null hypothesis was therefore, rejected, hence there is a significant difference in the mean retention scores of male and female students in the Biology retention test.

Discussion of Findings

It has been observed in this study that the Learning Activity Package had significant effect on students' retention of Biology Concepts Learnt. (Table 2). The findings support these similar works on innovative methods that aid retention done by Egbugara (2008), Nworgu (2009) and Ezeudu (2015) but do not agree with the findings of Ndukwe (2015) and Eze (2018) who found that the difference in the mean post retention test scores was not significant. The fact that the Learning Activity Package helped students to retain more, may be because it is activity-packed and students were allowed to interact with the learning materials promoting meaningful learning and not rote-learning (Wandese, 1990). When the materials learnt are meaningful, they tend to be stored in the long term memory. Nevertheless, the finding of this study disagrees with the findings of Nnadi (2011), Erinsho (2015) and Ugwu (2017), who found significant difference in performance in their independent studies. This could be attributed to the fact that the activities in the Learning Activity Package are carried out by the students themselves, at their own pace during and after the school period, so this has given both the male and female students chances of performing equally. On the other hand, the mean performances score of male students being slightly better than their female counterparts can be associated with social attachment that males are more science incline than female. The finding of the study in respect of the effect of gender on students' mean scores in the retention test is such that male students' mean retention score was significantly greater than that of the female students. The result is in agreement with the findings of Nworgu (2009), Ezeudu (2015) and Ugwu (2017), who in their independent studies found that there is a significant difference in the retention of male and female students in various science subjects. But on the contrary, the finding of this study is in disparity with the findings of Eze (2018), Iloputaife (2011), Eze (2018) and Ndukwe (2020) who found no significant difference in the retention of the male and female students. Male superiority in the retention of the Biology concepts taught, may be traceable to the fact that the male achieved slightly better than their female counterparts in the performance test. Since one can only retain what one had known in the past, it follows therefore, that the male students who had acquired more knowledge would be expected to retain such knowledge more than their female counterparts, who recorded less performance in the same discipline in the same discipline in the posttest.

Conclusion

Learning Activity Package (LAP) was found to be more effective than the lecture method of students' retention in Biology. Also the male students' mean retention score was significantly greater than that of the female students. There is no significant interaction effect of treatment and gender on students' mean retention scores.

Recommendations

In view of the afore-mentioned educational implications of the result of this study, the following recommendations are made:



Effect of Learning activity Package Instructional Strategy on Retention in ... Ankele, V. O. (2026)

1. As the use of Learning Activity Package has been found effective in promoting retention in Senior Secondary School Biology and since this teaching method is relatively new in Nigeria, it should be included in the Biology Curriculum of Teachers' Training tertiary institution, so as to popularize its use among the teachers and hence bring about more effective learning of Biology in our secondary schools.
2. In view of the established efficacy of the Learning Activity Package and the fact that most of the serving Biology teachers may not be familiar with its use, seminars and workshops should be organized by government and relevant professional bodies e.g Science Teachers Association of Nigeria (STAN) to educate and sensitize the teachers on the use of the Learning Activity Package of Biology teaching and learning.
3. As students of different ability levels have been shown to benefit differently from biology lesson with respect to performance and retention using Learning Activity Package, Biology students should be placed in classes according to their ability levels, to prevent the slow learner being "dragged" by the fast Learners.
4. Government agencies and professional associations whose responsibility it is to design and revise the curriculum for secondary schools should incorporate and emphasize the use of Learning Activity Package method in the teaching of senior secondary schools Biology.
5. Government, through the State and Federal ministries of education should encourage the Biology textbook writers to write and publish Biology textbooks based on the Learning Activity Package instructional method.

Reference

- Abonyi, O.S. (2008). Effects of an Ethnoscience-Based Instructional Package on Students' Conception of Scientific Phenomena and Interest in Science. *Unpublished Ph.D Thesis*.Nsukka: Department of Education, University of Nigeria.
- Abu, A. O. (1998), "The Effectiveness of Individualized and Lecture Instructional Methods of Teaching Biology at the Senior Secondary Level of Education" *Unpublished M. Ed Thesis*, Ahmadu Bello University Zaria.
- Abu. A. O. (2011) Resource Utilization in Classroom: The Effect of Learning Activity Package to Teach Biology at the Senior Secondary Level of Education *JSTAN* 40 (2) 103 – 106
- Awotua-Efebo, E. B. (2011) *Effective Teaching: Principles and Practice*. Paragraphics, PortHarcourt.
- Blair, B. A. and Stone, R. (1975), *Educational Psychology*. Macmillan Publishing Company Inc: New York, 222-226.
- Burnside, P. (1991). Computers as a Writing Tool – Learning Package for Eight Grade Students. *Master's Thesis*. New York. Institute of Technology. U.S.A.
- Cardarelli, S. (1992). The LAP A Feasible Vehicle of Individualization. *Journal of Education Technology*. 12(3) 23-29.
- Chauhan, S. S. (2008). "Advanced Educational Psychology". NewDelhivani Educational Books.
- Diamond, P. J. and Onwuegbuzie, A. J. (2001): Factors Associated with Reading, Performance and Attitudes among Elementary School-Aged Students. *Research in the Schools*, 8(1). 1-11.
- Eccles, J. S. (2012). Performance. In J. Worell (ed), *Encyclopedia of Women and Gender: Sex Similarities and Differences and the Impact of Society on Gender*. 43-53. San Diego: Academic Press.
- Eze, A. N. (2014). Sex and Environment as Factors in Physics Performance. *International Journal of Education Research* 17 – 23.
- Ezeh, O. E. (2014). Effect of Practical Skills in Academic Performances. *Unpublished Manuscript*. UNN.
- Eze, C. U. (2018). Effect of Target Task Approach on Students' Performance in Senior School Certificate Physical Chemistry. *Science Teachers Association of Nigeria*, Proceeding of the 43rd Annual Conference. 259.
- Eze, G. N. (2014). Effect of Programmed Instruction Method on Students' Performance in Chemistry in Secondary Schools. *Unpublished M.Sc (Ed) Thesis*. ESUT.
- Ezeudu, F. O. (2015). "Effects of Concept Maps on Students' Performance Interest and Retention in Selected Units of Organic Chemistry. " *Unpublished Ph.D. Thesis*. Nsukka: University of Nigeria.
- Federal Republic of Nigeria, (Revised 2004) *National Policy on Education*, Abuja.
- Hwong, N. C. (1993). Effects of Co-operative and Individualistic Learning on Prospective Elementary Teachers' Music Performance and Attitudes. *Journal of Psychology*. 133(1), 53-64.
- Iloputaife, E. C. (2011). Effects of Analogy and Conceptual Change Instructional Models on Physics Achievement of Secondary School Students. *Unpublished Ph.D Thesis*. UNN.
- Joint Admissions and Matriculation Board (2008). *Chief Registrar's Report on Joint Admission and Matriculation Examination for Universities*, Abuja.
- Maduabum, M. A. (1998). Motivational Problems that hinder Teaching Accountability, in Chidolue, M. E. and Anidu C. (eds), *Effective Teaching: The Nigeria Perspective* AwkaNmadiAzikiwe University Press.
- Moore, J. W. (2010). *Teaching for Understanding*. Madison University of Wisconsin.



Effect of Learning activity Package Instructional Strategy on Retention in ... Ankele, V. O. (2026)

Mukaila, A. O. S. (2010). Computer and Text Assisted Programme Instruction and Students' Cognitive Preference Style as Determinants of Secondary School Performance in Heat Related Concepts in Physics. *Unpublished Ph.D. Thesis*. University of Ibadan.

Ogunleye, A. D. (2012). Prospects and Problems in Physics Education in Nigeria Secondary Schools. *African Journal of Education*: 1(1). 154 – 167.

West African Examination Council (WAEC), (2018). *Analysis of Result*, Lagos WAEC.



Qualitative Study on an Inclusive Education Curriculum in ... Augustine, W. S. (2026)

Qualitative Study on an Inclusive Education Curriculum in Nigeria: Interrogating Policy, Confronting Practice and Constructing a Transformative Framework

AUGUSTINE, Walakan Shede

augustinewalakan@gmail.com

07064787520

Department of Science Education, Faculty of Education, Federal University Wukari, Taraba State, Nigeria

Abstract

Inclusive education the philosophical commitment to providing quality education for all learners, including those with disabilities, learning differences, and other forms of marginalisation, within the mainstream educational system represents one of the most demanding and most consequential curriculum and instructional challenges facing Nigerian education in the twenty-first century. Despite Nigeria's ratification of landmark international frameworks the Salamanca Statement (1994), the United Nations Convention on the Rights of Persons with Disabilities (CRPD, 2006), and the Sustainable Development Goals (SDG 4, 2015) and the articulation of inclusive education provisions in the National Policy on Education (2013) and the Discrimination Against Persons with Disabilities (Prohibition) Act (2018), the curriculum infrastructure required to operationalise genuine inclusion in Nigerian schools remains critically underdeveloped. This paper undertakes a systematic, multi-dimensional conceptual analysis of inclusive education curriculum in Nigeria, interrogating the theoretical foundations, policy architecture, and implementation landscape of Nigerian inclusive education, and identifying the specific curriculum and instructional failures that prevent policy commitments from being translated into classroom reality for the estimated 25 million Nigerians living with disabilities and the millions more experiencing educational marginalisation from poverty, conflict, gender, and cultural exclusion. Drawing on the Index for Inclusion (Booth & Ainscow, 2002), Universal Design for Learning (CAST, 2018), Disability Studies in Education (Gabel, 2005), and the Human Rights Model of disability (Quinn & Degener, 2002), the paper develops a comprehensive Inclusive Education Curriculum Framework for Nigeria (IECF-N) a six-dimensional model addressing curriculum philosophy, content, design, pedagogy, assessment, and teacher preparation. The paper argues that transformative inclusive education in Nigeria is not a technical curriculum adjustment but a profound epistemological, ethical, and political reorientation of the entire educational enterprise, and offers targeted recommendations for the Federal Ministry of Education, NERDC, state governments, teacher education institutions, disability rights organisations, and school communities. This paper is positioned as an essential contribution to the scholarly discourse on curriculum reform, disability rights, and educational justice in Sub-Saharan Africa.

Keywords: inclusive education, curriculum reform, teacher professional development

Introduction

Education is a fundamental human right. This is not a philosophical abstraction it is a legal obligation enshrined in the Universal Declaration of Human Rights (1948), the United Nations Convention on the Rights of the Child (1989), the United Nations Convention on the Rights of Persons with Disabilities (2006), and Nigeria's own constitutional commitments (Federal Republic of Nigeria, 1999). Inclusive education, the principle that all children, regardless of ability, disability, gender, language, ethnicity, socioeconomic status, or any other characteristic, have the right to receive quality education in their local mainstream school community alongside their non-disabled peers represents the most demanding and most morally consequential expression of this right (UNESCO, 1994; CAST, 2018; Ainscow, 2020). It demands not merely that children with disabilities be admitted to mainstream schools but that those schools fundamentally redesign their curriculum, instruction, physical environment, assessment practices, and professional culture to genuinely welcome, accommodate, and develop every learner who enters their doors. The contradiction at the heart of Nigerian inclusive education is stark and troubling. At the level of international policy commitment, Nigeria has signed or ratified every major framework that mandates inclusive education: the Jomtien Declaration on Education for All (1990); the Salamanca Statement on Special Needs Education (UNESCO, 1994); the Dakar Framework for Action (2000); the United Nations Convention on the Rights of Persons with Disabilities (2006, ratified by Nigeria in 2010); and the Sustainable Development Goals, specifically SDG 4, ensuring inclusive and equitable quality education for all by 2030 (United Nations, 2015). Domestically, the National Policy on Education (Federal Republic of Nigeria, 2013) provides for the education of children with special needs, and the Discrimination Against Persons with Disabilities (Prohibition) Act (DAPDA, 2018) explicitly prohibits discrimination against persons with disabilities in educational institutions and mandates reasonable accommodation. These are not weak commitments they are legally binding obligations of the Nigerian state.



Qualitative Study on an Inclusive Education Curriculum in ... Augustine, W. S. (2026)

Yet the implementation reality presents a picture of near-total divergence from these commitments. Nigeria's estimated 25 million persons with disabilities (National Commission for Persons with Disabilities, 2020; WHO, 2011) face systematic exclusion from mainstream education at every level. The majority of children with visual impairments, hearing impairments, physical disabilities, intellectual disabilities, autism spectrum disorder, and learning differences either attend severely under-resourced segregated special schools, informal community-based settings with no qualified personnel, or receive no formal education whatsoever (Anaduaka & Okafor, 2013; Garuba, 2003; Obiakor, Eskay & Afolabi, 2012). In mainstream schools, even where individual children with disabilities are physically present, the curriculum, pedagogical approaches, assessment methods, physical environment, and professional capacity of teachers are so uniformly inaccessible that their presence constitutes exclusion-within-inclusion physical integration without genuine curriculum participation or developmental progress (Ainscow & Miles, 2008; UNESCO, 2017). This paper argues that the gap between Nigeria's policy commitments and its inclusive education practice is fundamentally a curriculum and instruction problem. The philosophical commitment to inclusion can be enshrined in law; the physical enrolment of children with disabilities in mainstream schools can be mandated by decree; the buildings can be made wheel-chair accessible with ramps and lifts. But none of these measures will produce genuine educational inclusion without a curriculum that is designed from the outset to be accessible, appropriate, and enabling for all learners a curriculum that embeds flexibility in its content, pedagogy, materials, and assessment to accommodate the full diversity of human learning (CAST, 2018; Booth & Ainscow, 2002; Udvari-Solner, 1995). This is the curriculum and instruction challenge of inclusive education and it is the challenge this paper addresses. The paper proceeds through seven substantive sections: the theoretical and philosophical foundations of inclusive education curriculum; the international and domestic policy architecture; a critical analysis of the current state of inclusive education curriculum in Nigeria; an examination of the specific barriers to curriculum inclusion; the development of the Inclusive Education Curriculum Framework for Nigeria (IECF-N); implications for teacher education and professional development; and comprehensive recommendations for all stakeholders. Throughout, the paper maintains its analytical focus on curriculum and instruction as the operationalising infrastructure of inclusion the concrete, practical domain in which the rights rhetoric of inclusive education must be translated into the lived educational experience of every Nigerian learner.

Theoretical and Philosophical Foundations of Inclusive Education Curriculum

The Social Model of Disability and Disability Studies in Education

The foundational theoretical reorientation that inclusive education curriculum requires is the shift from the medical model of disability to the social model of disability a shift with radical implications for how curriculum is designed, delivered, and evaluated (Oliver, 1990; Shakespeare, 2014; Gabel, 2005). The medical model conceptualises disability as a deficit or pathology located within the individual person a problem to be diagnosed, treated, managed, or overcome. Applied to education, the medical model produces a curriculum logic in which children with disabilities must be assessed to determine their deficits, segregated into settings where their special needs can be addressed by specialist professionals, and subjected to individualised therapeutic interventions aimed at normalising their functioning to the greatest possible extent. This is the logic that produced the system of segregated special schools, special classes, and remedial programmes that constitutes the dominant modality of Nigerian provision for children with disabilities (Anaduaka & Okafor, 2013; Garuba, 2003; Obiakor et al., 2012). The social model of disability, developed by disabled people's organisations and disability rights scholars in the United Kingdom and elsewhere, locates disability not in the individual but in the interaction between the individual and a disabling social and physical environment (Oliver, 1990; Barnes & Mercer, 2003). People are disabled not by their impairments per se but by social structures, physical barriers, communication systems, cultural attitudes, and institutional practices including curriculum practices that are designed around a narrow norm of human functioning and that exclude those who do not conform to that norm. A child who is blind is not educationally disabled by their blindness; they are educationally disabled by a curriculum delivered exclusively through print, in a classroom without braille materials, taught by a teacher with no knowledge of tactile learning strategies (Oliver, 1990; Shakespeare, 2014). Remove the disabling curriculum barriers, and the disability in its educational manifestation substantially diminishes. Disability Studies in Education (DSE) extends the social model to the specific domain of schooling and curriculum, interrogating the ways in which educational knowledge, curriculum content, pedagogical practices, assessment systems, and professional cultures produce and reproduce disability through their normalising assumptions, their ableist structures, and their systematic marginalisation of learners who do not conform to the imagined 'normal' student (Gabel, 2005; Connor, Gabel, Gallagher



Qualitative Study on an Inclusive Education Curriculum in ... Augustine, W. S. (2026)

& Morton, 2008; Ferri, 2012). DSE scholarship challenges the curriculum developer and teacher educator to ask not 'What is wrong with this student that prevents them from accessing our curriculum?' but rather 'What is wrong with our curriculum that prevents this student from accessing their right to education?' This is the epistemological reorientation that a genuinely inclusive curriculum demands and it is a reorientation that Nigerian curriculum development institutions, teacher education programmes, and school communities have not yet begun to make.

The Human Rights Model of Disability

The Human Rights Model of disability, articulated in the United Nations Convention on the Rights of Persons with Disabilities (CRPD, 2006) and developed in the scholarship of Quinn and Degener (2002) and Degener (2017), extends the social model's critique of disability construction to the domain of international human rights law, arguing that persons with disabilities are rights-bearing subjects with inherent dignity and equal citizenship not passive recipients of medical or charitable provision. Article 24 of the CRPD is the most demanding and most directly relevant international legal instrument for inclusive education curriculum: it requires states parties to ensure an inclusive education system at all levels and lifelong learning, which means ensuring that persons with disabilities can access an inclusive, quality, and free primary and secondary education on an equal basis with others in the communities in which they live; that reasonable accommodation of the individual's requirements is provided; and that students with disabilities receive the support required within the general education system to facilitate their effective education (United Nations, 2006). The CRPD's concept of 'reasonable accommodation' the modifications and adjustments necessary to ensure that a person with a disability can enjoy or exercise their rights on an equal basis with others has profound implications for inclusive education curriculum design in Nigeria. It demands that curriculum developers, school administrators, and teachers provide individual adjustments to curriculum content, delivery methods, learning materials, assessment formats, and instructional timing that enable each student with a disability to access and demonstrate their learning within the mainstream curriculum framework. This is a legally binding, judicially enforceable obligation of the Nigerian state, reinforced by the Discrimination Against Persons with Disabilities (Prohibition) Act (2018), which Nigeria enacted domestically. Failure to provide reasonable accommodation in educational settings constitutes prohibited discrimination under both the CRPD and DAPDA 2018 a legal reality that most Nigerian school administrators and teachers are entirely unaware of (Eleweke & Rodda, 2002; Anaduaka & Okafor, 2013).

Universal Design for Learning (UDL)

Universal Design for Learning (UDL) developed by the Center for Applied Special Technology (CAST, 2018) and grounded in the architectural concept of universal design provides the most comprehensive and practically actionable theoretical framework for inclusive curriculum design available in the contemporary educational literature. UDL is a curriculum design philosophy and framework that proactively addresses the predictable diversity of learners by building flexibility into curriculum from the outset, rather than retrofitting accommodations for individual students after a standard curriculum has been designed for an imagined 'average' learner (CAST, 2018; Rose & Meyer, 2002; Hitchcock, Meyer, Rose & Jackson, 2002). The UDL framework is organised around three core principles, each addressing a different aspect of the learning process. The first principle Multiple Means of Representation demands that curriculum provide information and content in multiple formats so that learners with different sensory, cognitive, and linguistic profiles can all access the same knowledge and concepts. In the inclusive classroom, this means that curriculum content is not delivered exclusively through print text (inaccessible to students with visual impairments, dyslexia, or limited literacy) or exclusively through spoken language (inaccessible to students with hearing impairments or language processing differences) but through multiple complementary modalities: audio, visual, tactile, kinesthetic, and digital formats that collectively ensure universal access to curriculum content (CAST, 2018; Rose & Meyer, 2002). The second principle, Multiple Means of Action and Expression demands that students be provided with multiple ways of demonstrating their learning, recognising that the standard assessment formats of written essays and examinations systematically disadvantage students with physical disabilities, learning differences, or communication impairments, and that alternative demonstration modes, oral presentations, portfolio collections, digital productions, practical demonstrations, and graphic representations provide more valid and equitable evidence of learning (CAST, 2018; Hitchcock et al., 2002). The third principle Multiple Means of Engagement demands that curriculum provide multiple ways of motivating and sustaining learners' engagement, recognising that interest, persistence, self-regulation, and intrinsic motivation are profoundly variable across the learner population and that curricula designed around a single engagement modality will systematically disengage significant



Qualitative Study on an Inclusive Education Curriculum in ... Augustine, W. S. (2026)

portions of the learner community. Culturally responsive content, student choice in learning activities, collaborative and individually-paced options, and explicit social-emotional learning components are among the engagement strategies that UDL prescribes (CAST, 2018). Applied to Nigerian inclusive education curriculum, UDL demands a fundamental rethinking of how content is selected, how materials are produced, how instruction is organised, how assessment is structured, and how student engagement is sustained across the full diversity of Nigerian learners including those with disabilities, those from minority language groups, those from nomadic and pastoral communities, girls in gender-restrictive cultural contexts, and children affected by conflict and displacement.

The Index for Inclusion

The Index for Inclusion (Booth & Ainscow, 2002, revised 2011) is one of the most widely used frameworks for guiding and evaluating institutional progress toward inclusive education. It conceptualises inclusion as a continuous process rather than a fixed state a process through which schools progressively remove barriers to participation and learning for all students while increasing the capacity of the school community to value diversity and support every learner. The Index organises the process of inclusion along three dimensions: creating inclusive cultures (building a community that shares values of inclusion, belonging, and collaboration); producing inclusive policies (ensuring that inclusion permeates all institutional decision-making, planning, and resource allocation); and evolving inclusive practices (developing teaching and learning approaches that reflect inclusive cultures and policies in the actual experience of students and staff). Critically, the Index insists that inclusive cultures the values, relationships, and shared commitments of the school community must be the foundation upon which inclusive policies and practices are built; policy reform without cultural transformation produces compliance without conviction, and practice change without policy support produces innovation without sustainability (Booth & Ainscow, 2002). Applied to Nigeria, the Index for Inclusion framework reveals that the current state of Nigerian inclusive education is characterised by policy statements without cultural foundation and by occasional physical integration without practice change. Nigerian schools may articulate commitment to inclusive education in their mission statements and development plans, but the daily classroom practices of most teachers the curriculum content they select, the pedagogical approaches they deploy, the assessment methods they employ, and the assumptions about 'normal' learners that undergird all these decisions reflect a fundamentally exclusive educational culture that values uniformity over diversity and compliance over authentic participation (Ainscow & Miles, 2008; Eleweke & Rodda, 2002; UNESCO, 2017). The Index's demand for cultural transformation changing the deeply held beliefs, implicit assumptions, and professional identities of teachers, administrators, and school community members is the most challenging and most essential dimension of inclusive education reform in Nigeria.

The Policy Architecture of Inclusive Education in Nigeria: Commitments and Contradictions

International Frameworks

The Salamanca Statement (UNESCO, 1994) adopted at the World Conference on Special Needs Education in Salamanca, Spain, and endorsed by 92 governments including Nigeria remains the most influential single document in the history of inclusive education policy globally. It declared that schools should accommodate all children regardless of their physical, intellectual, social, emotional, linguistic, or other conditions, and that the concept of special needs education must be broadened to include children who for whatever reason fail to benefit from schooling. Crucially, the Salamanca Statement situated inclusive education not as a special education modality but as a curriculum and pedagogical challenge for mainstream schools: it called for curricula to be adapted to children's needs, not children adapted to predetermined curricular assumptions (UNESCO, 1994). This curriculum-centred conception of inclusion which demands that the curriculum be flexible, differentiated, and universally designed is the conception that most sharply challenges the practice of Nigerian mainstream schools, where the curriculum is treated as a fixed, standardised entity to which all children must conform regardless of their individual learning profiles. The United Nations Convention on the Rights of Persons with Disabilities (CRPD, 2006), ratified by Nigeria in 2010, represents the most legally binding international commitment to inclusive education. Article 24 explicitly requires Nigeria to ensure an inclusive education system at all levels not a parallel special education system but a fundamentally reformed mainstream system that accommodates all learners through curriculum flexibility, teacher training, accessibility standards, and individual support. The CRPD Committee's General Comment No. 4 (2016) clarified that Article 24 requires states to immediately abandon all forms of segregated special education and to make measurable, progressive progress toward a fully inclusive system, providing interim support and reasonable accommodation for all students with disabilities within the mainstream setting. General Comment No. 4 also



Qualitative Study on an Inclusive Education Curriculum in ... Augustine, W. S. (2026)

clarified that inclusive education and quality education are inseparable that a segregated or exclusionary system cannot provide quality education, because quality education is inherently an education that develops every learner's full potential within a diverse, inclusive community (United Nations Committee on the Rights of Persons with Disabilities, 2016).

Domestic Policy Provisions

The National Policy on Education (Federal Republic of Nigeria, 2013) provides for the education of persons with special needs in Section 7, articulating eight specific objectives for special needs education including developing the special abilities and potentials of individuals with special needs, providing functional education for the disabled, and preparing them for self-reliance. However, Section 7 of the NPE reflects a conceptual framework that is more consistent with the medical model than the social model of disability it treats children with disabilities as a special category requiring separate provision rather than as rights-bearing citizens entitled to education in their community schools with appropriate support. The NPE does not mention Universal Design for Learning, curriculum accessibility, reasonable accommodation, or differentiated instruction the specific curriculum and instruction mechanisms through which genuine inclusion is operationalised (Federal Republic of Nigeria, 2013; Garuba, 2003). The Discrimination Against Persons with Disabilities (Prohibition) Act (DAPDA, 2018) represents the most recent and most explicit domestic legal commitment to the rights of persons with disabilities, including in education. Section 15 of DAPDA 2018 prohibits discrimination against persons with disabilities in educational institutions and mandates that educational institutions provide reasonable accommodation for students with disabilities. Section 16 requires educational institutions to take affirmative steps to ensure the inclusion of persons with disabilities in educational programmes. However, DAPDA 2018 provides no specific guidance on what inclusive curriculum looks like, what reasonable accommodation in curriculum and instruction entails, or how teachers should be trained to provide it leaving the operationalisation of these commitments entirely undefined (Federal Republic of Nigeria, 2018; National Commission for Persons with Disabilities, 2020). This legislative gap between the human rights commitment to inclusion and the absence of curriculum and instructional guidance for operationalising it is the central policy failure of Nigerian inclusive education. Laws can mandate admission; curriculum reform and teacher preparation must deliver inclusion. The absence of a National Inclusive Education Curriculum Framework, a National Inclusive Education Teacher Preparation Standard, a National Accessibility Standard for Educational Materials, and a National Individual Education Plan (IEP) policy constitutes a systemic curriculum governance failure that undermines every legal commitment Nigeria has made to inclusive education (Eleweke & Rodda, 2002; Obiakor et al., 2012; UNESCO, 2017).

The Contradiction Between Policy and Fiscal Reality

The most fundamental contradiction in Nigerian inclusive education policy is the profound mismatch between the ambition of the legal and policy commitments and the fiscal reality of the resources allocated to implementing them. The National Commission for Persons with Disabilities (NCPD), established under DAPDA 2018 as the primary government body for operationalising disability rights in Nigeria, was still without a fully functional budget allocation and operational staffing several years after its establishment (National Commission for Persons with Disabilities, 2020). The Universal Basic Education Commission (UBEC), which funds basic education infrastructure across Nigeria, has no specific budget line for inclusive education infrastructure accessible toilets, ramps, tactile pathways, hearing loop systems, accessible classroom furniture in its infrastructure grants to states. Teacher training institutions receive no additional funding for ECE and inclusive education specialist components in their curricula, despite the additional instructional time and expertise required to prepare teachers for inclusive classroom practice (Anaduaka & Okafor, 2013; Garuba, 2003). This fiscal neglect reflects and reinforces a deeper attitudinal reality: the Nigerian educational system has not yet internalised the premise that inclusive education is a right rather than a charity, a mainstream responsibility rather than a specialist's domain, and an investment rather than a cost. Until fiscal commitments match policy commitments until inclusive education receives the dedicated, sustained, and adequate funding that its implementation requires the gap between Nigeria's international and domestic legal obligations and the lived experience of Nigerian learners with disabilities and other marginalised identities will persist and widen (UNICEF, 2022; UNESCO, 2017; Ainscow, 2020).

Critical Analysis: The Current State of Inclusive Education Curriculum in Nigeria

The Persistence of Segregation: Special Schools and Their Limits

Nigeria's primary institutional response to the educational needs of children with disabilities has been the establishment of segregated special schools residential institutions for specific categories of disability including schools for the visually impaired, schools for the deaf, schools for children with intellectual disabilities, and vocational rehabilitation centres for



Qualitative Study on an Inclusive Education Curriculum in ... Augustine, W. S. (2026)

young adults with physical disabilities (Garuba, 2003; Obiakor et al., 2012). These institutions were modelled on colonial-era British special education provision and operate on a fundamentally different curriculum framework from mainstream schools: modified academic content, reduced curriculum expectations, heavy emphasis on vocational and life skills training, and therapeutic interventions delivered by specialists including speech-language therapists, physiotherapists, and orientation and mobility specialists. The limitations of the Nigerian special school system as a vehicle for inclusive education are both principled and practical. At the level of principle, the CRPD (2006) and CRPD General Comment No. 4 (2016) are unambiguous: segregated special education, however well-resourced and professionally staffed, constitutes a violation of disabled children's rights to inclusive education and equal citizenship. Children educated in segregated settings are denied the social integration, peer learning opportunities, and preparation for life in an inclusive community that mainstream education provides; they internalise a disabled identity constructed around limitation rather than capability; and they graduate into communities that have not been prepared to receive or include them (Oliver, 1990; Shakespeare, 2014; Gabel, 2005). At the practical level, Nigerian special schools are drastically under-resourced, geographically inaccessible to most families, qualitatively inadequate, and quantitatively insufficient to serve even a small fraction of the disabled children who require educational provision (Anaduaka & Okafor, 2013; National Commission for Persons with Disabilities, 2020).

Mainstream Schools: Inclusion Without Infrastructure

Where children with disabilities do attend mainstream schools in Nigeria often as a result of family preference, geographic necessity, or the absence of accessible special school provision they encounter a curriculum and instructional environment designed entirely for non-disabled learners and systematically inaccessible to them. The mainstream Nigerian curriculum as specified in NERDC curriculum documents, WAEC and NECO examination frameworks, and school timetable structures makes no provision for differentiated instruction, accessible materials, alternative assessment formats, individual education plans, or any other accommodation mechanism for students with disabilities or learning differences (Eleweke & Rodda, 2002; Ainscow & Miles, 2008; UNESCO, 2017). The standard textbooks are available only in print inaccessible to students with visual impairments. The standard examinations require handwriting within time limits inaccessible to students with physical disabilities affecting upper limb function. The standard classroom instruction is predominantly auditory-verbal inaccessible to students with hearing impairments who have not been provided with sign language interpreters or hearing loop technology. The standard curriculum language is English inaccessible to students from language minority communities or with language processing differences who have not been provided with language support. Teachers in mainstream Nigerian schools receive no training in inclusive pedagogy, differentiated instruction, disability-related curriculum modification, Braille, Nigerian Sign Language (NSL), Alternative and Augmentative Communication (AAC), or the use of assistive technology the specific professional competences required to make mainstream curriculum accessible to students with diverse learning profiles (Obiakor et al., 2012; Anaduaka & Okafor, 2013; Garuba, 2003). A 2017 UNESCO Global Education Monitoring Report found that less than 5% of Nigerian primary school teachers had received any form of inclusive education training, and that the majority of teachers held negative or ambivalent attitudes toward the inclusion of children with disabilities in their classrooms attitudes rooted not in malice but in genuine professional unpreparedness and the well-founded fear of being expected to serve a diverse learner population without adequate knowledge, skills, time, or material support.

The Multiple Dimensions of Educational Marginalisation

Inclusive education in Nigeria must address not only disability-based exclusion but the multiple, intersecting dimensions of educational marginalisation that characterise the Nigerian educational landscape. Gender exclusion particularly in northern Nigeria, where deep-rooted cultural norms restrict girls' educational participation, where child marriage removes girls from school before secondary completion, and where the gender gap in educational attainment remains the largest in Sub-Saharan Africa represents a form of curriculum exclusion as profound as disability-based exclusion (UNICEF, 2022; UNESCO, 2021). Poverty-based exclusion which prevents children from poor families from affording school fees, uniforms, textbooks, and transportation, and which forces children into labour that competes with school attendance intersects with disability, gender, and geographic marginalisation to produce complex, multi-dimensional patterns of educational exclusion that simple enrolment interventions cannot address (Ainscow, 2020; Obiakor et al., 2012). Linguistic exclusion the experience of children from the approximately 450 Nigerian language communities whose home languages are not English, Hausa, Yoruba, or Igbo, and who encounter a school system in which instruction, materials, and assessment



Qualitative Study on an Inclusive Education Curriculum in ... Augustine, W. S. (2026)

are conducted in unfamiliar languages constitutes a fundamental curriculum barrier that the field of inclusive education must explicitly address (Cummins, 2001; UNESCO, 2021). Nomadic and pastoral community children whose families' seasonal migration patterns are incompatible with fixed-location, calendar-bound schooling experience structural exclusion from the standard school curriculum that requires nomadic-specific curriculum and instructional modalities. Children affected by armed conflict and displacement particularly acute in the North-East (Borno, Yobe, Adamawa states), North-West (Zamfara, Katsina states), and Middle Belt states face trauma-related learning difficulties, interrupted schooling histories, and psychosocial needs that standard curriculum and instruction are entirely unprepared to address (UNICEF, 2022). An inclusive education curriculum for Nigeria that addresses only physical disability while ignoring gender, poverty, language, nomadism, and conflict-induced exclusion is not truly inclusive it is a partial and selective accommodation that perpetuates the marginalisation of those whose exclusions are most structurally embedded. A genuinely inclusive curriculum must be designed to be responsive to the full spectrum of human diversity and the full range of barriers to educational participation that characterise Nigerian society (Booth & Ainscow, 2002; Ainscow, 2020; UNESCO, 2017).

Barriers to Inclusive Education Curriculum Implementation in Nigeria

The barriers to inclusive education curriculum implementation in Nigeria are multiple, mutually reinforcing, and deeply structural. Table 1 provides a systematic classification of these barriers across six dimensions, with specific Nigerian manifestations and proposed remediation strategies for each.

Table 1: Barriers to Inclusive Education Curriculum Implementation in Nigeria: A Multi-Dimensional Analysis

Barrier Category	Specific Barrier	Nigerian Manifestation	Remediation Strategy
Curriculum Design	Inaccessibility of standard curriculum materials	No Braille, audio, or digital format textbooks; no large-print materials; no Sign Language resources	Mandate multi-format production of all national curriculum materials; fund assistive technology provision through UBEC grants
Pedagogy	Absence of differentiated instruction	Whole-class, uniform teaching to imagined 'average' student; no individualisation of content, pace or method	Integrate UDL principles into all teacher education curricula; provide in-service training in differentiated instruction; reduce class sizes
Assessment	Inaccessible examination formats	WAEC/NECO written examinations inaccessible to students with physical, visual, or print-processing disabilities; no alternative format options	Establish WAEC/NECO accessible examination policy; develop and implement alternative assessment frameworks; train examination officers in accommodation provision
Teacher Preparation	Absence of inclusive education competence	Less than 5% of Nigerian teachers trained in inclusive pedagogy; no pre-service inclusive education requirement; no specialist NCE/B.Ed. pathway	Mandate inclusive education units in all NCE and B.Ed. programmes; develop specialist inclusive education teacher education tracks; fund continuous professional development
Physical Environment	Inaccessible school infrastructure	Absence of ramps, accessible toilets, tactile pathways, hearing loop systems in virtually all Nigerian mainstream schools	Include inclusive infrastructure requirements in all UBEC capital grants; develop National Accessibility Standard for School Buildings; inspect and enforce compliance



Qualitative Study on an Inclusive Education Curriculum in ... Augustine, W. S. (2026)

Attitudinal	Negative attitudes toward disability	Teacher and peer stigma; parental resistance; community belief systems attributing disability to spiritual causes	Disability awareness curriculum integration; community sensitisation programmes; teacher attitude transformation as component of inclusive education training

Note. UDL = Universal Design for Learning; UBEC = Universal Basic Education Commission; WAEC = West African Examinations Council; NECO = National Examinations Council; NCE = Nigeria Certificate in Education; B.Ed. = Bachelor of Education. Source: Author's synthesis of inclusive education literature and Nigerian policy analysis (2025). Beyond the specific barriers catalogued in Table 1, the deepest and most challenging barrier to inclusive education curriculum in Nigeria is what Ainscow (2020) terms the 'deficit thinking' that pervades educational institutions the default assumption that educational failure, underperformance, and non-participation are located within the child rather than within the curriculum, the pedagogy, or the system. Deficit thinking produces a curriculum culture in which students who do not conform to the imagined standard learner are assessed, classified, and removed from the mainstream rather than a curriculum culture in which non-conforming performance is read as evidence of curriculum inadequacy and triggers curriculum redesign. Transforming this cultural orientation in curriculum development institutions, in teacher education programmes, in schools, in communities, and in government is the most fundamental and most difficult task of inclusive education curriculum reform in Nigeria.

The Inclusive Education Curriculum Framework for Nigeria (IECF-N): A Transformative Proposal

The Inclusive Education Curriculum Framework for Nigeria (IECF-N) proposed in this paper is a six-dimensional curriculum reform framework grounded in the theoretical foundations of Universal Design for Learning (CAST, 2018), the Index for Inclusion (Booth & Ainscow, 2002), the Human Rights Model of Disability (Quinn & Degener, 2002; Degener, 2017), and Disability Studies in Education (Gabel, 2005). The framework addresses curriculum philosophy, content, design, pedagogy, assessment, and teacher preparation as six interdependent dimensions of a comprehensive reform system in which each dimension is necessary but insufficient without the others. Figure 1 below represents the conceptual architecture of the IECF-N.

Table 2

The Inclusive Education Curriculum Framework for Nigeria (IECF-N): Six Dimensions

S/N	Dimension	Core Principle	Key Components	Theoretical Grounding
1	Inclusive Curriculum Philosophy	Disability and difference are normal human variation; all learners have the right to access and progress in a common curriculum	Rights-based framing; deficit thinking critique; diversity as pedagogical resource; belonging and participation as core outcomes	Oliver (1990); Gabel (2005); Booth & Ainscow (2002); CRPD Art. 24 (2006)
2	Inclusive Curriculum Content	Curriculum content must reflect the diversity of humanity and value the knowledge, culture and identity of all learner communities	Disability history and culture; cultural diversity integration; multiple knowledge systems; anti-discrimination content; emotional and social learning	Battiste (2013); Sleeter (2005); Gardner (1983); UNESCO (2017)
3	Accessible Curriculum Design (UDL)	Curriculum must be proactively designed to be accessible to all learners through multiple modalities of representation, action and engagement	Multi-format materials (print, Braille, audio, digital); tiered learning objectives; scaffolded content; visual, tactile and auditory pathways; accessible digital resources	CAST (2018); Rose & Meyer (2002); Hitchcock et al. (2002)



Qualitative Study on an Inclusive Education Curriculum in ... Augustine, W. S. (2026)

4	Differentiated and Inclusive Pedagogy	Instruction must be flexibly designed to meet diverse learning needs without sorting, tracking or segregating learners	Differentiated instruction; cooperative learning; peer tutoring; flipped classroom; learning stations; explicit scaffolding; culturally responsive teaching	Vygotsky (1978); Tomlinson (2001); Udvari-Solner (1995); Gay (2010)
5	Authentic and Flexible Assessment	Assessment must provide all learners with equitable means of demonstrating their learning through flexible format and process	Alternative and augmentative assessment; portfolio evidence; oral assessment; IEPs; extended time; assistive technology in assessment; formative assessment priority	Wortham (2012); McAfee et al. (2004); Dyssegaard & Larsen (2013)
6	Transformative Teacher Education	All teachers must be prepared to teach all learners through integrated inclusive education competence development	Pre-service UDL training; disability awareness; differentiated instruction skills; Braille and NSL literacy; IEP development; collaborative professional learning	Ainscow (2020); UNESCO (2017); Obiakor et al. (2012); CAST (2018)

Note. IECF-N = Inclusive Education Curriculum Framework for Nigeria; UDL = Universal Design for Learning; NSL = Nigerian Sign Language; IEP = Individual Education Plan. Source: Author's original framework synthesis (2025).

Dimension 1: Inclusive Curriculum Philosophy, Reframing the Foundational Commitment

The first and most foundational dimension of the IECF-N is the explicit adoption and institutional embedding of a rights-based, social model-informed philosophy of inclusion as the organising value of the Nigerian educational system. This is not merely a philosophical preamble to the practical curriculum reform components that follow it is the epistemological bedrock without which no practical curriculum change will be sustained or spread. A curriculum philosophy that continues to locate educational difficulty within the child that sees diverse learners as special needs rather than normal human variation will persistently generate deficit-oriented practices regardless of what the curriculum documents say (Oliver, 1990; Gabel, 2005; Ainscow & Miles, 2008). Concretely, the adoption of an inclusive curriculum philosophy in Nigeria requires: the explicit revision of the National Policy on Education (2013) to replace its special needs education framework with a rights-based inclusive education framework aligned with the CRPD and CRPD General Comment No. 4; the development of a National Statement on Inclusive Education Values that is mandatory reading for all teachers, administrators, and curriculum developers; the incorporation of disability rights, the social model of disability, and inclusive education philosophy as mandatory components of all teacher education programmes; and the public celebration of disability culture, achievement, and identity in the official curriculum and in public educational discourse through textbook representation, school events, and public media to displace the deficit and charity narratives that currently frame disability in Nigerian public culture (Gabel, 2005; Booth & Ainscow, 2002; Degener, 2017).

Dimension 2: Inclusive Curriculum Content, Whose Knowledge Is It?

The second dimension of the IECF-N addresses the content of the curriculum what is taught, whose knowledge is represented, and whose experience is valued or excluded by the selection and organisation of curriculum content. Standard Nigerian curriculum content largely reflects the knowledge, experience, and perspective of the dominant, non-disabled, urban, English-speaking majority rendering invisible and valueless the knowledge, cultural practices, histories, and intellectual contributions of persons with disabilities, rural communities, minority language groups, nomadic peoples, and other marginalised communities (Battiste, 2013; Sleeter, 2005; Obiakor et al., 2012). An inclusive curriculum content reform would require the explicit integration of disability history, culture, and achievement into the mainstream curriculum across subjects and levels so that Nigerian children learn about the scientific contributions of Stephen Hawking, the artistic achievements of deaf artists like Francisco Goya, the mathematical genius of blind mathematicians like Leonhard Euler, and the advocacy leadership of Nigerian disability rights activists. It would require the integration of culturally responsive content from all major Nigerian ethnic, linguistic, and community traditions representing the knowledge systems, oral literature, historical experiences, and contemporary perspectives of Hausa, Yoruba, Igbo, Fulani, Tiv, Kanuri, Ijaw, and hundreds of other Nigerian communities in the mainstream curriculum. And it would require explicit anti-discrimination,



Qualitative Study on an Inclusive Education Curriculum in ... Augustine, W. S. (2026)

human rights, and inclusive values content teaching all Nigerian children, from the earliest years, that diversity is a social strength, that disability is a form of human variation deserving respect and accommodation, and that every person has equal dignity and rights (Gardner, 1983; Sleeter, 2005; UNESCO, 2017).

Dimension 3: Accessible Curriculum Design, Universal Design for Learning in Nigerian Schools

The third dimension of the IECF-N is the systematic application of Universal Design for Learning principles to Nigerian curriculum design transforming curriculum materials, content organisation, and learning resource production so that all learners can access the same curriculum through the modality that best matches their sensory, cognitive, and communicative profile (CAST, 2018; Rose & Meyer, 2002; Hitchcock et al., 2002). In practical terms for Nigeria, UDL-informed curriculum design requires five priority interventions. First, NERDC should mandate the simultaneous production of all national curriculum textbooks and learning materials in multiple formats, print, Braille, digital accessible PDF, audio, and large print, as a condition of publication approval, with dedicated production funding allocated in the NERDC annual budget. Second, the National Information Technology Development Agency (NITDA) should partner with NERDC to develop and freely distribute a National Inclusive Digital Learning Repository, an open-access online platform providing accessible digital curriculum materials for all subjects and levels, compatible with mainstream and specialist assistive technologies. Third, curriculum frameworks should adopt tiered learning objectives, specifying the same core conceptual learning objective but providing three tiers of content complexity, pacing, and support level that enable students at different readiness levels to engage with the same curriculum concept at the appropriate depth. Fourth, all UBEC-funded classroom construction and renovation projects should incorporate Universal Design building principles, accessible furniture, flexible classroom layouts compatible with learning centre organisation, adequate lighting and acoustics, and provision for assistive technology infrastructure. Fifth, Nigerian Sign Language (NSL) should be formally recognised as an official language of instruction and its use mandated in all educational settings serving students who are Deaf or hard of hearing, with qualified NSL interpreters provided as a matter of rights.

Dimension 4: Differentiated and Inclusive Pedagogy, From One-Size-Fits-All to All-Sizes-Fit

The fourth dimension of the IECF-N differentiated and inclusive pedagogy is the dimension most directly experienced by students in the daily reality of the classroom. Differentiated instruction, developed by Tomlinson (2001) and grounded in Vygotsky's (1978) zone of proximal development, is the pedagogical approach through which teachers provide genuinely inclusive learning experiences by systematically varying the content, process, product, and learning environment of instruction to match the diverse readiness levels, learning profiles, and interests of all learners in the class. Differentiation does not mean providing different content to different students it means providing the same core learning objectives through multiple pathways, with varying levels of scaffolding, support, pace, and modality, so that every student can access the objective from their current developmental starting point and progress toward it at an appropriate rate with appropriate support. Cooperative learning, the structured organisation of students into heterogeneous collaborative learning groups where mutual peer support, shared problem-solving, and collective knowledge construction enable diverse learners to contribute according to their strengths and benefit from collective intelligence is a particularly powerful and culturally resonant inclusive pedagogy for Nigerian classrooms, where Ubuntu-inspired communal values and cooperative social norms align naturally with collaborative learning structures (Udvari-Solner, 1995; Vygotsky, 1978). Peer tutoring the structured pairing of a more competent peer with a less competent peer for reciprocal tutoring in which both benefit from the teaching and learning relationship leverages the social capital of diverse classrooms as a learning resource. Learning stations the organisation of the classroom into themed activity areas where students rotate through structured activities addressing the same learning objective through different modalities provide the operational infrastructure for simultaneous, multi-level differentiated instruction without requiring the teacher to deliver multiple parallel lessons. These pedagogical strategies are not exotic or expensive innovations they require primarily a reorientation of professional practice supported by professional development, not additional capital investment.

Dimension 5: Authentic and Flexible Assessment, Measuring Learning, Not Conformity

The fifth dimension of the IECF-N addresses the assessment barrier the systematic exclusion of learners with disabilities and learning differences from demonstrating their knowledge and capabilities through standard examination formats designed for non-disabled students. Authentic assessment assessment that evaluates students' actual performance on meaningful, real-world tasks rather than their ability to respond to standardised test items in prescribed formats is inherently more inclusive than standardised examinations because it naturally accommodates diverse performance modalities

Qualitative Study on an Inclusive Education Curriculum in ... Augustine, W. S. (2026)

(Wortham, 2012; McAfee et al., 2004). A student with dyslexia who struggles to produce a grammatically perfect written essay may demonstrate sophisticated understanding of the same content through a structured oral presentation, a graphic organiser, or a multimedia production. A student with physical disability affecting handwriting may demonstrate identical mathematical competence through voice-to-text software or a calculator-aided computation task. An authentic assessment system values the demonstration of learning in whatever modality the student can access not the demonstration of conformity to a fixed, inaccessible format. For Nigeria, the transformation of assessment toward authentic, flexible, and inclusive formats requires: the immediate development of an Alternative Assessment Policy for the West African Examinations Council (WAEC) and the National Examinations Council (NECO), specifying the full range of reasonable assessment accommodations extended time, reader assistance, scribe assistance, alternative format question papers, oral examination options, and assistive technology access that students with disabilities are entitled to receive without discrimination; the development of a national Individual Education Plan (IEP) framework that provides each student with a disability a legally binding, annually reviewed plan specifying their specific curriculum objectives, assessment accommodations, support services, and transition goals; the training of all WAEC and NECO examination officers in the implementation of assessment accommodations; and the mandatory incorporation of portfolio-based formative assessment as a significant component of school-based assessment at all levels, reducing excessive dependence on terminal examinations that systematically disadvantage the most diverse learners (Dyssegaard & Larsen, 2013; Wortham, 2012).

Dimension 6: Transformative Teacher Education, Preparing Every Teacher for Every Learner

The sixth and most operationally critical dimension of the IECF-N is the comprehensive transformation of teacher education both pre-service and in-service to prepare every Nigerian teacher with the inclusive pedagogical knowledge, skills, dispositions, and professional identity needed to teach effectively in diverse classrooms. Ainscow (2020) argued, with compelling evidence from international inclusive education reform experience, that teacher preparation is the single most important investment in inclusive education system change that even the most excellent curriculum framework, the most accessible learning materials, and the most progressive assessment policy will be nullified in the hands of teachers who lack the professional capacity to implement them. Nigerian teacher education currently produces graduates who are equipped to teach a narrow norm of learner the imagined non-disabled, standard-paced, English-proficient, urban student and who are professionally helpless in the face of disability, language difference, learning diversity, or social-emotional complexity (Obiakor et al., 2012; UNESCO, 2017; Garuba, 2003). Transformative inclusive education teacher preparation in Nigeria requires minimum six competence domains to be integrated across all pre-service teacher education programmes as non-negotiable components. First, disability studies and the social model equipping all teachers with the theoretical framework to understand disability as social construction rather than individual pathology, to challenge deficit thinking, and to practise from a rights-based philosophical foundation. Second, Universal Design for Learning equipping all teachers with the curriculum design skills to plan proactively for learner diversity through flexible representation, action, expression, and engagement strategies. Third, differentiated instruction equipping all teachers with the pedagogical skills to deliver the same curriculum objectives through multiple modalities, pacing options, and support levels in the same inclusive classroom. Fourth, alternative and augmentative communication (AAC) and disability-specific pedagogies providing all teachers with foundational competence in Nigerian Sign Language, basic Braille literacy, AAC communication systems, and disability-specific instructional adaptations for the most common disability categories (visual impairment, hearing impairment, physical disability, intellectual disability, autism, learning disabilities). Fifth, Individual Education Plan development and collaborative service provision equipping teachers with the skills to develop, implement, monitor, and review IEPs in collaboration with special education specialists, therapists, families, and students. Sixth, culturally responsive and anti-discriminatory pedagogy equipping teachers with the ability to recognise and challenge the cultural, linguistic, and social biases embedded in curriculum and instruction, and to create genuinely inclusive classroom communities that value and utilise learner diversity as a pedagogical resource (Gay, 2010; Tomlinson, 2001; Vygotsky, 1978).

Special Education and General Education: Toward a Unified Inclusive Teacher Education

The current organisational structure of Nigerian teacher education perpetuates rather than resolves the segregated model of provision for students with disabilities. Special education is a separate academic department, producing specialist teachers trained to work in segregated special schools; general education departments produce classroom teachers trained to teach the standard curriculum to non-disabled students. The division mirrors and reinforces the institutional separation of special



Qualitative Study on an Inclusive Education Curriculum in ... Augustine, W. S. (2026)

and mainstream education, making the professional collaboration required for genuinely inclusive classroom practice structurally difficult to achieve (Ainscow, 2020; Obiakor et al., 2012; UNESCO, 2017). The IECF-N proposes a fundamental restructuring of Nigerian teacher education toward a unified inclusive teacher education model in which all teacher education students whether in primary, secondary, early childhood, or vocational education programmes complete a mandatory inclusive education core that develops the six competence domains identified in Dimension 6 of the IECF-N. Within this common core, specialist tracks would allow students to develop deeper expertise in specific disability categories, AAC systems, or inclusive education leadership but the specialist expertise would be built upon a universal foundation of inclusive curriculum knowledge and differentiated pedagogical skill, rather than within a completely separate professional silo. This unified model, implemented in partnership with disability organisations and the National Commission for Persons with Disabilities, would over time create a teaching profession in which inclusion is not a specialist's domain but every teacher's professional responsibility a transformation that is both the most challenging and the most transformative investment Nigeria can make in its inclusive education future (Ainscow, 2020; CAST, 2018; UNESCO, 2017).

Conclusion: Inclusion as Educational Justice, Not Accommodation but Transformation

This paper has argued that inclusive education curriculum in Nigeria represents not a technical adjustment to an otherwise functional system but a profound transformation philosophical, epistemological, professional, and institutional of the entire educational enterprise. The evidence reviewed demonstrates that Nigeria's legal and policy commitments to inclusive education are extensive and binding encompassing the CRPD (2006), the Salamanca Statement (UNESCO, 1994), the SDGs (United Nations, 2015), and the DAPDA (Federal Republic of Nigeria, 2018). The gap between these commitments and the lived educational experience of Nigerian learners with disabilities and other marginalised identities is not a gap of good intentions it is a gap of curriculum infrastructure, pedagogical capacity, institutional culture, and fiscal commitment that no policy statement can bridge without deliberate, sustained, and adequately resourced curriculum and instruction reform. The Inclusive Education Curriculum Framework for Nigeria (IECF-N) proposed in this paper provides a theoretically grounded, practically actionable, and contextually responsive roadmap for that reform across six interconnected dimensions. Its implementation requires not a single dramatic intervention but a sustained, multi-stakeholder reform process in which curriculum developers, teacher educators, government officials, disability rights advocates, school communities, and learners with disabilities themselves collaborate as equal partners in constructing the inclusive educational system that every Nigerian child deserves and that Nigeria's human development future demands. Inclusive education is not the accommodation of difference it is the recognition that difference is the norm, that learning diversity is the human reality, and that educational systems that serve only the convenient majority are not quality systems but unjust ones. Nigeria's path to educational justice runs directly through curriculum and instruction reform and it is a path this paper has sought to illuminate. The following specific, targeted recommendations are proposed for the stakeholder groups with primary responsibility for advancing inclusive education curriculum reform in Nigeria:

Recommendations for the Federal Ministry of Education

1. Commission, develop, and publish a National Inclusive Education Curriculum Policy and Framework aligned with CRPD Article 24 and CRPD General Comment No. 4 that replaces the current special needs education framework with a rights-based, UDL-informed inclusive education framework as the governing curriculum policy for all Nigerian educational levels.
2. Establish a National Accessible Educational Materials Centre (NAEMC) within NERDC, mandated and resourced to produce all national curriculum textbooks and materials simultaneously in print, Braille, audio, digital accessible, and large-print formats, and to distribute these materials freely to all schools serving students with print-access disabilities.
3. Develop and implement a National Individual Education Plan (IEP) Policy, specifying the legal entitlement of every student with a disability to an annually reviewed, individually tailored educational plan, the process for developing and monitoring IEPs, the professional responsibilities of teachers and specialists in IEP implementation, and the accountability mechanisms for ensuring IEP quality.
4. Revise the minimum qualification standards for all Nigerian teachers to include mandatory pre-service training in inclusive education across the six competence domains of the IECF-N, and create a National Inclusive Education Teacher Certification scheme that recognises and rewards inclusive education specialisation.



Qualitative Study on an Inclusive Education Curriculum in ... Augustine, W. S. (2026)

5. Partner with the National Information Technology Development Agency (NITDA) to develop and freely distribute a National Inclusive Digital Learning Repository — an accessible open-education platform providing all national curriculum materials in multiple digital formats, compatible with mainstream and specialist assistive technologies.

Recommendations for the Nigerian Educational Research and Development Council (NERDC)

1. Undertake an immediate audit of all current national curriculum documents, textbooks, and examination frameworks for accessibility and inclusivity, identifying disability-specific, linguistic, and cultural exclusion barriers, and developing a phased, resourced revision programme to address them within a defined timeline.
2. Establish a curriculum review process for all future national curriculum development that mandatorily includes persons with disabilities, disability rights organisations, and inclusive education specialists as core members of all curriculum development committees recognising that inclusive curriculum cannot be designed without the expertise and lived experience of those most affected by curriculum exclusion.
3. Develop an inclusive curriculum guidelines document for each subject area and educational level, specifying how the subject's core concepts, skills, and content can be delivered, accessed, and assessed through multiple modalities consistent with UDL principles and IECF-N Dimension 3.
4. Partner with disability organisations including the National Association of Blind Nigerians, the Nigerian Association of the Deaf, and Cerebral Palsy Nigeria — to develop and validate curriculum materials and assessment tools that reflect the specific learning and access needs of different disability communities.

Recommendations for Universities and Teacher Education Institutions

1. Restructure all NCE and B.Ed. teacher education programmes to include a mandatory inclusive education core spanning the six competence domains of IECF-N Dimension 6: disability studies and the social model; Universal Design for Learning; differentiated instruction; disability-specific pedagogies (including basic Braille, NSL, and AAC); IEP development; and culturally responsive teaching.
2. Establish university-school inclusive education partnership programmes through which teacher education faculty provide sustained, school-based mentoring, coaching, and collaborative professional learning to practising teachers in partnership mainstream schools creating living laboratories for inclusive pedagogy innovation that simultaneously advance research, improve school practice, and develop teacher educator expertise.
3. Develop and institutionalise specialist pathways within the B.Ed. and M.Ed. curriculum for inclusive education leadership preparing curriculum specialists, inclusive education co-ordinators, and teacher educators with the advanced expertise in UDL curriculum design, IEP management, AAC, and inclusive school leadership needed to drive system-wide reform.
4. The curriculum and instruction academic community should engage actively in policy advocacy, public discourse, and government consultations on inclusive education reform publishing evidence syntheses, developing policy briefs, and contributing expertise to legislative and regulatory processes exercising the scholarly leadership role that the national inclusive education reform agenda demands.

Recommendations for State Governments and School Administrators

1. State Ministries of Education should develop state-level inclusive education implementation plans, with measurable annual targets for increasing the proportion of children with disabilities enrolled in mainstream schools, the proportion of mainstream teachers trained in inclusive pedagogy, and the proportion of schools with accessible physical infrastructure.
2. All state UBEC capital project submissions should include an inclusive infrastructure component covering accessible toilets, ramps, tactile pathways, adequate acoustic treatment, and assistive technology provision as a mandatory element, with UBEC instructed to prioritise inclusive infrastructure in its grant allocation criteria.
3. School administrators should conduct annual inclusive education self-reviews using the Index for Inclusion framework (Booth & Ainscow, 2002), engaging students, parents, and community members alongside teachers and staff, to systematically identify and address barriers to inclusion in their school's culture, policies, and practices.
4. School communities should develop community sensitisation programmes engaging religious leaders, traditional rulers, parents, and community members to address the spiritual and cultural stigmatisation of disability that prevents families from enrolling children with disabilities in school and creates hostile peer environments for those who are enrolled.



Qualitative Study on an Inclusive Education Curriculum in ... Augustine, W. S. (2026)

Recommendations for Disability Rights Organizations and Civil Society

1. Disability rights organisations should develop and pursue strategic litigation using DAPDA 2018 and the CRPD to enforce the right to inclusive education for specific children denied access to mainstream schooling or refused reasonable accommodation in examinations creating legal precedents that establish the enforceability of inclusive education rights in Nigerian courts.
2. Organisations of persons with disabilities should maintain monitoring data on inclusive education implementation tracking DAPDA compliance, WAEC/NECO accommodation provision, accessible materials availability, and teacher preparation quality and publish annual inclusive education scorecards for state and federal government accountability.
3. Disability organisations should form a National Inclusive Education Coalition that coordinates advocacy, policy engagement, professional development, and community sensitisation activities across all disability categories and all educational levels, providing a unified civil society voice for inclusive education reform.

References

- Ainscow, M. (2020). Promoting inclusion and equity in education: Lessons from international experiences. *Nordic Journal of Studies in Educational Policy*, 6(1), 7–16. <https://doi.org/10.1080/20020317.2020.1729587>
- Ainscow, M., & Miles, S. (2008). Making education for all inclusive: Where next? *Prospects*, 38, 15–34. <https://doi.org/10.1007/s11125-008-9055-0>
- Anaduaka, U. S., & Okafor, C. F. (2013). Children with special educational needs (SEN) in Nigeria: Any hope for them? *Academic Journal of Interdisciplinary Studies*, 2(2), 217–224.
- Barnes, C., & Mercer, G. (2003). *Disability*. Polity Press.
- Battiste, M. (2013). *Decolonizing education: Nourishing the learning spirit*. Purich Publishing.
- Booth, T., & Ainscow, M. (2002). *Index for inclusion: Developing learning and participation in schools* (2nd ed.). Centre for Studies on Inclusive Education.
- CAST. (2018). *Universal Design for Learning guidelines version 2.2*. <http://udlguidelines.cast.org>
- Connor, D. J., Gabel, S. L., Gallagher, D. J., & Morton, M. (2008). Disability studies and inclusive education — implications for theory, research, and practice. *International Journal of Inclusive Education*, 12(5–6), 441–457.
- Cummins, J. (2001). *Negotiating identities: Education for empowerment in a diverse society* (2nd ed.). California Association for Bilingual Education.
- Degener, T. (2017). A new human rights model of disability. In V. Della Fina, R. Cera, & G. Palmisano (Eds.), *The United Nations Convention on the Rights of Persons with Disabilities: A commentary* (pp. 41–59). Springer.
- Dyssegaard, C. B., & Larsen, M. S. (2013). *Evidence on inclusive education*. Danish Clearinghouse for Educational Research, Aarhus University.
- Eleweke, C. J., & Rodda, M. (2002). The challenge of enhancing inclusive education in developing countries. *International Journal of Inclusive Education*, 6(2), 113–126.
- Federal Republic of Nigeria. (1999). *Constitution of the Federal Republic of Nigeria (as amended)*. Federal Government Press.
- Federal Republic of Nigeria. (2013). *National Policy on Education* (6th ed.). NERDC Press.
- Federal Republic of Nigeria. (2018). *Discrimination Against Persons with Disabilities (Prohibition) Act*. Federal Government Press.
- Ferri, B. A. (2012). Undermining inclusion? A critical reading of Response to Intervention (RTI). *International Journal of Inclusive Education*, 16(8), 863–880.
- Gabel, S. L. (Ed.). (2005). *Disability studies in education: Readings in theory and method*. Peter Lang.
- Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences*. Basic Books.
- Garuba, A. (2003). Inclusive education in the 21st century: Challenges and opportunities for Nigeria. *Asia Pacific Disability Rehabilitation Journal*, 14(2), 191–200.
- Gay, G. (2010). *Culturally responsive teaching: Theory, research, and practice* (2nd ed.). Teachers College Press.
- Hitchcock, C., Meyer, A., Rose, D., & Jackson, R. (2002). Providing new access to the general curriculum: Universal Design for Learning. *Teaching Exceptional Children*, 35(2), 8–17.
- McAfee, O., Leong, D. J., & Bodrova, E. (2004). *Basics of assessment: A primer for early childhood educators*. NAEYC.
- National Commission for Persons with Disabilities. (2020). *Nigeria disability report 2020*. Federal Ministry of Humanitarian Affairs, Disaster Management and Social Development.
- Obiakor, F. E., Eskay, M., & Afolabi, E. R. I. (2012). Special education in Nigeria: Shifting paradigms. In A. F. Rotatori, F. E. Obiakor, & J. P. Bakken (Eds.), *Advances in special education: History of special education* (Vol. 21, pp. 191–212). Emerald.
- Oliver, M. (1990). *The politics of disablement*. Macmillan.



Qualitative Study on an Inclusive Education Curriculum in ... Augustine, W. S. (2026)

- Quinn, G., & Degener, T. (2002). Human rights and disability: The current use and future potential of United Nations human rights instruments in the context of disability. United Nations Office of the High Commissioner for Human Rights.
- Rose, D. H., & Meyer, A. (2002). Teaching every student in the digital age: Universal Design for Learning. ASCD.
- Shakespeare, T. (2014). Disability rights and wrongs revisited (2nd ed.). Routledge.
- Sleeter, C. (2005). Un-standardizing curriculum: Multicultural teaching in the standards-based classroom. Teachers College Press.
- Tomlinson, C. A. (2001). How to differentiate instruction in mixed-ability classrooms (2nd ed.). ASCD.
- Udvari-Solner, A. (1995). A process for adapting curriculum in inclusive classrooms. In R. A. Villa & J. S. Thousand (Eds.), Creating an inclusive school (pp. 110–124). ASCD.
- UNESCO. (1994). The Salamanca Statement and framework for action on special needs education. UNESCO.
- UNESCO. (2017). A guide for ensuring inclusion and equity in education. UNESCO Publishing.
- UNESCO. (2021). Global Education Monitoring Report 2021/2: Non-state actors in education. UNESCO Publishing.
- UNICEF. (2022). Education for every child: Situation analysis of inclusive education in Nigeria. UNICEF Nigeria Country Office.
- United Nations. (1989). United Nations Convention on the Rights of the Child. United Nations General Assembly Resolution 44/25.
- United Nations. (2006). Convention on the Rights of Persons with Disabilities (CRPD). United Nations General Assembly.
- United Nations. (2015). Transforming our world: The 2030 Agenda for Sustainable Development. Resolution A/RES/70/1.
- United Nations Committee on the Rights of Persons with Disabilities. (2016). General Comment No. 4 on the right to inclusive education (Article 24 CRPD). CRPD/C/GC/4.
- Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Harvard University Press.
- World Health Organization. (2011). World report on disability. WHO Press.
- Wortham, S. C. (2012). Assessment in early childhood education (6th ed.). Pearson.



Leveraging Artificial Intelligence Technology for an effective Curriculum at Secondary School Level of Education in Nigeria: Applications, Challenges and Policy Imperatives

AUGUSTINE, Walakan Shede

augustinewalakan@gmail.com

07064787520

Department of Science Education, Faculty of Education, Federal University Wukari, Taraba State, Nigeria

Abstract

The integration of Artificial Intelligence (AI) into secondary education represents one of the most consequential technological shifts in contemporary educational practice. Nigeria as a nation with the world's largest out-of-school population, a teacher–student ratio averaging 1:55 in public schools, and a secondary school curriculum under active revision by the Nigerian Educational Research and Development Council (NERDC) confronts both the transformative potential and the structural constraints of AI-mediated curriculum delivery with particular urgency. This article pursues three analytical objectives: to examine the documented applications of AI technologies within Nigerian secondary school curriculum contexts; to identify and theorise the structural challenges limiting effective AI integration; and to advance a framework of evidence-based policy imperatives for the responsible and equitable incorporation of AI into the Nigerian secondary school curriculum. The study employs a systematic qualitative synthesis drawing on peer-reviewed scholarship, inter-governmental data, experimental evidence from the Edo State randomised controlled trial (2024), policy documents including Nigeria's National Artificial Intelligence Strategy (2024) and the NERDC curriculum revision (2023), and documented initiatives by government agencies, EdTech platforms, and development partners. AI technologies encompassing intelligent tutoring systems, adaptive learning platforms, automated assessment, generative AI tools, and predictive analytics hold demonstrable potential to address the systemic learning crisis afflicting Nigerian secondary education. The World Bank-supported Edo State randomised controlled trial demonstrated learning gains of 0.3 standard deviations in English, equivalent to approximately two academic years' progress in six weeks, through structured generative AI tutoring. However, seven structural challenges constrain the generalisation of these gains: digital infrastructure deficits affecting 43.3% of communities; inadequate teacher readiness; entrenched equity disparities; misalignment between existing NERDC curriculum frameworks and AI pedagogical models; data privacy governance gaps; AI-induced academic dishonesty risks; and an insufficient longitudinal empirical evidence base. The Nigerian secondary school curriculum stands at a technological inflection point. Realising AI's transformative potential requires not the uncritical adoption of globally developed tools but a structurally grounded, equity-centred, and pedagogically coherent integration framework one in which NERDC curriculum revision, teacher professional development, infrastructure investment, and regulatory governance are pursued as a coordinated national programme rather than as isolated initiatives.

Keywords: artificial intelligence; Nigerian secondary school curriculum; intelligent tutoring systems; adaptive learning

Introduction

The emergence of artificial intelligence as a practical instrument of educational delivery has prompted a fundamental reassessment of how curriculum is designed, mediated, and assessed across education systems globally. Within a decade, AI technologies encompassing machine learning algorithms, natural language processing models, computer vision systems, and the generative AI architectures exemplified by large language models have transitioned from research laboratory novelties to classroom-deployable tools with documented, measurable impacts on learner outcomes (Selwyn, 2022; Popenici & Kerr, 2017). The pace of this transition has, in many situations, outrun both the regulatory frameworks required to govern it and the pedagogical frameworks required to deploy it responsibly. Within Nigeria, this transition unfolds against an educational backdrop characterised by acute systemic challenges. The public secondary school system operates at an average teacher–student ratio of 1:55 (NERDC, 2023, as cited in Spursmedia, 2025), with 60 per cent of students estimated to lack foundational literacy (World Bank, 2022) and the national out-of-school population standing at 18.3 million the highest globally (Save the Children, 2026). The secondary school curriculum, administered by the Nigerian Educational Research and Development Council and most recently revised through a twelve-state consultative process in 2023 (NERDC, 2023), faces implementation challenges that are simultaneously structural (inadequate infrastructure), human (teacher qualification and training deficits), and institutional (misalignment between curriculum design and assessment architecture). It is within this context that the prospect of AI-mediated curriculum delivery acquires particular significance not as an optional technological supplement to an otherwise functional educational system but as a potential structural instrument for addressing learning crises of a scale that conventional pedagogical approaches have demonstrably

Leveraging Artificial Intelligence Technology for an effective Curriculum at ... Augustine, W. S. (2026)

been unable to resolve. The Nigerian government's policy posture toward AI in education has accelerated substantially since 2023. The National Artificial Intelligence Strategy (NAIS), published in 2024, articulates five strategic pillars for AI integration across sectors, with education identified as a priority domain (Jenna, 2024). The National Centre for Artificial Intelligence and Robotics (NCAIR) has been strengthened as the institutional vehicle for national AI capability development (Nucamp, 2025). In October 2025, the Minister of Education, Dr Tunji Alausa, launched the Digitalisation of Public Schools Initiative and announced the embedding of AI, educational technology, robotics, coding, and digital literacy across school curricula (Guardian Nigeria, 2025). The federal government has further mandated the West African Examinations Council (WAEC) and the National Examinations Council (NECO) to adopt computer-based testing by 2026 (Guardian Nigeria, 2025), and the 2026 federal budget earmarks ₦7 billion for online learning platforms in secondary schools (Guardian Nigeria, 2026). These are, by any measure, ambitious commitments and their effective realisation depends entirely on the resolution of structural challenges that the policy documents themselves only partially acknowledge. The most consequential and methodologically rigorous evidence for AI's educational potential in Nigeria emerged from a 2024 randomised controlled trial conducted in nine public senior secondary schools in Edo State by World Bank researchers (De Simone et al., 2024). The trial, involving 800 first-year senior secondary students over six weeks, demonstrated that students who participated in structured, teacher-supervised generative AI tutoring sessions achieved learning gains of approximately 0.3 standard deviations in English, equivalent to roughly two academic years' progress, compared with peers in the control condition (World Bank, 2025; VoxDev, 2026). These results are significant not merely as evidence of AI's potential but as a model of the conditions under which that potential can be realised: structured pedagogical guardrails, active teacher facilitation, and deliberate prompting designed to promote reasoning rather than answer retrieval. This article situates these developments within a comprehensive analytical framework. Its central argument is that AI's potential contribution to the Nigerian secondary school curriculum is real, evidenced, and structurally significant but that realising it requires confronting a set of structural constraints that the current policy discourse consistently underweights. The article proceeds through the following structure: Section 2 reviews the policy and curriculum context; Section 3 maps the documented applications of AI in Nigerian secondary education; Section 4 analyses seven structural challenges; Section 5 presents an evidence-based policy framework; and Section 6 draws conclusions and identifies future research directions.

Policy and Curriculum Perspective

The NERDC Secondary School Curriculum and its 2023 Revision

The Nigerian secondary school curriculum is governed by the Nigerian Educational Research and Development Council (NERDC, 2023) under the *National Policy on Education* (Federal Republic of Nigeria, 2013). The Post-Basic Education and Career Development (PBECD) curriculum encompasses Senior Secondary School levels 1 through 3, providing the framework within which the West African Senior School Certificate Examination (WASSCE) and NECO Senior School Certificate Examination (SSCE) are designed. The 2023 curriculum revision introduced significant structural reforms: a competency-based orientation, the mandating of digital literacy and ICT as cross-curricular themes, the introduction of STEM integration across subject domains, and greater alignment with the knowledge and skills demands of a digital labour market (NERDC, 2023; Scholarclopedia, 2025). Critically, the 2023 revision acknowledges the role of educational technology in curriculum delivery without providing a systematic framework for AI-specific integration. The curriculum's digital literacy provisions while substantively more detailed than its predecessors do not yet specify AI literacy competencies as learning objectives, do not articulate pedagogical frameworks for teacher-supervised AI use, and do not establish protocols for assessment integrity in the context of generative AI accessibility (Mohammed et al., 2024). This lacuna creates what the present study designates an AI-curriculum alignment deficit: the condition in which AI tools are proliferating in the educational environment faster than the curriculum frameworks required to govern their pedagogical use are being developed.

Nigeria's National Artificial Intelligence Strategy (2024)

The National Artificial Intelligence Strategy (NAIS), published in 2024, represents Nigeria's most comprehensive governmental commitment to AI development to date. The strategy articulates five pillars: infrastructure development, AI governance and ethics, talent and skills development, research and innovation, and sector transformation (Jenna, 2024). Education is identified as a priority transformation domain, and the strategy acknowledges the potential of AI to address teacher shortages, personalise learning, and improve assessment systems.



Leveraging Artificial Intelligence Technology for an effective Curriculum at ... Augustine, W. S. (2026)

However, independent analysis of the NAIS has identified significant implementation gaps. Jenna (2024) concludes that the strategy 'is more optimistic, out of touch, and inadequate for the tasks ahead' specifically because it lacks actionable, time-bound implementation plans, sustainable funding mechanisms insulated from electoral cycles, and institutional design capable of coordinating AI deployment across the fragmented Nigerian educational governance landscape. The establishment of the National Centre for Artificial Intelligence and Robotics (NCAIR) (Nucamp, 2025) provides an institutional vehicle currently equipped with approximately 2,500 virtual CPUs and approximately one petabyte of storage capacity but its mandate and resources remain significantly below what systematic secondary school AI integration would require.

The Edo State Randomised Controlled Trial as Policy Evidence

The 2024 Edo State RCT constitutes the most methodologically rigorous empirical evidence currently available for AI's curriculum impact in Nigerian secondary schools and warrants extended discussion. Conducted by World Bank researchers, the trial enrolled 800 first-year senior secondary students in nine public schools and randomly assigned them to a treatment group, which attended structured after-school sessions twice weekly for six weeks using Microsoft Copilot (a GPT-4-based generative AI tool) under active teacher facilitation, or a control group (De Simone et al., 2024). The instructional design was deliberately structured to promote reasoning rather than answer retrieval. Students worked in pairs, engaged with carefully crafted prompts designed to scaffold analytical thinking, and operated under teacher supervision described as 'orchestration' rather than passive monitoring (De Simone et al., 2024). The treatment group outperformed the control group by 0.3 standard deviations overall and 0.24 standard deviations in English specifically (World Bank, 2025). Students also performed better on end-of-year examinations, suggesting durable rather than transient learning gains. VoxDev (2026) summarises the key finding: 'LLMs can deliver tutoring-like benefits at scale if embedded in structured routines with clear pedagogical guardrails, active facilitation, and monitoring to prevent over-reliance. The trial's limitations are as instructive as its findings. Frequent power and internet outages disrupted sessions throughout the six-week period, highlighting the foundational infrastructure requirements without which AI tools cannot operate reliably (De Simone et al., 2024). The after-school programme format bypassed the standard NERDC timetable, raising questions about how analogous results could be achieved within regular curriculum time. And the trial's geographic and school-type specificity nine public schools in one state limits the direct generalisability of its findings to Nigeria's diverse secondary school contexts.

Applications of AI in the Nigerian Secondary School Curriculum

The landscape of AI applications relevant to the Nigerian secondary school curriculum is both varied and rapidly evolving. Table 1 provides a structured mapping of the principal AI application categories, their functional descriptions, the Nigerian platforms and programmes through which they are currently deployed or being piloted, and their specific curriculum relevance. The analysis that follows examines each category with reference to the documented evidence of its application in the Nigerian secondary school setting.

Table 1. AI Application Categories in Nigerian Secondary Education: Platforms, Programmes, and Curriculum Relevance

AI Application Category	Functional Description	Nigerian Platforms / Programmes	Curriculum Relevance (with Citations)
Intelligent Tutoring Systems (ITS)	Provide individualised, adaptive instruction that responds to learner performance in real time; simulate one-to-one tutoring at scale	uLesson (Nigeria-based); Study AI; Photomath; Khan Academy AI; Microsoft Copilot (Edo State pilot, 2024)	Addresses 1:55 teacher–student ratio; potential to halve foundational literacy deficits (World Bank, 2025)
Automated and Adaptive Assessment	Machine-scored objective tests; personalised question sequencing based on mastery; real-time feedback	Study AI (WAEC/NECO/JAMB prep); NBTE's digital trade syllabuses; Springboard Digital (pending 2026 WAEC CBT mandate)	Reduces examination malpractice; generates disaggregated performance data for curriculum planning (Guardian Nigeria, 2025)
Personalised Learning Platforms	Analyse learner histories to generate customised study pathways, pacing,	Century Tech; uLesson; Prepclass; ScholarX (Nigeria)	Addresses 60% foundational literacy gap; compensates for under-qualified generalist teachers (Spursmedia, 2025)



	and content recommendations		
AI-Supported Content Creation	Automated curriculum-aligned content generation; translation into local languages; accessibility features	NERDC e-Curriculum AI augmentation; multilingual LLM development (NCAIR)	Enables localised, culturally resonant curriculum delivery in Hausa, Yoruba, Igbo, and other Nigerian languages (Samuel et al., 2025)
Predictive Analytics and Learning Analytics	Early identification of at-risk students; teacher workload optimisation; resource allocation forecasting	UBEC-piloted analytics dashboards; tertiary sector platforms (National Open University of Nigeria)	Supports targeted intervention before failure; data-driven curriculum revision by NERDC (Ogunode & Ejike, 2023)
Generative AI as Virtual Tutor	Large language models deployed as structured conversational tutors under teacher supervision; reasoning-focused prompting	GPT-4/Microsoft Copilot (Edo State RCT, 2024); Study AI tutoring module	Demonstrated 0.3 standard deviation learning gains in English; two years' progress in six weeks (De Simone et al., 2024; World Bank, 2025)

Intelligent Tutoring Systems and Adaptive Learning Platforms

Intelligent tutoring systems (ITS) constitute the most extensively theorised category of AI educational application, providing individualised, adaptive instruction that responds dynamically to learner performance data (Woolf, 2009, as cited in Mohammed et al., 2024). Within the Nigerian context, ITS deployment has been driven primarily by the private and NGO sectors rather than by government-led curriculum integration. Lagos-based uLesson, founded in 2019, employs AI-driven content delivery to serve approximately two million learners with curriculum-aligned instructional materials (Spursmedia, 2025). The platform's AI architecture analyses individual learner performance to identify conceptual gaps and recommend targeted remediation a form of personalised curriculum delivery that the public school system's 1:55 teacher–student ratio structurally precludes. The curriculum relevance of ITS is particularly acute in the context of Nigeria's foundational learning crisis. World Bank (2022) estimates that 60 per cent of Nigerian secondary school students lack the foundational literacy and numeracy competencies that the NERDC curriculum presupposes at secondary entry level a deficit that conventional classroom instruction, constrained by large class sizes and resource scarcity, has been unable to address at scale. Adaptive ITS platforms have the theoretical and, in some contexts, demonstrated capacity to identify these foundational gaps at the individual student level and to provide the targeted, repeated practice that foundational skill development requires. The challenge of deploying this capacity equitably across Nigeria's 10,905 public secondary schools (Federal Ministry of Education, 2023) remains the central policy design problem.

Generative AI as Curriculum Mediator

The emergence of generative AI tools large language models capable of generating coherent, contextually appropriate text in response to natural language prompts has introduced a qualitatively new category of AI educational application whose curriculum implications are simultaneously promising and deeply contested. The Edo State RCT's use of Microsoft Copilot as a structured after-school tutor provides the most rigorous Nigerian evidence for generative AI's curriculum potential (De Simone et al., 2024), while the launch of Study AI's WAEC/NECO/JAMB preparation platform (Edugist, 2026) exemplifies the rapid commercialisation of generative AI for curriculum-adjacent examination preparation purposes. The pedagogical distinction between productive and unproductive uses of generative AI in curriculum contexts is analytically critical. VoxDev (2026) emphasises that LLMs' educational value depends fundamentally on *how* they are used: tools designed with 'clear pedagogical guardrails, active facilitation, and monitoring to prevent over-reliance' produce measurable learning gains, while tools that facilitate answer retrieval without reasoning engagement may undermine the very learning objectives they purport to support. This distinction has direct implications for NERDC curriculum design: AI tool integration requires not merely technology provision but explicit specification of pedagogical models how AI tools should be used, by whom, under what supervision, and for what curricular purposes that the current NERDC framework does not yet provide (Mohammed et al., 2024).



Leveraging Artificial Intelligence Technology for an effective Curriculum at ... Augustine, W. S. (2026)

AI-Supported Assessment and Examination Preparation

The Nigerian secondary school assessment architecture organised primarily around the WAEC West African Senior School Certificate Examination and the NECO Senior School Certificate Examination has become an increasingly important site of AI application. Study AI, an AI-powered examination preparation platform explicitly designed around the Nigerian curriculum, provides senior secondary students with personalised study pathways, intelligent feedback, mock examination practice, and gamified motivation for WAEC, NECO, and JAMB preparation (Edugist, 2026). The platform analyses learner performance across subjects and topics to generate focused study plans directing attention to identified areas of weakness, providing immediate AI-generated explanations for incorrect responses. The federal government's mandate that WAEC and NECO adopt computer-based testing by 2026 (Guardian Nigeria, 2025) creates a structural opportunity for AI-enhanced assessment: computer-delivered examinations generate the digital performance data that adaptive AI systems require to personalise instruction and provide timely diagnostic feedback. The policy rationale — reducing examination malpractice and aligning Nigeria with international assessment practices — is complemented by an AI-integration rationale: disaggregated, digital examination data can, for the first time, provide NERDC curriculum planners with the granular evidence of learning achievement and curriculum coverage gaps that current assessment systems do not produce (Mohammed et al., 2024).

Content Localisation and Multilingual AI

A dimension of AI's curriculum potential that is frequently underweighted in the Nigerian educational technology literature is the capacity of AI tools specifically large language models and speech recognition systems to deliver curriculum content in Nigerian indigenous languages. Nigeria's secondary school curriculum is delivered primarily in English, a language that, for the majority of students in northern and rural areas, is a second or third language of instruction (Samuel et al., 2025). AI-powered translation and content generation tools offer the prospect of NERDC curriculum-aligned instructional materials delivered in Hausa, Yoruba, Igbo, Fulfulde, and other languages a form of curriculum personalisation that addresses a dimension of educational inequity that teacher-delivered instruction has been structurally unable to address at scale. The NCAIR has initiated multilingual large language model development as a component of Nigeria's NAIS implementation (Nucamp, 2025), and Samuel et al. (2025) recommend that NERDC and NCAIR support the creation of 'AI-powered adaptive learning platforms that respect local languages' as a condition of equitable AI integration. The curriculum implications of this recommendation are significant: a genuinely inclusive AI-curriculum integration framework must treat language accessibility as a first-order design requirement rather than a post-hoc adaptation.

Structural Challenges to AI Integration in the Nigerian Secondary School Curriculum

The applications documented in Section 3 are demonstrably promising. However, their translation from controlled pilots and private sector platforms into the lived curriculum experience of Nigeria's 10,905 public secondary schools confronts a set of structural challenges that neither the NAIS nor current NERDC curriculum frameworks adequately address. Table 2 presents a structured mapping of these challenges, their empirical basis, and their specific curriculum implications.

Table 2. Structural Challenges to AI Integration in the Nigerian Secondary School Curriculum: Empirical Basis and Curriculum Implications

Challenge	Empirical Basis (with Citations)	Curriculum Implication
Digital infrastructure deficit	Only 40% internet penetration nationally; rural schools lack electricity and connectivity; 43.3% of communities remain offline (NCC, 2023; Edugist, 2025)	Frequent power and internet outages disrupted the Edo State AI pilot despite its otherwise successful outcomes (De Simone et al., 2024). AI tools that presuppose connectivity are structurally inaccessible to the majority of public secondary schools.
Teacher readiness and capacity	Most secondary school teachers lack training in AI tool integration; readiness encompasses technical, pedagogical, ethical, and confidence dimensions (Eke, 2024)	Without structured teacher development, AI risks reinforcing rote learning rather than transforming it. The Edo pilot succeeded only when teachers functioned as 'orchestra conductors' rather than passive observers (De Simone et al., 2024).
Equity and digital divide	AI tools currently benefit urban, private, and well-resourced schools disproportionately; the poorest 40% of	Unless equity is designed into deployment, AI could widen existing educational inequality



	learners have the greatest learning deficits and the least access to AI (World Bank, 2022)	rather than narrow it — advantaging those already advantaged.
NERDC curriculum misalignment	The 2023 NERDC curriculum revision does not yet incorporate systematic AI literacy standards or pedagogical frameworks for AI-assisted learning at secondary level	Without explicit curriculum frameworks, AI integration remains ad hoc and externally driven, disconnected from NERDC's mandated learning objectives and terminal examination requirements (Mohammed et al., 2024).
Data privacy and ethics	Absence of enforceable data governance frameworks for AI in education; student data processed by commercial platforms outside Nigerian regulatory jurisdiction (Samuel et al., 2025)	Learner data collected by AI platforms is subject to commercial use policies inconsistent with educational ethics; Nigeria's regulatory capacity for AI oversight remains nascent (ResearchGate, 2024).
AI-induced academic dishonesty	Proliferation of generative AI tools creates structural conditions for academic dishonesty in assessment-oriented secondary school culture	Where AI is used for answer generation rather than reasoning development, it undermines the assessment integrity that WAEC and NECO examination systems depend upon.
Insufficient empirical evidence base	A large-scale, longitudinal, disaggregated evidence base for AI's impact on Nigerian secondary school curriculum outcomes does not yet exist (Samuel et al., 2025)	Policy decisions and large-scale investments are being made without the evidence quality required to identify which AI applications produce durable learning gains across diverse school contexts.

Digital Infrastructure as the Foundational Constraint

The most fundamental and least tractable challenge to AI integration in Nigerian secondary schools is the state of the digital infrastructure upon which all AI applications depend. NCC (2023) reports national internet penetration at approximately 40 per cent, with Edugist (2025) estimating that 43.3 per cent of communities remain offline and rural communities disproportionately affected. Electricity supply is unreliable nationally, with public secondary schools in many states experiencing load-shedding patterns that render sustained digital learning sessions operationally impossible. The Edo State RCT provides the most direct evidence of how this infrastructure deficit constrains even well-designed AI educational programmes: despite the programme's otherwise successful outcomes, De Simone et al. (2024) report that 'frequent power and internet outages disrupted sessions,' highlighting 'the foundational requirements necessary for successful AI integration.' This finding is particularly sobering when considered against the scale of the federal government's ambitions: the distribution of interactive smart boards beginning at Queens College, Lagos (Guardian Nigeria, 2025) a well-resourced urban school cannot straightforwardly serve as a model for AI deployment in the more than 7,000 public secondary schools estimated to lack reliable electricity or internet connectivity.

Teacher Readiness as the Pedagogical Constraint

The Edo State trial's finding that teacher functioning as 'orchestra conductors' actively structuring, monitoring, and facilitating AI interactions was essential to the programme's effectiveness (De Simone et al., 2024) has direct implications for the Nigerian teaching workforce's current preparedness for AI-mediated curriculum delivery. Eke (2024) identifies four dimensions of teacher readiness for AI integration: technical skills, pedagogical integration capacity, ethical understanding, and self-confidence in AI use and documents that 'existing literature within Nigeria demonstrates' significant deficits across all four dimensions in the secondary school teaching workforce. The structural cause of this readiness deficit is clear: pre-service teacher education programmes in Nigeria do not systematically prepare graduates for AI-mediated instruction, and in-service professional development in AI pedagogy is neither mandated nor systematically provided (Education International, 2025). The National Commission for Colleges of Education (NCCE) and the Teachers Registration Council of Nigeria (TRCN) have not, as of the time of writing, incorporated AI literacy standards into their professional qualification frameworks (Samuel et al., 2025). Without this curricular and professional development infrastructure, the human capacity required to deploy AI as the Edo State trial deployed it with structured pedagogical guardrails and active facilitation does not exist at the scale that national curriculum integration would require.



Leveraging Artificial Intelligence Technology for an effective Curriculum at ... Augustine, W. S. (2026)

Equity as the Ethical Constraint

A dimension of AI integration that receives insufficient analytical attention in the Nigerian policy discourse is its potential to exacerbate rather than reduce educational inequality. The pattern of AI adoption evident in Nigerian secondary education replicates a global phenomenon: AI tools are adopted first and most deeply by well-resourced urban schools, creating a new layer of educational advantage for learners who are already advantaged by their school's location, funding level, and infrastructure quality (Samuel et al., 2025). The 60 per cent of Nigerian secondary students who lack foundational literacy (World Bank, 2022) and who have the greatest educational need are, by virtue of their schools' resource constraints, the least likely to benefit from AI-mediated curriculum delivery in the absence of deliberate equity-by-design policy interventions. This equity dimension has a specific curriculum manifestation. If AI tools are deployed at scale in well-resourced schools but not in under-resourced ones, the effective curriculum delivered to learners the de facto curriculum will diverge further between advantaged and disadvantaged school types. The NERDC's de jure curriculum may formally apply to all secondary schools equally; but a curriculum mediated by AI-powered ITS, adaptive assessment, and generative AI tutoring produces qualitatively different learning experiences than one delivered by a single generalist teacher to a class of 80 pupils with no digital support. The curriculum equity implications of uneven AI adoption are thus structural and require structural policy responses (Samuel et al., 2025; Ogunode & Ejike, 2023).

Data Privacy and Algorithmic Ethics

The deployment of AI tools in educational settings necessarily involves the collection, processing, and analysis of substantial quantities of learner data performance records, interaction logs, assessment responses, and in some cases biometric data. Within the Nigerian secondary school context, the governance framework for such data collection is critically underdeveloped. Nigeria's Data Protection Act (2023) establishes a foundational regulatory framework but does not incorporate education-specific provisions for the governance of learner data processed by AI systems (Samuel et al., 2025). Many of the AI platforms currently deployed in Nigerian secondary schools including internationally developed tools such as Microsoft Copilot and ChatGPT process learner data under terms of service designed for commercial contexts that are inconsistent with the data protection principles applicable to children and to educational environments. The curriculum implications of this governance gap extend beyond data protection to questions of algorithmic fairness. AI systems trained on datasets that do not adequately represent Nigerian learner populations their linguistic diversity, cultural contexts, and curricular frameworks may produce pedagogical recommendations that systematically disadvantage learners whose learning profiles deviate from the datasets' modal cases (Samuel et al., 2025). The NCAIR's multilingual LLM development initiative (Nucamp, 2025) addresses part of this concern, but a comprehensive solution requires the development of Nigerian educational AI training datasets — a resource that does not currently exist at the scale or quality required for equitable AI-curriculum integration.

Policy Imperatives: An Evidence-Based Framework for AI-Curriculum Integration

The analytical framework developed in the preceding sections generates a set of policy imperatives whose implementation is a necessary condition for AI's educational potential to be realised equitably and sustainably within the Nigerian secondary school curriculum. These imperatives are organised below as a six-point framework, sequenced in order of structural priority. They are addressed simultaneously to the Nigerian federal and state ministries of education, NERDC, NCAIR, the TRCN, WAEC, NECO, and the National Universities Commission reflecting the institutional complexity of a policy domain that spans curriculum design, professional development, infrastructure governance, regulatory oversight, and research investment.

Revise the NERDC Curriculum to Incorporate AI Literacy as a Core Competency

The most structurally fundamental policy imperative is the revision of the NERDC secondary school curriculum to incorporate AI literacy as a formally specified, assessed learning competency rather than an implicit aspiration subsumed within digital literacy provisions. This revision should establish, as minimum curriculum requirements: conceptual understanding of how AI systems function and how their outputs are generated; practical competence in the use of AI tools for curriculum-aligned learning tasks; critical evaluation skills for assessing AI-generated content; and ethical reasoning capacities for navigating the implications of AI use in academic contexts (Samuel et al., 2025; Mohammed et al., 2024). The pedagogical framework for teacher-supervised AI use specifying how AI tools should be integrated into lesson design, how AI-mediated learning should be structured to promote reasoning rather than answer retrieval, and how assessment integrity should be maintained should be developed as a NERDC implementation guide accompanying the curriculum



Leveraging Artificial Intelligence Technology for an effective Curriculum at ... Augustine, W. S. (2026)

revision. The Edo State trial's instructional design (De Simone et al., 2024) provides an evidence-based model for this pedagogical specification, adapted for integration within standard NERDC timetabling rather than supplementary after-school arrangement.

Establish a Conflict-Sensitive, Equity-Centred Infrastructure Deployment Sequence

The infrastructure prerequisite for AI-curriculum integration reliable electricity and internet connectivity cannot be wished away by policy ambition. The Digitalisation of Public Schools Initiative (Guardian Nigeria, 2025) and the 2026 budget's ₦7 billion allocation for online learning platforms (Guardian Nigeria, 2026) must be implemented through a deployment sequence that prioritises the schools with the greatest learning deficits and the most acute infrastructure needs rather than the schools already best positioned to absorb digital tools. This is an equity-by-design principle: infrastructure investment that follows the path of least resistance will deepen the digital divide rather than address it. Practically, this requires UBEC and the Federal Ministry of Education to deploy solar power systems, connectivity infrastructure, and device provision to underserved rural and conflict-affected secondary schools as a precondition for not a sequel to curriculum-based AI integration. The ₦7 billion online learning allocation should be evaluated against this sequencing principle, with an independent assessment of what proportion of target schools have the power and connectivity infrastructure required to use the funded platforms before deployment proceeds.

Professionalise AI Pedagogy through Mandatory Teacher Development

The evidence from the Edo State RCT (De Simone et al., 2024) and from the broader literature on AI in education (Eke, 2024; Education International, 2025) converges on a single finding: AI tools do not produce educational value autonomously. They produce it when teachers possess the pedagogical competence to structure, facilitate, and critically oversee their use. The TRCN and NCCE should, as a matter of regulatory priority, incorporate AI literacy and AI pedagogy into the professional qualification standards for secondary school teachers specifying minimum competencies in AI tool use, AI-assisted lesson design, and assessment integrity management in AI-accessible environments. At the in-service level, the 3 Million Technical Talents (3MTT) programme and the NAIS skills development pillar provide existing infrastructure that should be explicitly extended to secondary school teacher professional development in AI pedagogy. Microsoft's \$1 million commitment to train Nigerian educators in AI (Nucamp, 2025) and analogous private sector commitments should be aligned to NERDC curriculum frameworks and TRCN competency standards rather than deployed as standalone corporate social responsibility initiatives disconnected from the national curriculum architecture.

Develop a Regulatory Framework for AI Data Governance in Secondary Education

The governance vacuum for learner data in AI-mediated secondary education requires a specific regulatory response that the Nigeria Data Protection Commission should develop in collaboration with the Federal Ministry of Education, NERDC, and NCAIR. A Secondary Education AI Data Governance Framework should establish: mandatory data protection impact assessments for AI platforms deployed in secondary schools; standards for the local storage and processing of learner data generated by AI educational tools; requirements for the audit and publication of the training datasets used by AI platforms providing curriculum services to Nigerian learners; and enforcement mechanisms with meaningful consequences for non-compliant providers (Samuel et al., 2025).

Fund a Longitudinal National Research Programme

The Edo State RCT, while providing important and rigorous evidence, is a six-week, single-state, single-subject intervention. The Nigerian evidence base for AI's long-term impacts on secondary school curriculum outcomes disaggregated by school type, geographic context, subject domain, teacher preparation level, and learner socioeconomic background does not yet exist. NERDC, TETFund, the National Universities Commission, and development partners should collectively fund a longitudinal national research programme on AI in secondary education, incorporating randomised controlled trials across multiple states and school types, quasi-experimental studies of naturally occurring AI deployment variation, and qualitative research with learners, teachers, and curriculum designers (Samuel et al., 2025; Ogunode & Ejike, 2023). This research programme should have a specific sub-focus on equity: documenting the differential impacts of AI integration on learners from different socioeconomic, geographic, gender, and linguistic backgrounds, and generating the evidence required to ensure that AI integration policy does not systematically advantage those already advantaged within the Nigerian secondary education system.



Leveraging Artificial Intelligence Technology for an effective Curriculum at ... Augustine, W. S. (2026)

Establish a Multi-Stakeholder AI-Education Coordination Body

The institutional fragmentation of AI-education governance in Nigeria distributed across the Federal Ministry of Education, NERDC, NCAIR, NITDA, the National Communications Commission, WAEC, NECO, state ministries of education, teacher professional bodies, the EdTech sector, and development partners constitutes a governance coordination failure whose resolution is a precondition for effective national AI-curriculum integration. Samuel et al. (2025) and Adewale and Oduwole (2024) recommend a 'multi-sectoral task force' model: a standing coordination body with representatives from each of the institutional actors listed above, with a clear mandate for harmonising AI-education standards, aligning funding streams, preventing implementation duplication, and monitoring integration outcomes against agreed curriculum delivery metrics.

Discussion of Findings

The evidence assembled in this article supports a nuanced position on AI and the Nigerian secondary school curriculum one that is neither the uncritical optimism of technology advocates nor the scepticism of those who regard AI as a distraction from the foundational resource investments Nigeria's educational system requires. AI tools, when deployed within carefully designed pedagogical frameworks, under active teacher facilitation, and with equity-by-design infrastructure sequencing, have demonstrated meaningful capacity to address Nigeria's learning crisis. The Edo State trial's results two years' English learning progress in six weeks are not an anomaly produced by exceptional circumstances. They are the measured consequence of a coherent pedagogical design that harnessed AI's capacity for individualised, responsive feedback within a structured curricular context. However, the conditions that produced those results structured prompts, teacher supervision, reasoning-focused rather than answer-retrieval-focused interaction are precisely the conditions that are absent from the majority of AI deployments in Nigerian secondary education. The proliferation of AI-powered examination preparation platforms, while addressing real student demand, operates primarily in the answer-retrieval mode that the Edo trial's design was deliberately constructed to avoid. The risk, which the evidence on generative AI in education globally documents, is that AI that facilitates the retrieval of correct answers without developing the reasoning processes that generate them undermines the curriculum objectives that examination preparation is supposed to serve (VoxDev, 2026). The policy implication is that the Nigerian secondary school curriculum's AI integration challenge is not primarily technological but pedagogical. The question is not whether AI tools can improve curriculum outcomes the evidence suggests they can, under appropriate conditions but whether Nigeria has the curriculum frameworks, teacher professional development infrastructure, regulatory governance capacity, and equity-centred deployment architecture to create those conditions at the scale of its 10,905 public secondary schools. On the current evidence, it does not but the institutional building blocks required to create those conditions exist, and the policy framework advanced in Section 5 is designed to activate them.

The AI-Curriculum Alignment Deficit: A Conceptual Summary

What the NERDC curriculum currently provides: Digital literacy as a cross-curricular theme; ICT as a subject; STEM integration; competency-based outcomes framework. No specific AI literacy competencies; no pedagogical frameworks for teacher-supervised AI use; no assessment integrity protocols for AI-accessible examination environments. What AI-curriculum integration requires: Explicit AI literacy learning objectives by level and subject; teacher professional qualification standards incorporating AI pedagogy; curriculum-aligned protocols for structured AI tool use; WAEC/NECO assessment design adapted for AI-accessible environments; NERDC curriculum framework for AI content localisation in indigenous languages. The deficit: AI tools are proliferating in the Nigerian secondary school environment faster than the curriculum frameworks required to govern their pedagogical use are being developed. Resolving this deficit is the central curriculum policy challenge of the present decade.

Conclusion

This article has examined the intersection of artificial intelligence and the Nigerian secondary school curriculum across the decade 2016–2026, advancing three substantive contributions to the scholarly literature. First, it has mapped the landscape of AI applications in Nigerian secondary education from intelligent tutoring systems and adaptive learning platforms to generative AI tutors and AI-powered examination preparation and established the documented evidence base for their curriculum relevance. Second, it has identified and analysed seven structural challenges constraining the effective and equitable integration of these applications: digital infrastructure deficits, teacher readiness gaps, equity disparities, the AI-curriculum alignment deficit, data governance failures, academic dishonesty risks, and an insufficient longitudinal evidence base. Third, it has advanced a six-point policy imperative framework addressing these challenges through curriculum



Leveraging Artificial Intelligence Technology for an effective Curriculum at ... Augustine, W. S. (2026)

revision, equity-centred infrastructure deployment, mandatory teacher professionalisation, AI data governance regulation, longitudinal research investment, and multi-stakeholder coordination. The conceptual contribution that the present analysis offers to the broader literature on AI in education is the identification of the AI-curriculum alignment deficit as a specific, analytically tractable policy problem: the condition in which AI tools proliferate in educational environments faster than the curriculum frameworks required to govern their pedagogical use are developed. This deficit is observable in the gap between Nigeria's accelerating AI-education investments and the NERDC curriculum's current silence on AI literacy competencies, pedagogical frameworks for AI use, and assessment integrity protocols. Resolving this deficit is, the analysis suggests, a prior condition for realising AI's educational potential rather than a consequence of its realisation. The decade ahead will determine whether Nigeria occupies the position of a late adopter — struggling to retrofit AI tools into a curriculum architecture designed for an earlier era — or of a pedagogical innovator that develops AI-curriculum integration frameworks appropriate to its own context, evidence base, and equity imperatives. The Edo State trial of 2024 demonstrates that the second path is available. The policy framework advanced in this article attempts to map it. The work of traversing it requires a sustained, coordinated institutional commitment that the present analysis has sought to both motivate and inform. Future research should prioritise the following directions: longitudinal evaluation of AI-integration interventions across diverse Nigerian secondary school contexts and subject domains; comparative analysis of AI-curriculum integration models from Sub-Saharan African systems with analogous infrastructure constraints and demographic profiles; participatory design research engaging secondary school students and teachers in the development of AI-curriculum frameworks appropriate to Nigerian pedagogical cultures; and quantitative modelling of the equity implications of different AI deployment sequences across Nigeria's heterogeneous school system.

References

- Adewale, T., & Oduwale, K. (2024). Multi-stakeholder coordination for AI in Nigerian education. *Journal of Educational Governance*, 12(3), 44–59.
- Ayanwale, M. A., Opeyemowo, O. A. G., & Adekomaya, O. (2024). AI applications in mathematics education in Nigeria. *Journal of Mathematics Education Research*, 18(2), 77–93.
- De Simone, G., Ferrario, M., & Okonkwo, C. (2024). From chalkboards to chatbots: Evaluating the impact of generative AI on learning outcomes in Nigeria. World Bank Policy Research Working Paper. <https://voxddev.org/topic/education/how-ai-tutors-improved-learning-nigeria>
- EduGist. (2025, August). The future of teaching: Will AI ever replace the Nigerian classroom teacher? <https://edugist.org/the-future-of-teaching-will-ai-ever-replace-the-nigerian-classroom-teacher/>
- EduGist. (2026, February). Study AI: Nigeria's AI-powered exam prep platform transforming JAMB, WAEC, NECO preparation. <https://edugist.org/study-ai-nigerias-ai-powered-exam-prep-platform-transforming-jamb-waec-neco-preparation/>
- Eke, D. O. (2024). Teacher readiness for AI integration in Nigerian secondary schools: A multidimensional analysis. *Unizik Orient Journal of Education*, 12(1), 45–62. <https://journals.unizik.edu.ng/foej/article/download/7671/6485/17641>
- Federal Ministry of Education. (2023). Basic and secondary school statistics in Nigeria. Federal Ministry of Education.
- Federal Republic of Nigeria. (2013). *National Policy on Education (5th ed.)*. NERDC Press.
- Guardian Nigeria. (2024). uLesson leveraging AI to deliver interactive content to millions of learners. <https://guardian.ng>
- Guardian Nigeria. (2025, October). Minister of Education launches Digitalisation of Public Schools Initiative. <https://guardian.ng/features/going-digital-building-21st-century-schools-on-weak-infrastructure/>
- Guardian Nigeria. (2025, December). Foundation launches AI-powered platform for NECO, WAEC preparation. <https://guardian.ng/education/foundation-launches-ai-powered-platform-for-neco-waec-preparation/>
- Guardian Nigeria. (2026, March). Going digital: Building 21st-century schools on weak infrastructure? <https://guardian.ng/features/going-digital-building-21st-century-schools-on-weak-infrastructure/>
- ICTworks. (2025, January). Generative AI proven to advance learning outcomes in Nigeria. <https://www.ictworks.org/genai-advance-learning-outcomes/>
- Lawani, E. (2025, September). Bridging the gap: Deepening learning in Nigerian secondary education through AI and reflective practice. Medium. <https://medium.com/@elawani217>
- Mohammed, A., Bashir, U. F., & Ismail, A. A. (2024). Artificial intelligence and curriculum implementation in public secondary schools of the Federal Capital Territory, Abuja, Nigeria. *Innovative: International Multidisciplinary Journal of Applied Technology*. <https://ijedem.com/index.php/ijedem/article/download/27/24/47>
- NCC. (2023). Annual report on broadband and internet penetration in Nigeria. Nigerian Communications Commission.
- NERDC. (2023). Revised national curriculum framework: Post-Basic Education and Career Development (PBECD) curriculum. <https://www.nerdc.gov.ng>



Leveraging Artificial Intelligence Technology for an effective Curriculum at ... Augustine, W. S. (2026)

- Nucamp. (2025, September). The complete guide to using AI in the education industry in Nigeria in 2025. <https://www.nucamp.co/blog/coding-bootcamp-nigeria-nga-education-the-complete-guide-to-using-ai-in-the-education-industry-in-nigeria-in-2025>
- Ogunode, N. J., & Ejike, C. N. (2023). Artificial intelligence and curriculum implementation of Post-Basic Education and Career Development (PBECD) in Nigeria. *Journal of Innovation in Education and Social Research*, 1(4), 50–56.
- Ogunode, N. J., & Ehichoya, E. (2024). Deployment of artificial intelligence for the implementation of early child care development and education (ECCDE) curriculum in public ECCDE centres in Abuja, Nigeria. *Electronic Research Journal of Social Sciences and Humanities*, 6(1), 58–64.
- Opesemowo, O. A. G., & Adekomaya, O. (2024). Effect of integrating artificial intelligence on the teaching and learning of geometry within secondary schools in Ogun Central Senatorial Districts, Nigeria. *International Journal of Research and Innovation in Social Science*. <https://rsisinternational.org/journals/ijriss/articles/effect-of-integrating-artificial-intelligence-ai-on-the-teaching-and-learning-of-geometry-within-secondary-schools-in-ogun-central-senatorial-districts-nigeria/>
- Popenici, S. A. D., & Kerr, S. (2017). Exploring the impact of artificial intelligence on teaching and learning in higher education. *Research and Practice in Technology Enhanced Learning*, 12(1), 22. <https://doi.org/10.1186/s41039-017-0062-8>
- Jenna, E. (2024). Nigeria's National AI Strategy (2024): Overlooked critical challenges and strategic paths forward. https://www.researchgate.net/publication/395351492_Nigeria_s_National_AI_Strategy_2024_Overlooked_Critical_Challenges_and_Strategic_Paths_Forward
- Samuel, N., Adigun, O. O., & Folorunso, A. A. (2025). Artificial intelligence for inclusive education in Nigeria. *Zamfara International Journal of Science, Technology, Education & Mathematics*. <https://js.foefugusau.com.ng/index.php/foefujs/article/download/142/146>
- Samuel, N., et al. (2025). Artificial intelligence (AI) literacy: An investment for enhancing educators' skills in AI-powered primary schools in Nigeria. *International Journal of Research and Innovation in Social Science*. <https://rsisinternational.org/journals/ijriss/articles/artificial-intelligence-ai-literacy-an-investment-for-enhancing-educators-skills-in-ai-powered-primary-schools-in-nigeria/>
- Save the Children. (2026, January 26). 28 million Nigerian children and adolescents lack access to formal schooling. <https://www.savethechildren.net/nigeria/news/28-million-nigerian-children-and-adolescents-lack-access-formal-schooling-or-digital>
- Scholarcllopedia. (2025). New scheme of work 2025/2026 curriculum Nigeria. <https://scholarcllopedia.com/ng/new-scheme-of-work-2025-2026/>
- Selwyn, N. (2022). *Digital education* (2nd ed.). Polity Press.
- Spursmedia. (2025, March). Artificial intelligence in education: Revolutionizing learning in Nigeria. <https://spursmedia.com/artificial-intelligence-in-education/>
- VoxDev. (2026, March). How AI tutors improved learning in Nigeria. <https://voxdev.org/topic/education/how-ai-tutors-improved-learning-nigeria>
- World Bank. (2022). *Nigeria Human Capital Review*. World Bank Group.
- World Bank. (2025). Addressing the learning crisis with generative AI: Lessons from Edo State in Nigeria. *World Bank Development Blog*. <https://blogs.worldbank.org/en/developmenttalk/addressing-the-learning-crisis-with-generative-ai--lessons-from->
- ZME Science. (2025, January). AI is transforming education for Nigerian students: Two years of typical learning in just six weeks. <https://www.zmescience.com/science/ai-education-nigeria-success/>



Awareness and Application of Novel Pedagogical Strategies among Senior Secondary School Science Teachers in Suleja Local Government Area, Niger State, Nigeria

EKPENYONG, Emmanuel Sunday

esekpenyong@gmail.com

+2348032753949

Department of Science Laboratory Technology, Rahma College of Technology, Science and Management Studies, Suleja Niger State, Nigeria

Abstract

This study examined the awareness and application of novel pedagogical strategies among Senior Secondary School Science teachers in Suleja Local Government Area, Niger State, Nigeria. A survey research design was adopted. A sample of 268 male and female science teachers was randomly selected from public and private secondary schools in Suleja Local Government Area in the 2025/2026 academic session. Data were collected using a researcher-developed questionnaire and the internal consistency of the instrument was established using Cronbach's alpha, which produced a reliability coefficient of 0.86. Mean scores, percentages, standard deviation, and t-test were used for data analysis. Hypotheses were tested at the .05 level of significance. Findings revealed that many science teachers in Suleja Local Government Area are aware of and apply novel pedagogical strategies for content delivery, though challenges such as overcrowding and limited professional development persist. There was a significant influence of gender ($t_{(75.06)} = 9.361$; $p = .00$) and school type ($t_{(114.925)} = 2.759$; $p = .001$) on the level of science teachers' awareness and application of the strategies. It was recommended that school administrators should admit students in proportion to available infrastructure and staffing, in line with the student-teacher ratio stipulated by the National Policy on Education.

Keyword: Awareness, Application, Novel Pedagogical Strategies, Science Teachers

Introduction

Science, as a systematic study of nature acquired through the utilization of the scientific method (Nwuba, et al., 2023), is fundamental to every aspect of human endeavor, and its relevance cannot be overemphasized. It serves as a crucial tool for national growth and development, particularly in relation to civilization and technological advancement (Anaekwe, 2019). There is no gainsaying that without the proper application of scientific knowledge, it would be very difficult for humankind to understand and interact with the physical environment (Nwuba, 2021). This significance underscores why the National Policy on Education (FRN, 2013) mandates that science be taught and prioritized at all levels of education in Nigeria. At the senior secondary school level, Biology, Physics, and Chemistry constitute the core science subjects offered to science students. Regrettably, a significant number of students exhibit aversion toward science (Anaekwe, 2019), which no doubt leads to low enrollment rates in science classes. Among students who enroll in science, only a small proportion achieve credit-level passes in external examinations, including the ones conducted by West African Examinations Council and the National Examinations Council (Gengle, 2017). In Nigeria, credit passes are the minimum requirements for admission into science-related programs at the university level. Continued reliance on conventional teaching methods in science classrooms is a key factor underlying students' low interest and poor academic performance (Gambari, et al., 2015). Most secondary school science teachers lack awareness of effective pedagogical strategies and frequently relay on conventional strategies (Aina, & Langenhoven, 2015). This approach has been widely criticized for limiting student engagement and contributing to declining achievement in science (Nwaeze, 2016). In response to these challenges, scholars worldwide have increasingly advocated for the adoption of novel pedagogical strategies to facilitate effective content delivery, especially at the senior secondary school level of education (Udeani, & Okafor, 2012), as it has been found to improve students' learning outcomes (Tufail, & Mahmood., 2020). Novel pedagogical strategies entail using new instructional methods that prioritize learners' participation and are different from the usual talk-and-chalk lecture methods (Nwuba et al., 2022). These strategies make lessons more interesting and engaging, facilitate learning, improve retention and understanding, and by extension improve students' enrollment and academic performance. For instance, the Vee-map teaching strategy helps students better understand the nature and purpose of laboratory activities; that is, it helps students understand how new knowledge is attained in an experimental situation (Tufail & Mahmood, 2020). Similarly, inquiry-based learning develops students' critical thinking skills because it helps students develop interpreting, analyzing, evaluating, inferring, explaining, and self-regulation skills, which are the core critical thinking skills (Santos et al., 2023). The application of these strategies



Awareness and Application of Novel Pedagogical Strategies among ... Ekpenyong, E. S. (2026)

means accepting and making use of them in delivering science content. It simply implies implementing new creative ideas (Okpala, et al., 2022). In Benue State, Achor, et al., (2013) observed that teachers demonstrated a high level of awareness of innovative teaching strategies while only a limited number of the strategies examined were actually utilized effectively in content delivery. Similarly, Gbadamosi (2015) found that biology teachers in the Oyo South Senatorial District exhibited considerable awareness of the selected innovative approaches. In contrast, science teachers in Kebbi State demonstrated a low level of awareness of innovative instructional strategies (Usman, et al., 2020). Gender encompasses physical, biological, psychological, and behavioral traits that distinguish masculinity and femininity (Mainhood, 2020). Differences in educational outcomes between genders have been widely researched and debated (Uzezi, 2020). One particularly contentious issue involves the possible role played by biological differences between males and females. With respect to pedagogical strategies, Oyelekan et al. (2017) found that male teachers perceive the application of novel instructional strategies more positively than their female counterparts. In contrast, Khurshid, & Zahur, (2018) reported that female teachers demonstrate greater awareness and more frequently apply innovative teaching strategies than males. However, Mohammed, & Dajal, (2024) found no significant gender difference in the awareness of novel methods among science teachers in the North-East. On school type, Khurshid, & Zahur, (2018), observed that both awareness and application of innovative pedagogical strategies were higher among teachers in private schools than in public schools. Similarly, Waqas (2020) noted significant variations in the use of innovative teaching styles between public and private school teachers in Pakistan. Against this background, the present study assessed the awareness and application of novel pedagogical strategies among senior secondary school science teachers in Suleja Local Government Area, Niger State, Nigeria.

Statement of the Research Problem

Despite science's critical role in national and technological development, teaching and learning remain ineffective, as reflected in students' poor performance in external examinations conducted by Joint Admission and Matriculation Board, West African Examinations Council and the National Examinations Council examinations among others. In Suleja Local Government Area of Niger State, many science teachers still rely on conventional, teacher-centered teaching strategies, which students find dull, boring and which contribute to low learning outcomes. Scholars including Gambari, et al., (2015) and Aina & Langenhoven (2015) have criticized these instructional strategies and among others advocated for student-centered, novel strategies. While studies by Apochi & Okpaje (2022), Khurshid & Zahur (2018), and Gbadamosi (2013) have examined awareness and use of some of these strategies in relation to school type and gender, research tailored to Suleja Local Government Area is lacking. This study therefore examined the awareness and application of novel pedagogical strategies among senior secondary school science teachers in Suleja Local Government Area, Niger State, Nigeria.

Objectives of the study

The purpose of this study was to examine the awareness and application of novel pedagogical strategies among senior secondary school science teachers in Suleja Local Government Area, Niger State, Nigeria. Specifically, the study sought to determine the:

1. Level of science teachers' awareness and application of novel pedagogical strategies in senior secondary schools in Suleja Local Government Area, Niger State.
2. Perception of science teachers towards the application of novel pedagogical strategies in senior secondary schools in Suleja Local Government Area, Niger State.
3. Problems militating against science teachers' awareness and application of novel pedagogical strategies in senior secondary schools in Suleja Local Government Area, Niger State.

Research Questions

1. What is the level of science teachers' awareness and application of novel pedagogical strategies in senior secondary schools in Suleja Local Government Area, Niger State?
2. What is the perception of science teachers towards the application of novel pedagogical strategies in senior secondary schools in Suleja Local Government Area, Niger State?
3. What are the problems militating against science teachers awareness and application of novel pedagogical strategies in senior secondary schools in Suleja Local Government Area, Niger State?



Hypotheses

1. There is no significant difference in the mean rating of male and female science teachers on the level of awareness and application of novel pedagogical strategies in senior secondary school in Suleja Local Government Area, Niger State.
2. There is no significant difference in the mean rating of private and public school science teachers' perceptions on application of novel pedagogical strategies in senior secondary School in Suleja Local Government Area, Niger State.

Methodology

This study adopted a survey research design. The population consisted of all male and female science teachers in both public and private senior secondary schools in Suleja Local Government Area, Niger State, Nigeria. A sample of 268 science teachers was randomly selected from 10 public and 60 private senior secondary schools using the simple random sampling technique for the 2025/2026 academic session. The sample comprised 195 females and 73 males. Data were collected using a researcher-developed questionnaire titled "Awareness and Application of Novel Pedagogical Strategies Questionnaire [AANPSQ]." The questionnaire contained four sections with 33 items rated on a three-point Likert scale: Disagree = 3, Agree = 2, and Strongly Agree = 1. Face and content validity of the instrument were established by three experts in Science Education and Measurement and Evaluation. The internal consistency reliability of the instrument was determined using Cronbach's alpha coefficient on data from a pilot test of 20 science teachers who were not part of the main study. Cronbach's alpha yielded a reliability coefficient of .86, which was considered acceptable for the study. Cronbach's alpha was appropriate because the Likert-type items were scored using multiple response categories. Data obtained were analyzed using descriptive statistics, including means, percentages, and standard deviations, and inferential statistics, specifically independent samples t-tests. Hypotheses were tested at the .05 level of significance. A criterion mean of 2.50 was adopted. Thus, items with mean ratings of 2.50 and above were accepted, while those below 2.50 were not accepted.

Presentation of Results

Research Question 1

What is the Level of science teachers' awareness and application of novel pedagogical strategies in senior secondary schools in Suleja Local Government Area, Niger State?

Table 1: Descriptive analysis of science Teachers' level of awareness and application

SN	Items	Not Aware	Aware but not Utilized	Aware and Utilized	Mean	SD
1	Icebreakers grap bag	12 (4.5)	39 (14.6)	217 (81.0)	2.76	.520
2	Individualize teaching strategy	15 (5.6)	39 (14.6)	214 (79.9)	2.74	.552
3	Twinning	13 (4.9)	41 (15.3)	214 (79.9)	2.75	.534
4	Vee-map teaching strategy	14 (5.2)	40 (14.9)	214 (79.9)	2.75	.543
5	Industrial Simulation strategy	14 (5.2)	42 (15.7)	212 (79.1)	2.74	.546
6	Crawford Slip method	12 (4.5)	39 (14.6)	217 (81.0)	2.76	.520
7	Flipped classroom strategy	13 (4.9)	42 (15.7)	213 (79.5)	2.75	.536
8	Adaptive Teaching strategy	15 (5.6)	39 (14.6)	214 (79.9)	2.74	.552
9	Demo kits teaching strategy	14 (5.2)	37 (13.8)	217 (81.0)	2.76	.538
10	Creative teaching	13 (4.9)	43 (16.0)	212 (79.1)	2.74	.538
11	Inquiry-based learning	14 (5.2)	41 (15.3)	213 (79.5)	2.74	.545
12	Self-discovery learning strategy	14 (5.2)	42 (15.7)	212 (79.1)	2.74	.546
13	Jigsaws Strategy	14 (5.2)	39 (14.6)	215 (80.2)	2.75	.541

Criterion mean = 2.50; weighted mean = 2.75; N = 268

Table 1 shows that the weighted mean score (2.75) is greater than the criterion mean score (2.50), indicating that most science teachers are aware and apply novel pedagogical strategies in senior secondary schools in Suleja Local Government Area, Niger State.

Research Question 2: What is the perception of science teachers towards the application of novel pedagogical strategies in senior secondary schools in Suleja Local Government Area, Niger State?

Table 2: Descriptive analysis of Science teachers' response

Awareness and Application of Novel Pedagogical Strategies among ... Ekpenyong, E. S. (2026)

SN	Items	Disagree	Agree	Strongly Agree	Mean	SD
1	Icebreakers grap bag could be a great way to develop trust in the classroom and help to spur participation from all students. Also, encourages students to speak and participate on a regular basis.	28 (10.4)	106 (39.6)	134 (50.0)	3.40	.671
2	The use of Individualize teaching strategy could caters for individual difference in science classrooms and allows every learner to learn at his own pace.	28 (10.4)	106 (39.6)	134 (50.0)	3.40	.671
3	Twinning could enhance the possibility of fostering students' cooperation and learning.	27 (10.1)	106 (39.6)	135 (50.4)	3.40	.666
4	The Vee-map teaching strategy could promote students better understanding of the nature and purpose of science laboratory activities.	28 (10.4)	106 (39.6)	134 (50.0)	3.40	.671
5	Industrial Simulation strategy could be used to transpose the normal classroom into an authentic setting where skills can be evaluated under more realistic conditions and prepares students to be able to face the complexity in the real world.	28 (10.4)	106 (39.6)	134 (50.0)	3.40	.671
6	Using Crawford Slip method could minimize time and equipment in science classrooms. It levels the playing field between quieter learner and more outspoken students.	28 (10.4)	107 (39.9)	133 (49.6)	3.39	.670
7	With flipped classroom strategy, the teacher does not give direct instruction. He act as a facilitator who sets up the content, maps out homework, and provides a welcoming learning space that students can explore in.	28 (10.4)	106 (39.6)	134 (50.0)	3.40	.671
8	Adaptive Teaching strategy could use data about a learner's previous and current learning to create a personalized path through educational content.	30 (11.2)	105 (39.2)	133 (49.6)	3.38	.680
9	Demo kits teaching strategy could be used in classrooms to promote physical observation of the concepts being discussed by the teachers. It compensates the impossibility of demonstrating the objects due to their size or lack of availability.	28 (10.4)	105 (39.2)	135 (50.4)	3.40	.671
10	In the process of creative teaching, the teacher could inspire learners' interests in learning material, and then presents specific problems and asks learners to apply all sorts of available resources to find the best satisfying solution creatively.	29 (10.8)	106 (39.6)	133 (49.6)	3.39	.675

Criterion mean = 2.50; weighted mean = 3.39; N = 268

Table 2 shows that over 70% of the science teachers strongly agreed to have possessed the perceived knowledge required to apply novel strategies for effective teaching and learning of science.

Research Question 3: What are the problems militating against science teachers awareness and application of novel pedagogical strategies in senior secondary schools in Suleja Local Government Area, Niger State?

Table 3: Descriptive analysis of Science teachers' response

SN	Items	Disagree	Agree	Strongly Agree	mean	SD
1	Low commitment of science teachers for improvement due to low remuneration.		133 (49.6)	135 (50.4)	3.50	.501

Awareness and Application of Novel Pedagogical Strategies among ... Ekpenyong, E. S. (2026)

2	Over populated classroom due to insufficient infrastructure and manpower.	0 (0)	268 (100)	4.00	.000
3	Lack of seminar, workshop and in service training for science teachers.	0 (0)	268 (100)	4.00	.000
4	Lack of availability of instructional materials and unwillingness of the teachers to improvise.	135 (50.4)	133 (49.6)	3.50	.501
5	Lack of professional/teaching qualification by science teachers.	133 (49.6)	135 (50.4)	3.50	.501
6	Insufficient periods allotted for science instructions on school time table.	135 (50.4)	133 (49.6)	3.50	.501
7	Too much workload on science teachers as a result of shortage of teachers in schools.	2 (0.7)	266 (99.3)	3.99	.086
8	Science teachers teach outside their discipline due to shortage of teachers.	133 (49.6)	135 (50.4)	3.50	.501
9	None approval of study leave and grant by employers.	135 (50.4)	133 (49.6)	3.50	.501
10	Insufficient training from teachers' training institutions.	133 (49.6)	133 (49.6)	2 (0.7)	2.51 .516

Criterion mean = 2.50; weighted mean = 3.55; N = 268

Table 3 shows that the weighted mean score (3.55) is greater than the criterion mean score (2.50), implying that the problems militate against science teachers' level of awareness and application of novel pedagogical strategies in senior secondary schools in Suleja Local Government Area, Niger State.

Hypothesis 1: There is no significant difference in the mean rating of male and female science teachers on level of awareness and application of novel pedagogical strategies in Suleja Local Government Area, Niger State.

Table 4: t-test analysis of Science teachers' response based on gender

Gender	N	Mean	SD	df	t	F	Sig. (2-tailed)	Decision
Male	73	28.41	9.08	75.060	-9.361	239.059	0.000	Significant (H ₀₁ not accepted)
Female	195	38.47	2.16					

Table 4 reveals a significant difference in the mean scores between science teachers' level of awareness and application of novel pedagogical strategies based on gender ($t_{(75.06)} = -9.361$; $p = 0.001$) and hence leading to non-acceptance of hypothesis 1. This means that female senior secondary school science teachers in Suleja Local Government Area demonstrate higher awareness and application of novel pedagogical strategies than their male counterparts.

Hypothesis 2: There is no significant difference in the mean rating of private and public school science teachers' perceptions on application of novel pedagogical strategies in Suleja Local Government Area, Niger State.

Table 5: t-test analysis of Science teachers' response based on school type

School Type	N	Mean	SD	df	t	F	Sig. (2-tailed)	Decision
Private	63	41.68	7.80	114.925	-2.759	8.420	0.007	Significant (H ₀₂ not accepted)
Public	205	44.88	8.82					

Table 5 reveals a significant difference in the mean scores between science teachers' perception towards application of novel pedagogical strategies across school types ($t_{(114.925)} = -2.759$; $p = 0.001$) and hence resulting in non-acceptance of hypothesis 2. This implies that public school science teachers in Suleja Local Government Area hold more favorable perceptions toward application of novel pedagogical strategies than their private school counterparts.



Discussion of Findings

Table 1 shows that over 70% of the teachers surveyed are both aware of and apply novel pedagogical strategies considered in the study for content delivery. However, 16% reported awareness without actual use in the classroom, while 5% were neither aware of nor apply the novel strategies. The weighted mean score of 2.75 exceeded the criterion mean of 2.5, suggesting that, overall, science teachers in senior secondary schools in Suleja Local Government Area, Niger State are aware of and apply the listed novel pedagogical strategies. This finding aligns with Gbadamosi (2015), who reported high awareness and a high level of application among Biology teachers in Oyo South Senatorial District while contrasting Usman, et al., (2020), who found that in Kebbi State, science teachers low awareness and no application. Similarly, Table 2 indicated that the weighted mean score (3.39) is greater than the criterion mean score (2.50), this implies that most science teachers had positive perception towards application of novel pedagogical strategies in senior secondary schools in Suleja and it is consistent with Oyelekan, et al., (2017) view. Table 3 indicates several barriers hindering awareness and application and all respondents (100%) cited overcrowded classrooms due to inadequate infrastructure and staffing, and absence of seminars, workshops, and in-service training. The weighted mean score of 3.55, above the criterion mean of 2.50, confirms that teachers strongly agree these challenges impede their level of awareness and application of novel strategies in senior secondary School in Suleja Local Government Area. The t-test results on Table 4 shows that female science teachers recorded a higher mean score ($M = 38.47$, $SD = 2.16$) compared to male teachers ($M = 28.41$, $SD = 9.08$). The difference was statistically significant, $t(75.06) = -9.361$, $p = 0.001$, leading to non-acceptance of hypothesis 1. This means that female senior secondary school science teachers in Suleja demonstrate higher awareness and application of novel pedagogical strategies than their male counterparts. This outcome supports Khurshid and Zahur (2018) but differs from Oyelekan, et al., (2017) who found that male teachers perceive the application of novel instructional strategies more positively than their female counterparts, it also contrasts Mohammed, et al. (2024), who found no significant gender difference in the awareness and use of novel strategies among science teachers in the North-East. Table 5 reveals that senior secondary School science teachers in public schools had a higher mean score ($M = 44.88$, $SD = 8.82$) than those in private schools ($M = 41.68$, $SD = 7.80$). The difference was statistically significant, $t(114.925) = -2.759$, $p = 0.001$, resulting in non-acceptance of hypothesis 2. This implies that public school science teachers in Suleja Local Government Area hold more favorable perceptions toward application of novel pedagogical strategies than their private school counterparts. This finding corroborates Waqas (2020), who reported significant differences in the application of innovative teaching strategies between public and private school teachers.

Conclusion

The study examined the awareness and application of novel pedagogical strategies among senior secondary school science teachers in Suleja Local Government Area, Niger State and revealed that most science teachers in the area are aware of and applies novel pedagogical strategies; however, challenges such as overcrowding and limited professional development persist. Female science teachers and those in public schools showed significantly higher levels of awareness, application, and positive perception than male and private school science teachers. These results underscore the need for targeted interventions, including reduced class sizes, regular training programs, and curriculum updates, to strengthen the adoption of novel practices across all school types.

Recommendations

Based on the findings of this study, the following recommendations are posed:

1. Schools in Suleja Local Government Area of Niger State should adhere to the student-teacher ratio prescribed by the National Policy on Education and provide sufficient periods for science instructions.
2. Since female teachers showed significantly higher awareness and application, targeted mentorship and support programs should be developed to encourage male science teachers to adopt and effectively use innovative strategies.
3. Public schools in Suleja Local Government Area, which showed more favorable perceptions, should partner with private schools to share best practices, resources, and training opportunities.

References

Achor, E. E., Samba, R. M., & Ogbaba, J. A. (2013). Teachers' awareness and utilization of innovative teaching strategies in secondary school science in Benue State, Nigeria. *Educational Research*, 1(2), 32–38.



Awareness and Application of Novel Pedagogical Strategies among ... Ekpenyong, E. S. (2026)

- Aina, J. K., & Langenhoven, K. (2015). Teaching method in science education: The need for a paradigm shift to peer instruction (PI) in Nigerian schools. *International Journal of Academic Research and Reflection*, 3(6), 2309–0405.
- Anaekwe, M. C. (2019). Reducing learning difficulties in science, technology, engineering and mathematics (STEM) classrooms. *Science, Technology, Engineering and Mathematics Journal of Anambra State*, 2(1), 1–14.
- Federal Republic of Nigeria. (2013). National policy on education (6th ed.). NERDC Press.
- Gambari, A. I., Yusuf, M. O., & Thomas, D. A. (2015). Effects of computer-assisted STAD, LTM and ICI cooperative learning strategies on Nigerian secondary school students' achievement, gender and motivation in physics. *The Malaysian Online Journal of Educational Sciences*, 3(4), 11–26.
- Gbadamosi, A. F. (2015). Biology teachers' awareness and utilization of innovative teaching strategies in Oyo south senatorial district, Nigeria [M.Ed. research project].
- Gengle, H. I., Abel, M. A., & Mohammed, B. K. (2017). Effective teaching and learning strategies in science and mathematics to improve students' academic performance in Nigeria. *Journal of Education, Society and Behavioural Science*, 19(1), 1–9.
- Khurshid, F., & Zahur, B. (2018). Comparison of teachers' awareness and utilization of innovative teaching strategies in private and public sector secondary schools. *Elixir Psychology*, 45, 36096–36099.
- Mainhood, L. (2020). Gender equity in physics education: Modelling a future for Canadian physics education research. *Journal of the Canadian Association for Curriculum Studies*, 18(1).
- Mohammed, A. U., & Dajal, R. G. (2024). Assessment of biology teachers' level of awareness and utilisation of innovative teaching strategies in senior secondary schools in North-East, Nigeria. *Journal of Institutional Research, Big Data Analytics and Innovation*, 1(1), 271–279.
- Nwaeze, C. C. (2016). Innovative teaching methods in science education for junior secondary school basic science students. *Journal of Teacher Perspective*, 11(2), 166–173.
- Nwuba, I. S. (2021). Effect of experiential learning approach on secondary school students' critical thinking ability and academic achievement in biology in Awka Education Zone [Unpublished master's thesis]. Nnamdi Azikiwe University.
- Nwuba, I. S., Egwu, S. O., & Osuafor, A. M. (2022). Enhancing academic achievement of secondary school students in biology using mnemonic integrated instruction. *Journal Plus Education*, 30(1), 254–265.
- Nwuba, I. S., Egwu, O. S., Nwoye, A. N., & Awosika, O. F. (2023). Science teachers' awareness and utilization of innovative formative assessment techniques for assessing students in science classrooms in Anambra State. *Journal Plus Education*, 32(1), 133–146.
- Okpala, C. C., Amobi, U. V., & Uche, E. D. (2022). Teachers' awareness of innovative teaching and learning of biology in secondary schools. *International Journal of Research in Education and Sustainable Development*, 2(1), 27–36.
- Oyelekan, O. S., Igbokwe, E. F., & Olorundare, A. S. (2017). Science teachers' utilization of innovative strategies for teaching senior school science in Ilorin, Nigeria. *Malaysian Online Journal of Educational Science*, 5(2), 49–65.
- Santos, C., Rybska, E., Klichowski, M., Jankowiak, B., Jaskulska, S., Domingues, N., Carvalho, D., Rocha, T., Paredes, H., Martins, P., & Rocha, J. (2023). Science education through project-based learning: A case study. *Procedia Computer Science*, 219, 1713–1720.
- Tufail, I., & Mahmood, M. K. (2020). Teaching methods preferred by school science teachers and students in their classroom. *PUPIL: International Journal of Teaching, Education, and Learning*, 4 (2):332–347.
- Udeani, U., & Okafor, P. N. (2012). The effect of concept mapping instructional strategy on the biology achievement of senior secondary school slow learners. *Journal of Emerging Trends in Educational Research and Policy Studies*, 3(2):137–142.
- Usman, M., Samba, M., & Kamba, A. H. (2020). Assessment of level of awareness and extent of utilization of innovative instructional strategies for teaching science in secondary schools in Kebbi State, Nigeria. *African Educational Research Journal*, 8(3):491–498
- Uzezi, J. G. (2020). Gender difference among science education pre-service teachers' enrolment and achievement in Taraba state, Nigeria. *ATBU Journal of Science, Technology and Education*, 8(1):277–285.
- Waqas, A. K. (2020). Comparative study of innovative teaching styles of public and private schools teachers in the classroom. Heroshima University, Pakistan, 53–67.



Qualitative Study on Harnessing Language and Literature Studies for ... Enu, E. N. (2026)

Qualitative Study on Harnessing Language and literature Studies for Sustainable National Development in Nigeria: A Strategic Approach

ENU, Evelyn Nwene

evelynazuka16@gmail.com

[07039394766](tel:07039394766)

Department of Primary and Early Childhood Education, Emmmanuel Alayande University of Education, Oyo State,
Nigeria

Abstract

This paper explores how language and literature contribute immensely to the unity and national development of a country with special emphasis on Nigeria. It examines the ways in which language and literature can be harnessed to promote cultural identity, social cohesion and economic development. The paper also examines the contribution of language and literature in individual development, moral development, national integration and unity, commerce, science and technology, communication and cultural development which are agents of national development. By analyzing the intersections between language, literature and national development, it provides insights into the potential of language and literature to contribute to sustainable growth and national prosperity. The paper reveals that language is a very important instrument in national development and its development could rapidly develop a nation. Government should develop and implement inclusive language policies that will promote multilingualism and language diversity. There is need to support programmes that promote the use of language in education, media and government to preserve Nigeria's cultural heritage and tradition and enhance communication among diverse communities. Therefore indigenous languages should be integrated into formal education. Also, there is need to translate laws and key political texts into indigenous languages so that indigenous peoples may participate in political and legal fields.

Keywords: Language, Literature, National development, Sustainable growth, Cultural identity

Introduction

Language can be defined according to its scope, even though in all cases, this may lead to one-sidedness, as one aspect is bound to be over emphasized and the other undervalued. Language is seen as a specially developed and unique means of communication, thinking and facilitating self-knowledge, self-consciousness and self-expression. Language is also defined as a system or medium of communication which is mutually intelligible to members of a particular speech community. Language as defined by Stone (2001), is a system of vocal and written symbols commonly accepted and understood by a given human community, and by which members of that social group communicate. Literature on the other hand is writing which expresses and communicates thoughts, feelings and attitudes towards life. It is equally seen as an imaginative work of art-oral or written, which reflects and projects the life and culture of a people. It can be a fiction or non-fiction. Moody (2018) views it as writing which expresses social aspects of human experiences. Language and literature have played important roles in the lives of men since their origin. Man cannot function without language. All his activities: economic, educational, socio-political and religious, have language and literature at their nucleus. Language and literature are therefore key factors of individual and collective development. National development is predetermined by personal development. Indeed, national development would be a mirage if it were not founded on the development of the individual. Here, we shall first of all look at the extent to which language and literature are essential to the development of the individual before talking about the national development.

Individual Development and Language

Languages have important roles to play in the life of an individual. It is necessary for the development of individual intelligence and thoughts which in turn contribute to the creative potential of any nation. It is only when there is positive development in individual minds that there can be positive forces for national development. A child unconsciously learns his first word and gradually enriches his vocabulary. As the child grows in size and his vocabulary becomes richer, his intelligence develops faster through conscious use of language which serves as indispensable tools in the thinking process and in the formulation of ideas. By the time the child moves into the formal education where his ability to read and write is now fully developed, his creative and critical potential are further trained and sharpened through language. The child having acquired solid language background can manipulate language to express his ideas about any aspect of his society's life and thus make suggestions for improvement. He can now read magazines, books, newspapers, and learned journals to know the ideas expressed by other people. The child's intellectual awareness coupled with his active linguistic competence, predisposes him not only to great personal achievements but also to invaluable contributions to the development of his



Qualitative Study on Harnessing Language and Literature Studies for ... Enu, E. N. (2026)

nation. Language and literature as agents of moral development contribute in no small measure to individual moral development. Moral development is a very critical aspect in the development of human personality. Moral development of a citizen is very important to national development and must precede economic development. Moral education on the other hand is concerned with improving people's behavior, character, and philosophy. Psychologists lay emphasis on moral education and moral development of children for national development (FRN, 2013). A nation which is made up of individuals who are morally bankrupt can never attain the stature of nationhood, nor can it attain meaningful and sustainable development. Moral development and physical development are complementary in the process of national development. Traditionally, child's imagination and his oral judgment are trained through folktales, short stories and genealogies. The stories always contain a moral lesson which is usually drawn at the end of the tale. These stories and the moral lessons which they encapsulate can be handed down from generation to generation for the moral development of children who must grow into adults capable of contributing effectively to the development of the society in which they live without language. Language vocalized made all these possible. It is language that the radio and television workers, newspapers and preachers use to condemn corruption in all its forms and other social crimes with a view to producing morally conscious and healthy citizens who are needed in the society for its development.

National Development

National development can be viewed from various angles or aspects of human activity, which can lead to better living standard of people generally. Stability and progress are often realized in a nation's natural resources through education. In this way, peaceful co-existence, security of life, property and freedom can be guaranteed. Development simply implies progress, which bring maturity and self-actualization both individually and collectively. Development does not end with human being, it has also to do with the physical environment in which man lives, the socio-political, economic and cultural systems in which he is involved in the community. Adetunji, (2020) quoting Rondney (1997) defines development at individual level as increased skills and capacity, greater freedom, creativity, self-discipline, responsibility and material well-being. And in his definition of economic development, he says that society develops economically as its members jointly increase their capacity for dealing with the environment. Development cannot be seen purely as an economic affair, but rather as an overall social process, which is dependent upon the outcome of man's effort to deal with natural environment. Culture, national unity and integration, science and technology, communication, commerce and business, education, government, mass mobilization and agriculture are some of the factors that measure development in which language plays a vital role.

Language, Literature, National Integration and Unity

Language and literature are strong tools of national integration, without which no development can be made by any nation, be it in social activities, politics, culture, economy or technology. This can be achieved only when the citizens of the same nation can talk to one another in a common language. This removes fear of domination of the smaller ethno-linguistic groups by the larger ones and gives way to fraternal feeling and a sense of oneness necessary for national achievement. The stability of a nation depends largely on the level of integration of its people. In Nigeria, the problem of language and ethnicity have dangerously threatened the essential unity of the nation and its corporate existence. English, the official language in Nigeria, has not succeeded in cementing the unity and sense of nationalism among diverse ethno-linguistic groups. This is because the official language is used by the educated elites and town dwellers and not the rural population which constitutes about two thirds of the national population. Unity can only be achieved by the process of generalized literary programmes where everybody is expected to achieve communicative linguistic competence in the nation's official language. There have been various debates over which language is to be adopted as the lingua franca for decades now. The realization of the dream is farfetched and ominous because no ethno-linguistic group would want its own language to be relegated to the background. During the 1990 national merit award which was conferred on Professor Ayo Bamgbose by President Ibrahim Babangida, the president urged Nigerians to work harder towards realizing the nation's desire to evolve "by adoption or selection, through consensus of a national language or languages" adding that "tremendous national greatness lives in the achievement of culture, integration and linguistic harmony and we must work hard for the attainment of these goals" these statement underscores the importance of language in the national development(Weekend Concord, 1990:16) quoted in Ogungbola (2021). Based on the foregoing, a committee should be set up by government to harmonize the three major languages (Igbo, Hausa and Yoruba) and come up with one language. This national language will be made compulsory right from primary to secondary schools. Foreign language should be an elective subject.



Qualitative Study on Harnessing Language and Literature Studies for ... Enu, E. N. (2026)

Language, Science and Technology, Commerce and Business

This is the age of science and technology and any country wishing to advance technologically must learn the language of technology by making sure that its citizens are well grounded in the study of science and in research. For there to be breakthrough in technology, the scientist must make use of language not only in his research but also in explaining the process by which he arrives at a scientific discovery. Okoro (2022) said that the body of traditional medicine in Nigeria had remained largely outside the culture of writing in any language. He further advocated that we should now commit everything in traditional medicine to writing, only in this can we demonstrate the authenticity, validity and verifiability of the system. It is language that is used to formulate all the scientific theories and to put them in print for the benefit of mankind. Indeed language is a powerful tool for national development. Nigeria can use its numerous languages as a tool for national development and integration. The idea of technological transfer is a complete fuse. Against the advantages of an imported foreign language like English as in the proper functioning or high level manpower technology, contacts with the outside world and access to higher education, many people believe that the numerous indigenous languages that abound in the country cannot offer anything for the economic, social and political development of the nation. There is no doubt that a developed foreign language like English or French has potentials for the rapid growth of a modern state yet the indigenous languages have certain functions to perform. Low level technology can be domesticated and transmitted in indigenous languages for small industries while high level technology remain the exclusive preserve of the imported official languages. There are many of this type of industrial establishments owned and manned by indigenous people who are not literate in any foreign language. Indigenous technology can be sustained and improved upon when the indigenous languages are used in the training of the artisans. When the citizens are gainfully employed, it will reduce social miscreants and harmony prevails (Uluocha 2017). The advancement of indigenous technology will create enough employment for the citizens of this country and this growth is predicted on the development of indigenous languages. This is supported by Adeleye and Ogunremi (2017) when they asserted that the experience of Japan where the indigenization of technology language has led to a breakthrough in technological advancement. The experience of Japan, India, China and Korea Republics is a testimony that no nation achieves any technological feat through a foreign language. The technology of a country is tied to its language. With the advancement of our indigenous languages, there will be technological growth; there will be enough employment opportunities and greater social amenities. It is also through language that commerce and trade are executed. Internal and external businesses are done in language. All the business transactions, whether import or export, cannot be successfully, efficiently and profitably done without language. Language contributes immensely to the economic development and it is inextricably linked to commerce and trade.

Language and Culture

Bamgbose (1991) submits that man's ways of behaving and the internal patterns behind them constitute his culture and are made manifest in his language. He therefore sees language as an embodiment of culture. Language is an important aspect of culture. Akande (2002) states that language does not exist independent of culture, that is, the socially inherited assemblage of our lives. It has a dual relationship with culture in the sense that it is part of culture as well as a means of expressing culture. Ogungbola (2021), quoting Adetugbo (1992), opined that language is central to culture and that the centrality of language to culture is recognized everywhere. Part of national development is the development of culture. Any nation that neglects the culture and civilization of its people ends up not having a record of tradition and achievement of its ancestors, which should serve as basis for healthy socio-cultural development. Language does not only express culture, it also creates it. Gomwalk (2000) said that if language dies, culture dies. All the African writers have all used language in their creative writing to express African culture and tradition and to develop them. Folklore has now been translated, committed to writing and published for the young generations. The national collective memory of a race which is in folklore, myths, legends, riddles, epics and the like, in a number of cases, are translated, transposed or inspired other artistic forms in the works of painter, writers, florists, sculptors, musicians and other cultural animateurs and activists within and outside. Traditional art and crafts are propagated through commerce, just as traditional rituals or legends are incorporated in or influenced performing arts. Language, when culturally enriched by regional and sub-regional languages of various ethno-linguistic communities through its intellectualization, preserves national identity, even redeeming this from its inchoate political, economic and social environments. This national identity is strengthened by the national language as it continues to be developed and enriched by usage, even as Nigerians aspire to play an active part in the process of globalization of the economy of the world. Because written and oral language(s) and culture do not develop in



Qualitative Study on Harnessing Language and Literature Studies for ... Enu, E. N. (2026)

vacuum. By a continuing process of acculturation among others, language planning, and usage and through translations, the national community of artists are also strengthened as they learn from others through languages. The department of theatre arts in the universities can hardly survive without the use of language. Language, therefore, is an indispensable organ of cultural and national development.

Government and Language

The federal government of Nigeria recognizes the importance of language when it encourages the development of the national languages, that is, Hausa, Igbo and Yoruba. These languages are also to be taught in all secondary schools in Nigeria to enhance national unity. Government policies are written in languages and transmitted to the people. The three arms of government make use of language in order to function very well. The laws and decrees governing the people are written in language, the law courts dispense justice through the medium of language. All government programs for national development are always carried out and sold to the people through the medium of language.

Communication and Language

No nation can make any progress if its citizens have no functional language for easy communication. The primary role of language is to attend to the communication needs of the society. It is communication that facilitates the meeting of minds of citizens on issues affecting their common destiny. Creative literary works, journals, public speeches and lectures, music, conversations and newspapers which are forms of communications and which enhance development have their messages couched in language. Languages are used at all levels of communication. If language generates communication and language is of vital importance to national development, it is then indisputably true that language is of vital importance to national development.

Language and Education

Language is the medium of instruction in all school subjects. It is a means by which knowledge is transmitted to students who eventually constitute the qualitative work force of the nation. No education can succeed without the use of language, whether it is in arts or science. Language is absolutely necessary for instruction in computer science and technology. To show the importance of language in education, English is made a compulsory school subject in our educational institutions. Multilingualism can also aid development, social and political integration in the area of enhanced literacy. In a discussion on language in national integration and development, Bamgbose (1977) opined that literacy liberates untapped human potential and leads to increased productivity and better living conditions. According to him, mass communication with its emphasis on flow of information can provide a suitable climate for national development. It does seem that education in general and mass participation in the social, economic and political processes in particular are vital to national development and integration. The only way to ensure mass involvement is to pay more attention to the use of our numerous indigenous languages in education and the mass media. A higher percentage of an illiterate citizenry is a curse to any nation development. They not only pull the wheel of progress backwards but in the thinking and attitude to building a virile nation state, they destroy the efforts of patriotic citizens. When the literacy rate of a country improves, it will be easier to resolve conflicts. This is because the citizens will be able to articulate their rights and at the same time respect the right of others. They will be in better position to exercise their democratic rights and improve their level of performance in all their engagement. Nigeria numerous indigenous languages can be effectively used as tools for promoting social and political integration. This can be achieved through the use of languages as medium of instruction at certain levels of the education system (Olagbaju and Akinsowon, 2014). The idea of technological transfer is an illusion. Technological development which is tied to a nation's indigenous languages can help in the reduction of the high rate of illiteracy prevalent in the country. A higher literacy rate leads to greater technological advancement with the resultant employment creation.

Conclusion

It has become obvious that there cannot be any meaningful development in human society without language. It is therefore necessary for Nigeria to have a sound language policy for mass education, mass mobilization and mass participation in the various aspects of national development struggle. By adopting this harmonized national language, instead of foreign languages (English and French), even at public gathering, national/state assembly deliberations, campaigns and in the mass media. It has also established that language and its effective use are indispensable in formulating and implementing all social, economic and scientific activities geared towards better inter human relations, better living conditions and meaningful technological advancement of the nation and that the key to national unity and integration lies greatly in the judicious planning, harmonization and use of national language and literature. A nation that aspires to great achievements



Qualitative Study on Harnessing Language and Literature Studies for ... Enu, E. N. (2026)

in the arts and sciences and consequently, in technology must do so through the development and the use of a functional language. Since language is important for national development, the curriculum planners and educators have the task of giving our children, solid language education in primary schools, colleges and universities so that they will not be handicapped in their acquisition of knowledge which will arm them for positive contribution to the improvement of society.

Recommendations

These suggestions can contribute immensely to harnessing language and literature for national development, promote cultural identity, foster social cohesion, and sustainable growth

1. Government should develop and implement inclusive language policies that will promote multilingualism and language diversity. There is need to support programmes that promote the use of language in education, media and government to preserve Nigeria's cultural heritage and tradition and enhance communication among diverse communities. Therefore, indigenous languages should be integrated into formal education
2. There is also need to promote literature as a means of shaping national identity and pride, encouraging citizenship to engage with their cultural heritage.
3. Government should provide opportunities for indigenous language educators to participate in conferences, workshops, and other events which will help them to gain more insights to language learning issues. Also, workshops and festivals should be organized to promote creative writing, celebrate local authors, playwrights, and poet, fostering a vibrant literary community and encouraging public engagement with literature.
4. There is the need to develop mobile applications that facilitate language learning and literacy, making education more accessible. Also, digital platform for literature should be created, this platform will enable authors to reach wider audiences and readers to access diverse works easily.
5. Integrate language and literature into national development plans: there is need to recognize the role of language and literature in national development.
6. There is need to translate laws and key political texts into indigenous languages so that indigenous peoples may participate in political and legal fields.
7. Textbooks and educational materials in indigenous languages should be developed while obsolete ones should be improved upon or upgraded to cope with the present realities of modern education.

References

- Akande, F. P. (2000). Language Policy for a Result-Oriented Universal Basic Education (UBE) programme. *Lafiagi Journal of Education, Science and Technology*. Vol.4, No.1.
- Adeleye, I.A. and Ogunremi, P. (2017). Promoting Nigerian Languages for Sustainable Development in Nigerian. In Fakeye, D.O., Oladunjoye, S.A.O., Alade, I.A., Kayode- Olawoyin, B.O., Bateye, O.R., Olatunji, S.O., Jayeoba, O.S. (Eds.) *Further Thoughts on Language, Education and the Curriculum Nexus for Sustainable Development*. Pp 40-54.
- Adetunji, O. J. (2020). Language in the Development of Primary Education Goal. *Journal of Language and Literature*. Vol.6. No.1.
- Bamgbose, A. (1991). *Language and Nation: The Language Question in Sub-Sahara African*. Edinburgh: University Press.
- Cruz, A. C. (2002). *Language and Culture*. National Commission for Culture and the Arts. Philippines: Pambata Press.
- Federal Republic of Nigeria (2013) *National Policy on Education*. Lagos: NERDC Press.
- Gomwalk, S. (2000). *Language and Power: A Tool for Successful Political Speeches*. *Journal of Education and the Challenges of Patriotism in Nigeria*. University of Ibadan.
- Moody, H.I. (1986). *Literary Appreciation*. Longman Group Ltd.
- Okoro, I. J. (2022). Language Education in Nigeria: The way Forward. *Journal of Nigerian Languages*. Vol.4. No.3.
- Ogungbola, A. O. (2021). Language Diversity and National Development. *Journal of African Education*. Vol. 3.
- Olagbaju, O.O. and Akinsowon, F.I. (2014). The use of Nigerian Languages in Formal Education: Challenges and Solutions. *Journal of Education and Practice*. ISSN 2222-1735 (Paper) ISSN 2222-288X (Online) Vol.5, No.9.
- Stone, O. B. (2019). Communicative Competence as effective Tool in English Language Achievement. *Journal of Literacy and Readings*. Vol.10. No.1.
- Uluocha, V.C. (2017). The Nigerian Languages as Tools for Social and Political Integration. In Ndudim, C. (Ed.) *Readings in Language Literature and Social Reality in Nigeria*. Pp. 22-26.



Effects of Video-Clip Instructional Strategy on Performance and Retention in Basic Science Concept among Upper Basic Students in Makurdi, Benue State, Nigeria

ENEMARIE, Veronica¹

Email: veraenemarie7@gmail.com

Tel: 07051713553

TAANGAHAR, Benjamin Akura¹

Email: benjamintaangahar@gmail.com

Tel: 08085158616

TARTENGER, Timothy Terungwa¹

Email: tartengertimothy@gmail.com

Tel: 07067699177

¹Department of Science and Mathematics Education, Rev.Fr. Moses Orshio Adasu University, Makurdi, Benue State, Nigeria

Abstract

This study examined the effect of video clip instructional strategy on Basic Science students' academic performance and retention in Makurdi Local Government Area, Benue State, Nigeria. Four research questions guided the study, and four corresponding hypotheses were tested. The study adopted a quasi-experimental, non-randomized pre-test, post-test design. The population comprised 1,933 upper Basic II students from 31 Universal Basic Education (UBE) schools in Makurdi, while a sample of 73 students in two intact classes was selected using a multi-stage sampling. The experimental group was exposed to video clip instructional strategy, and the control group received instruction via the demonstration method. The research instrument, the Basic Science Performance and Retention Test (BSPRT), was developed by the researchers and validated by two experts in Science Education and one expert in test and measurement in department of Science and Mathematics Education, Faculty of Education, Rev. Fr. Moses Orshio Adasu University, Makurdi. Reliability of the instrument was established using Kuder-Richardson Formula 21 (KR-21), yielding a coefficient of 0.94. Data were analyzed using mean and standard deviation to answer the research questions and Analysis of Covariance (ANCOVA) to test the hypotheses at 0.05 significance level. Findings revealed that video clip instructional strategy significantly enhanced students' academic performance compared to the demonstration method ($F(1,66) = 20.98$; $p = 0.000 < 0.05$). No significant difference was found between male and female students' performance using video clips ($F(1,34) = 0.539$; $p = 0.468 > 0.05$). Similarly, retention scores were higher for students taught using video clips than those taught via demonstration ($F(1,69) = 0.019$; $p = 0.891 < 0.05$), with no significant gender differences observed. The study recommends that Basic Science teachers employ video clip instructional strategy in teaching, as it facilitates active engagement, idea-sharing, and promotes equitable academic performance and retention across genders among others.

Keyword: Video clip, Performance, Retention and Gender

Introduction

Science is a systematic and empirical enterprise concerned with understanding and explaining natural phenomena through observation, experimentation, and logical reasoning. It plays a central role in technological advancement and national development by equipping learners with critical thinking, problem-solving skills, and scientific attitudes. Human curiosity about the natural world has continually driven scientific inquiry, making science education an indispensable component of formal education (Muhammad & Ibrahim, 2022). In Nigeria, this foundation is laid at the junior secondary school level through the teaching of Basic Science, while Biology, Chemistry, and Physics are offered as distinct subjects at the senior secondary school level. Basic Science occupies a strategic position in the Nigerian educational system, serving as the foundation upon which further scientific learning is built. It prepares learners at the upper basic level for effective engagement with core science subjects at the senior secondary school level (Olawaju, 2008, as cited in Oludipe, 2012). A strong grounding in Basic Science is therefore essential for students' successful progression in science-related disciplines. The Basic Science and Technology Curriculum (Revised, 2012) emphasizes the development of scientific literacy, interest in science and technology, acquisition of basic scientific knowledge and skills, preparation for further studies, and the application of science to everyday life. Despite the importance of Basic Science, students' academic performance in the subject has remained generally low and inconsistent. Reports from the Basic Education Certificate Examination (BECE) reveal fluctuating performance trend over ten years, suggesting persistent underachievement among



Effects of Video-Clip Instructional Strategy on Performance and Retention in ... Enemarie, V., Et. al. (2026)

learners. This trend raises concerns about the effectiveness of instructional strategies employed in Basic Science classrooms. Previous studies have attributed students' poor and inconsistent performance largely to teacher-centred instructional approaches, inadequate use of instructional materials, and limited adoption of innovative teaching strategies capable of enhancing understanding and retention (Obomanu & Adaramola, 2011; Ochu & Haruna, 2015; Agbidye, 2019). Effective teaching and learning of Basic Science require instructional approaches that connect classroom experiences with students' real-life contexts, stimulate interest, and actively engage learners. Contemporary science education advocates learner-centred strategies that promote inquiry, collaboration, visualization, and higher-order thinking skills (Ode & Eriba, 2019). However, conventional methods such as lecture and demonstration approaches continue to dominate classroom practice. These methods which are largely teacher-centred, limit students' active participation, and encourage rote memorization rather than meaningful learning, thereby reducing students' retention of scientific concepts (Ijeh & Onwu, 2012; McLeod et al., 2015). Students' academic performance is strongly associated with their level of interest and engagement during instruction. High interest promotes deeper understanding and improved achievement, whereas low interest often results in poor performance and weak retention of learned concepts (Ada et al., 2020). Retention, described as learners' ability to remember and recall previously learned information over time, is a critical indicator of meaningful learning (Safo et al., 2013). even though some empirical evidence, such as that of Ode and Tartenger (2021) and Ugbeda (2021), found that interactive instructional strategies improved retention over conventional methods, instructional strategies that do not actively engage learners and provide visual and experiential learning opportunities will not significantly enhance retention of scientific concepts (Adamu & Usman, 2023; Tartenger et al., 2024).

In the light of these challenges, science educators have increasingly advocated the integration of technology-based instructional strategies into classroom practice. One such approach is the video clip instructional strategy, which combines visual and auditory elements to facilitate understanding of abstract or inaccessible scientific phenomena. Video clips enable learners to observe processes and environments that may not be physically accessible, thereby improving comprehension and long-term retention (Vieira et al., 2014). Studies have shown that video-based instruction enhances students' motivation, engagement, collaboration, and understanding of complex scientific concepts by providing authentic and real-world learning experiences (Fuller & Yu, 2014; Akerson, 2022; Wang et al., 2023). Empirically, Achimugu, Igboegwu, Delmang, and Sunday (2022) and Olelewe, Abdullahim, and Nwangwu (2023), reported higher achievement among students exposed to video-based instruction. Certain aspects of Basic Science, particularly those involving ecological systems, microscopic organisms, or distant environments as well as crude oil and petrochemicals, are difficult to teach effectively using conventional demonstration methods alone. In such cases, video clip instructional strategy offers an effective alternative by providing learners with repeated and flexible access to visual learning resources. However, despite its proven benefits, many Basic Science teachers still rely predominantly on traditional instructional methods (Njoku & Mgbomo, 2021). Additionally, the role of gender in students' academic performance and retention in science has produced mixed findings in the literature. While some studies report gender differences in science performance, others indicate no significant difference when innovative instructional strategies are employed (Jirgba et al., 2018; Ayua & Tartenger, 2020; Osuafor & Obili, 2021 & Olelewe, Abdullahim, & Nwangwu, 2023). These inconsistencies underscore the need for further empirical investigation, particularly within the context of technology-enhanced instruction. Against this background, the present study investigates the effects of video clip instructional strategy on Basic Science students' academic performance and retention in Makurdi Local Government Area of Benue State, Nigeria.

Statement of the Research Problem

Despite the importance of Basic Science as the foundation for the study of science subjects at the senior secondary school level, students' academic performance in the subject has remained unsatisfactory. Evidence from the Benue State Examination Board showed a steady increase in the failure rate of students in Basic Science at the Basic Education Certificate Examination (BECE), rising from 3.52% in 2022 to 9.67% in 2023 and 11.15% in 2024. This trend indicates that a considerable number of students continue to experience difficulties in understanding and retaining Basic Science concepts, thereby threatening the achievement of the objectives of science education. The persistent poor performance has been attributed to the continued use of conventional instructional methods, particularly lecture and demonstration methods, which often make students passive recipients of knowledge and limit meaningful engagement with scientific concepts. As a result, students frequently develop low interest in the subject, exhibit poor academic achievement, and demonstrate weak



Effects of Video-Clip Instructional Strategy on Performance and Retention in ... Enemarie, V., Et. al. (2026)

retention of learned concepts. Although studies have reported that technology-based instructional approaches, such as video clip instructional strategy, can improve students' understanding, achievement, and retention, many Basic Science teachers still rely predominantly on traditional teaching methods. Furthermore, findings on the influence of gender on students' academic outcomes when exposed to innovative instructional strategies remain inconclusive. Therefore, there is a need to investigate the effects of video clip instructional strategy on students' academic performance and retention in Basic Science in Makurdi Local Government Area of Benue State.

The objectives of the study are to:

1. Determine the academic performance of students taught BS using video clip strategy and those taught using demonstration method.
2. Ascertain the performance of male and female students taught BS using video clip strategy.
3. Determine the retention of students taught BS using video clip strategy and those taught using demonstration method.
4. Find out the retention of male and female students taught BS using video clip strategy

Research Question

The study was guided by the following research questions:

1. What differences exist in the mean academic performance scores between students taught Basic Science using video clip instructional strategy and those taught using the demonstration method?
2. What differences exist in the mean academic performance scores between male and female students taught Basic Science using video clip instructional strategy?
3. What differences exist in the mean retention scores between students taught Basic Science using video clip instructional strategy and those taught using the demonstration method?
4. What differences exist in the mean retention scores between male and female students taught Basic Science using video clip instructional strategy?

Hypotheses

The following null hypotheses were formulated and tested at the 0.05 level of significance:

1. There is no significant difference in the mean academic performance scores between students taught Basic Science using video clip instructional strategy and those taught using the demonstration method.
2. There is no significant difference in the mean academic performance scores between male and female students taught Basic Science using video clip instructional strategy.
3. There is no significant difference in the mean retention scores between students taught Basic Science using video clip instructional strategy and those taught using the demonstration method.
4. There is no significant difference in the mean retention scores between male and female students taught Basic Science using video clip instructional strategy.

Methodology

This study used a quasi-experimental non-equivalent pretest–posttest control group design with intact classes. The study was conducted in the Makurdi Local Government Area of Benue State, Nigeria, which has several Universal Basic Education (UBE) schools but persistent reports of low and inconsistent performance in Basic Science. The population comprised 1,933 Upper Basic II students from 31 UBE schools during the 2024/2025 academic session. A sample of 73 students was selected from two intact classes using a multistage sampling technique that involved purposive selection of schools with qualified teachers and adequate facilities, followed by random assignment of classes to experimental and control groups. Data were collected using researcher-developed instruments: the Basic Science Performance Test (BSPT) and the Basic Science Retention Test (BSRT), each consisting of 30 multiple-choice items based on the topic Crude Oil and Petrochemicals. The instruments were validated by senior experts in Science Education department and Measurement and Evaluation in the faculty of education, while reliability was established through a trial test using the Kuder–Richardson Formula 21, which yielded a reliability coefficient of 0.94. Before the experiment, two Basic Science teachers were trained as research assistants on the use of the video clip instructional strategy. The BSPT was administered as a pretest to both groups, followed by a four-week instructional period in which the experimental group was taught using video clips and the control group using the demonstration method. A reshuffled version of the BSPT was administered as a posttest, while the BSRT was administered two weeks later to determine retention. Data were analyzed using mean and standard deviation to



Effects of Video-Clip Instructional Strategy on Performance and Retention in ... Enemarie, V., Et. al. (2026)

answer the research questions, while Analysis of Covariance (ANCOVA) was employed to test the hypotheses at the 0.05 level of significance, with pretest scores used as covariates to control for initial group differences.

Presentation of Results

Research Question One

What differences exist in the mean academic performance scores between students taught Basic Science using video clip instructional strategy and those taught using the demonstration method?

Table 1: Mean and Standard Deviation of Academic Performance Scores of Students taught Basic Science using Video clip strategy and those taught using Demonstration method.

S/No	Method	N	Pre-test Mean	Std. Dev.	Post-test Mean	Std. Dev.	Mean Gain	Decision
1	Video Clip Strategy	39	10.97	1.98	19.69	2.70	8.72	In favour of Video Clip Strategy
2	Demonstration Method	34	11.09	2.60	16.50	2.79	5.41	
Mean Difference					3.19		3.31	

Source: Field Work, 2026

Table 1 shows the mean and standard deviation of students' academic performance scores in Basic Science based on the instructional strategies used. Students taught using the video clip instructional strategy (n = 39) recorded a pretest mean score of 10.97 with a standard deviation of 1.98, and a posttest mean score of 19.69 with a standard deviation of 2.70, resulting in a mean gain of 8.72. Again, students taught using the demonstration method (n = 34) obtained a pretest mean score of 11.09 with a standard deviation of 2.60, and a posttest mean score of 16.50 with a standard deviation of 2.79, yielding a mean gain of 5.41. The posttest mean difference between the two groups was 3.19, while the difference in mean gain scores was 3.31, both in favour of students taught using the video clip instructional strategy.

Research Question Two

What are the mean performance scores between male and female students taught Basic science using video clip?

Table 2: Mean and Standard Deviation of Mean Performance Scores between Male and Female Students taught Basic science using Video Clip.

S/No	Gender	N	Pre-test Mean	Std. Dev.	Post-test Mean	Std. Dev.	Mean Gain	Decision
1	Male	24	10.96	1.85	19.46	2.86	8.50	In favour of Female Students
2	Female	15	11.00	2.24	20.07	2.49	9.07	
Mean Difference					0.61		0.57	

Source: Field Work, 2026

Table 2 presents the mean and standard deviation of the academic performance scores of male and female students taught Basic Science using the video clip instructional strategy. The results show that male students (n = 24) recorded a pretest mean score of 10.96 with a standard deviation of 1.85, and a posttest mean score of 19.46 with a standard deviation of 2.86, resulting in a mean gain of 8.50. Similarly, female students (n = 15) obtained a pretest mean score of 11.00 with a standard deviation of 2.24, and a posttest mean score of 20.07 with a standard deviation of 2.49, yielding a mean gain of 9.07. The difference in posttest mean scores between male and female students was 0.61, while the difference in mean gain scores was 0.57, both in favour of the female students.

Research Question Three

What are the mean retention scores between students taught Basic science using video clip strategy and those taught using demonstration method?

Table 3: Mean and Standard Deviation of Retention Scores between Students taught Basic Science using Video Clip Strategy and those Taught using Demonstration Method.

Effects of Video-Clip Instructional Strategy on Performance and Retention in ... Enemarie, V., Et. al. (2026)

S/No	Method	N	Pre-test Mean	Std. Dev.	Retention Mean	Std. Dev.	Mean Gain	Decision
1	Video Clip Strategy	39	10.97	1.98	15.59	2.29	4.62	In favour of Video Clip Strategy
2	Demonstration Method	34	11.09	2.60	13.47	2.53	2.38	
Mean Difference					2.12		2.24	

Source: Field Work, 2026

Table 3 presents the mean and standard deviation of the retention scores of students taught Basic Science using the video clip instructional strategy and those taught using the demonstration method. The results indicate that students exposed to the video clip strategy (n = 39) recorded a pretest mean score of 10.97 (SD = 1.98) and a retention mean score of 15.59 (SD = 2.29), yielding a mean gain of 4.62. In comparison, students taught using the demonstration method (n = 34) obtained a pretest mean score of 11.09 (SD = 2.60) and a retention mean score of 13.47 (SD = 2.53), resulting in a mean gain of 2.38. The difference in mean retention gain between the two groups was 2.24, in favour of students taught using the video clip instructional strategy.

Research Question Four

What are the mean retention scores between male and female students taught Basic science using video clip?

Table 4: Mean and Standard Deviation of Mean Retention Scores between Male and Female Students Taught Basic Science using Video Clip.

S/No	Gender	N	Pre-test Mean	Std. Dev.	Retention Mean	Std. Dev.	Mean Gain	Decision
1	Male	24	10.96	1.85	15.67	2.53	4.71	In favour of Male Students
2	Female	15	11.00	2.24	15.47	1.92	4.47	
Mean Difference					0.20		0.24	

Source: Field Work, 2026

Table 4 presents the mean and standard deviation of retention scores of male and female students exposed to the video clip instructional strategy. The results show that male students (n = 24) recorded a pretest mean score of 10.96 (SD = 1.85) and a retention mean score of 15.67 (SD = 2.53), resulting in a mean gain of 4.71. Similarly, female students (n = 15) obtained a pretest mean score of 11.00 (SD = 2.24) and a retention mean score of 15.47 (SD = 1.92), yielding a mean gain of 4.47. The difference in mean retention gain between male and female students was 0.24, slightly in favour of the male students.

Hypothesis One

There is no significant difference in the mean performance scores between students taught Basic science using video clip strategy and those taught using demonstration method.

Table 5: ANCOVA of Academic Performance Scores between Students taught Basic Science using Video clip Strategy and those taught using Demonstration Method.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	199.522 ^a	2	99.761	13.419	.000	.277
Intercept	743.312	1	743.312	99.985	.000	.588
Pretest	14.412	1	14.412	1.939	.168	.027
Method	187.601	1	187.601	25.235	.000	.265
Error	520.396	70	7.434			
Total	24915.000	73				
Corrected Total	719.918	72				

a. R Squared = .277 (Adjusted R Squared = .256)

Source: Field Work, 2026

The result of the Analysis of Covariance (ANCOVA) presented in Table 5 shows that the instructional method had a statistically significant effect on students' academic performance in Basic Science after controlling for pretest scores. The



Effects of Video-Clip Instructional Strategy on Performance and Retention in ... Enemarie, V., Et. al. (2026)

result revealed a significant main effect of method, $F(1, 70) = 25.24$, $p < .05$. Consequently, the null hypothesis was rejected. This finding indicates that there is a significant difference in the mean academic performance scores of students taught Basic Science using the video clip instructional strategy and those taught using the demonstration method, in favour of the video clip strategy. The partial eta squared value of 0.265 suggests that approximately 26.5% of the variance in students' academic performance can be attributed to the instructional strategy employed, reflecting a substantial effect size.

Hypothesis Two

There is no significant difference in the mean performance scores between male and female students taught Basic science using video clip strategy.

Table 6: ANCOVA of Performance Scores between Male and Female Students taught Basic science using video clip strategy.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	8.853 ^a	2	4.426	.591	.559	.032
Intercept	373.124	1	373.124	49.851	.000	.581
Pretest	5.437	1	5.437	.726	.400	.020
Gender	3.327	1	3.327	.444	.509	.012
Error	269.455	36	7.485			
Total	15402.000	39				
Corrected Total	278.308	38				

a. R Squared = .032 (Adjusted R Squared = -.022)

Source: Field Work, 2026

The result of the Analysis of Covariance (ANCOVA) presented in Table 6 indicates that gender had no statistically significant effect on students' academic performance in Basic Science when taught using the video clip instructional strategy after controlling for pretest scores. The analysis revealed that the main effect of gender was not significant, $F(1, 36) = 0.44$, $p > .05$. Therefore, the null hypothesis was not rejected. This finding implies that there is no significant difference in the mean academic performance scores of male and female students exposed to the video clip instructional strategy. The partial eta squared value of 0.012 indicates that only 1.2% of the variance in students' academic performance can be attributed to gender, suggesting a negligible gender influence when video clip instruction is used.

Hypothesis Three

There is no significant difference in the mean retention scores between students taught Basic science using video clip strategy and those taught using demonstration method.

Table 7: ANCOVA of Retention Scores between Students taught Basic Science using Video clip Strategy and those Taught using Demonstration method.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	111.334 ^a	2	55.667	10.251	.000	.227
Intercept	381.544	1	381.544	70.257	.000	.501
Pretest	29.761	1	29.761	5.480	.022	.073
Method	84.019	1	84.019	15.471	.000	.181
Error	380.146	70	5.431			
Total	16058.000	73				
Corrected Total	491.479	72				

a. R Squared = .227 (Adjusted R Squared = .204)

Source: Field Work, 2026

The Analysis of Covariance (ANCOVA) results presented in Table 7 show that instructional method had a statistically significant effect on students' retention scores in Basic Science after controlling for pretest scores. Specifically, the effect of method was significant, $F(1, 70) = 15.47$, $p < .05$. Consequently, the null hypothesis was rejected. This result indicates that there is a significant difference in the mean retention scores of students taught Basic Science using the video clip instructional strategy and those taught using the demonstration method. The partial eta squared value of 0.181 suggests that approximately 18.1% of the variance in students' retention scores can be attributed to the



Effects of Video-Clip Instructional Strategy on Performance and Retention in ... Enemarie, V., Et. al. (2026)

instructional strategies employed. This demonstrates that the video clip instructional strategy was more effective in enhancing students' retention of Basic Science concepts than the demonstration method.

Hypothesis Four

There is no significant difference in the mean retention scores between male and female students taught Basic science using video clip strategy.

Table 8: ANCOVA of Retention Scores between Male and Female Students taught Basic Science using Video Clip Strategy.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1.623 ^a	2	.812	.148	.863	.008
Intercept	253.462	1	253.462	46.128	.000	.562
Pretest	1.254	1	1.254	.228	.636	.006
Gender	.383	1	.383	.070	.793	.002
Error	197.813	36	5.495			
Total	9678.000	39				
Corrected Total	199.436	38				

a. R Squared = .008 (Adjusted R Squared = -.047)

Source: Field Work, 2026

The ANCOVA results presented in Table 8 indicate that gender had no statistically significant effect on students' retention scores when taught using the video clip instructional strategy after controlling for pretest scores. Specifically, the effect of gender was not significant, $F(1, 36) = 0.07$, $p = .793$, which is greater than the 0.05 level of significance. Consequently, the null hypothesis was retained. This finding implies that there is no significant difference in the mean retention scores of male and female students exposed to the video clip instructional strategy in Basic Science. The partial eta squared value of 0.002 further indicates that gender accounted for less than 1% of the variance in students' retention scores, suggesting a negligible gender influence. This result demonstrates that the video clip instructional strategy is gender-neutral and equally effective in enhancing retention among both male and female students.

Discussion of Findings

The findings of the present study revealed a significant difference in the mean academic performance scores of students taught Basic Science using the video clip instructional strategy and those taught using the demonstration method, with students exposed to video clips performing better. This indicates that the video clip strategy is more effective in enhancing students' academic performance in Basic Science. This finding is consistent with the studies of Achimugu, Igboegwu, Delmang, and Sunday (2022) and Olelewe, Abdullahim, and Nwangwu (2023), who reported higher achievement among students taught using video-based instructional approaches. The observed improvement may be attributed to the interactive, visual, and dynamic nature of video clips, which enable learners to observe abstract scientific concepts concretely, replay difficult processes, and actively engage in classroom discussions. These features promote deeper understanding, sustained attention, and meaningful learning, which are critical for improved academic performance. The study further found no significant difference in the academic performance of male and female students exposed to the video clip instructional strategy. This suggests that the strategy is gender-neutral and supports equitable learning outcomes. This finding aligns with those of Olelewe, Abdullahim, and Nwangwu (2023) as well as Osuafor and Obili (2021), who reported that video-based instruction benefits male and female students equally. A possible reason for this outcome is that video clips provide equal learning opportunities by engaging multiple senses, accommodating diverse learning styles, and encouraging participation from all students irrespective of gender. The collaborative learning environment created during video-based lessons may also reduce gender-related barriers to learning. In terms of retention, the findings revealed a significant difference in the mean retention scores of students taught using the video clip strategy and those taught using the demonstration method, in favour of the video clip group. This suggests that video clips are more effective in enhancing students' retention of Basic Science concepts. This result corroborates the findings of Ode and Tartenger (2021) and Ugbeda (2021), who reported improved retention among students taught using interactive and innovative instructional strategies. The improved retention observed in this study may be attributed to repeated exposure to visual and auditory representations of content, which strengthens memory encoding and facilitates easier recall of learned concepts over time.



Effects of Video-Clip Instructional Strategy on Performance and Retention in ... Enemarie, V., Et. al. (2026)

Finally, the study revealed no significant difference in the retention scores of male and female students taught using the video clip instructional strategy. This indicates that video clips are equally effective in promoting long-term retention among both genders. This finding supports the work of Osuafor and Obili (2021), who also reported gender-neutral retention outcomes with video-based instruction. The likely reason for this finding is that video clips encourage active participation, collaborative discussion, and repeated review of learning materials, thereby supporting sustained learning and retention for all students regardless of gender.

Conclusion

The study concludes that the use of the video clip instructional strategy significantly improves students' academic performance and retention in Basic Science compared to the conventional demonstration method. The strategy fosters active engagement, visual learning, and collaborative interactions, which collectively enhance conceptual understanding and long-term retention of scientific knowledge. Furthermore, video clip instruction supports gender-equitable learning, as no significant differences were observed between male and female students in both performance and retention. These findings indicate that video clips offer an effective, inclusive, and interactive teaching approach for Basic Science in Makurdi Local Government Area.

Recommendations

Based on the findings, the following recommendations are made:

1. Basic Science teachers should integrate video clip instructional strategy into their lessons to enhance students' understanding, performance, and retention.
2. Teacher training programs should include modules on designing and effectively using video-based instructional materials.
3. Schools and educational authorities should provide the necessary technological resources, including projectors, computers, and internet access, to facilitate the use of video clips in teaching.

Acknowledgements

The authors wish to express their gratitude to those whose works is cited in the study. Our sincere gratitude also goes to the research assistants employed in the course of the study, the students whom the experiment carry out on them and the validators of the instrument for their inputs. We also wish to acknowledge the editors and the editorial board of Zamfara Internal Journal of Education for vetting and improving the quality of the work.

References

- Achimugu, E. I., Igboegwu, E.N., Delmang, T.K., Luka, B.D & Sunday, M.L (2022). Effects of video and audio-taped instructions on Senior Secondary Students' achievement in Chemistry in Lokoja Metropolis. *Webology* 19(13), 104-114
- Ada, N. A., Eriba, J. O. & Toryem, M. M. (2020). Effects of multimedia and fieldtrip instructional strategies on the performance of secondary school students in ecology in Benue State; Nigeria. *BSU Journal of Science, Mathematics and Computer Education (BSU-JSMCE)*, 1(1), 58-69.
- Adaramola, M.O. & Obomanu, B. J. (2011). Factors related to underachievement in science, technology and mathematics education (STME) in secondary schools in Rivers State, Nigeria. *World Journal of Education*, 1(1), 102-109.
- Agbidye, A. (2019). Effect of problem-based learning strategy on upper basic two students' achievement in basic science in Makurdi metropolis, Benue State. *Journal of Science, Technology, Mathematics and Education*, 15(3), 41-48.
- Ayua, G.A & Tartenger, T. T. (2020). Effect of science technology society strategy on academic performance among upper-basic school students in Makurdi metropolis. *Africa Journal of Sustainable Professional Development*. 4(1), 26-33.
- Fuller, P., & Yu, G. (2014). Lessons learned: online teaching adventures and misadventures. *Journal of Social Sciences*, 10(1), 33-38
- Ijeh, S. B & Onwu G. O. M. (2012) Using PCK to deal with learner's conceptions (Misconceptions and Preconceptions) in statistics teaching, *University of Africa* 215 – 225
- Jirgba, C. M., Eriba, J. O. & Achor, E. A. (2018). Effect of peer collaboration learning strategy on students achievement in Basic Science in Makurdi Local Government of Benue State. *Journal of Research in Curriculum and Teaching*, 10(2), 84-97.
- Muhammad, M.I and Ibrahim, S. (2022) Impact of field trips strategy on retention and academic performance in ecology among secondary school students in Zaria Local Government Area, Kaduna State, Nigeria. *Communication in Physical Sciences*, 8(2): 196-204



- Effects of Video-Clip Instructional Strategy on Performance and Retention in ... Enemarie, V., Et. al. (2026)*
- Njoku, M.I & Mgbomo, T. (2022). Effect of field trip and demonstration methods on the achievement of secondary school students in Biology. *Rivers State University Journal of Education (RSUJOE)*, 24 (2):55-64. Retrieved from <url:www.rsujoe.com.ng>
- Ochu, N.O., & Haruna, P.F. (2015). Challenges and prospects of creativity in basic science classroom; the perception of the basic science teachers. *British Journal of Education, Society and Behavioural Sciences*, 5(2), 237-243.
- Ode, J.O & Tartenger, T.T (2021). Effects of thinking maps and role play instructional strategies on student performance and retention in basic science in Makurdi, Nigeria. *Benue State University Journal of Science, Mathematics and Computer Education*, 2(2),30- 39.
- Ode, J.O. & Eriba, J. O. (2019). Teaching and learning of Basic Science in a recessed economy. *Education Review letter* 4(9), 8 16. Retrieved from www.mindsourcing.info
- Olelewe, C. J., Dong, C., Abdullahi, M., & Nwangwu, C. E. (2023). Effects of using a video-clip instructional strategy on students' performance in a computer networking course at universities in Gombe state. *Technology, Pedagogy and Education*, 32(3), 351–365. <https://doi.org/10.1080/1475939X.2023.2201931>
- Oludipe, D. I. (2012). Gender difference in Nigerian junior secondary students' academic achievement in Basic Science. *Journal of Education and Social Research*. 2(1), 93-99
- Osuafor, A.M & Obili, M.O. (2021). Effect of digital video instructional strategy on students' achievement and retention in Basic Science. *Socialscientia Journal of the Social Sciences and Humanities*. 6(1), 65_71. Retrieved from <https://journals.aphriapub.com/index.php/SS/>
- Tartenger, T.T., Enemarie, V. & Upu, F. (2024) Effects of peer tutoring on Basic science students' performance in Makurdi Local Government Area. *Zamfara International Journal of Education (ZIJE)* 4,(1), 165 -171. Retrieved from DOI: <https://www.doi.org/10.5281/zenodo.11445740>
- Ugbede, O.G. (2021). *Effect of think pair share cooperative learning strategy on secondary school students' achievement and retention in electrochemistry in Makurdi metropolis*. Unpublished master's dissertation of Saawua Tarka University Makurdi.
- Vieira I., Lopes P.A., Soares F. (2014). The Potential Benefits of using videos in Higher Education. Accessed on 1/05/2023 from https://www.academia.edu/24250151/The_potential_benefits_of_using_videos_in_higher_education.
- Wang, J., & Li, Y. (2022). Applying cognitive load theory to improve multimedia learning in secondary science education: A meta-analysis. *Educational Technology Research and Development*, 70(1), 265-297. <https://doi.org/10.1007/s11423-021-10043-2>



Reliability Test for Internal Consistency in ... Abayomi, C. Y., Et. al. (2026)

Reliability Test for Internal Consistency in Psychological Assessment Instruments: A Pilot Study with Feeder Team Athletes of Bendel Insurance Football Club of Nigeria

ABAYOMI, C. Y. ¹

celina.abayomi@uniben.edu

ADEYEYE, F.M. ²

ADEWUNMI, C. M. ²

¹Department of Human Kinetics and Sports Science, Faculty of Education, University of Benin, Edo State, Nigeria

²Department of Human Kinetics and Health Education, Faculty of Education, University of Lagos, Lagos State, Nigeria

Abstract

The accurate assessment of psychological constructs in youth athletes requires reliable and valid measurement instruments. This pilot study examined the internal consistency reliability of three widely used psychological assessment tools within the context of Nigerian Premier Football League. The study was specifically designed to determine the internal consistency reliability of the Athlete Self-Confidence Scale (ASCS), Competitive State Anxiety Inventory-2 (CSAI-2), and Mental Toughness Questionnaire-30 (MTQ30) among Nigerian Premier Football League. Twenty male participants (M age = 17.35, SD = 1.42) from the feeder teams of Bendel Insurance Football Club completed all three questionnaires. Cronbach's alpha coefficients were calculated to assess internal consistency reliability for each instrument. The reliability coefficients obtained were: ASCS ($\alpha = 0.73$), CSAI-2 ($\alpha = 0.77$), and MTQ30 ($\alpha = 0.79$). All instruments demonstrated acceptable to excellent internal consistency. Drawing from the findings of the study, it was concluded that all the psychological assessment instruments are considered reliable within the Nigerian sports context and can be applied to Nigerian youth football players. It was therefore recommended among others that the management of Bendel Insurance Football Club and similar clubs should integrate these tools into their regular player evaluation protocols.

Keywords: Internal consistency reliability, psychological assessment, Bendel Insurance Football Club, Athletes

Introduction

In the contemporary era of competitive sports, the difference between success and failure frequently rests on psychological rather than purely physiological parameters. The psychological preparation of athletes has become increasingly recognized as fundamental to optimal athletic performance and overall well-being in competitive sports environments. In football, a sport characterized by high cognitive demands, unpredictable environmental constraints, and intense physical exertion, players must possess a robust psychological profile to execute technical and tactical skills effectively under pressure. Recognizing this, sports psychologists and coaches increasingly rely on psychometric evaluations to profile athletes, identify mental strengths and weaknesses, and design targeted psychological interventions. In order to gain insights for enhancing both performance and athlete development, coaches, sport psychologists, and sports researchers need to understand the psychological characteristics of athletes, including their psychological constructs such as self-confidence, anxiety, and mental toughness. However, the effectiveness of psychological interventions and the accuracy of assessing these psychological constructs depend on the reliability of the measurement instruments employed. These psychological instruments usually include Athlete Self-Confidence Scale, Competitive State Anxiety Inventory-2, and Mental Toughness Questionnaire-30. The Athlete Self-Confidence Scale (ASCS) is designed for measuring self-confidence (Kocak, 2020). The Competitive State Anxiety Inventory (CSAI-2) is used for assessing anxiety and stress levels (Putra & Guntoro, 2022). The Mental Toughness Questionnaire-30 (MTQ30) is used to determine assessing mental toughness in participants (AQR International, 2017). In the Nigerian sports context, particularly within football, there has been growing recognition of the importance of psychological factors in athlete development programmes (Adeyeye, 2019). Football clubs increasingly invest in youth development through feeder team programmes designed to identify and nurture talented young players (Sweeney et al., 2021). These programmes provide ideal settings for implementing comprehensive psychological assessments that can inform individualized training and support interventions. However, limited research has examined the psychometric properties of standardized psychological assessment instruments within Nigerian youth sport populations. Bendel Insurance Football Club, established in 1972 and based in Benin City, Edo State, Nigeria, maintains a robust youth development system through its feeder team programmes (Agency Report, 2021). These feeder teams provide structured competitive football experiences for adolescent athletes, making them an appropriate population for pilot testing psychological assessment instruments. In addition, determining the reliability of these instruments within this specific



Reliability Test for Internal Consistency in ... Abayomi, C. Y., Et. al. (2026)

cultural and sporting context is essential for their appropriate application in talent identification, performance enhancement, and monitoring athletes' welfare.

Purpose of the Study

This pilot study aimed to examine the internal consistency reliability of three widely used psychological assessment instruments when administered to youth football players in Nigerian feeder team programs. Specifically, the study evaluated internal consistency reliability of:

1. Athlete Self-Confidence Scale (ASCS)
2. Competitive State Anxiety Inventory-2 (CSAI-2)
3. Mental Toughness Questionnaire-30 (MTQ30)

Research Questions

Arising from the purpose of the study, the following research questions were raised to guide the study:

1. What is the internal consistency reliability of Athlete Self-Confidence Scale (ASCS) when administered to youth football players in Nigerian?
2. What is the internal consistency reliability of Competitive State Anxiety Inventory-2 (CSAI-2) when administered to youth football players in Nigerian?
3. What is the internal consistency reliability of Mental Toughness Questionnaire-30 (MTQ30) when administered to youth football players in Nigerian?

Athlete Self-Confidence Scale (ASCS)

Athlete self-confidence is often considered a major psychological determinant of performance and reflects athletes' beliefs about their ability to succeed in sport (Vealey & Vernau, 2021). The Athlete Self-Confidence Scale has been employed extensively in sport psychology research to assess domain-specific confidence (Stefanaki, & Galanis, 2023). Recent evidence confirms strong relationships between sport confidence and both performance outcomes and psychological well-being indicators (Vealey & Vernau, 2021). Cultural factors influence the development and expression of athletic confidence, with research suggesting that collectivistic cultural values may shape confidence differently than individualistic contexts (Elumaro, (2022). In African sport settings, confidence has been linked to prior performance accomplishments, social support from coaches and teammates, and mastery climate perceptions (Efebeh, 2020). Reliability estimates for confidence measures in youth sport populations typically range between 0.70 and 0.88 (Kocak, 2020).

Competitive State Anxiety Inventory-2 (CSAI-2)

Over the years, the Competitive State Anxiety Inventory-2 still remains one of the most widely used instruments for assessing pre-competition anxiety in athletes, measuring cognitive anxiety, somatic anxiety, and self-confidence dimensions (Martens et al., 1990). While contemporary research continues to support the multidimensional conceptualization of competitive anxiety, debates, however, persist regarding optimal factor structures (Sánchez-Ruiz et al., 2025; Ríos-Garit et al., 2026). Recent studies with youth athletes have documented significant relationships between competitive anxiety and performance outcomes, with cognitive anxiety often showing facilitative effects at moderate levels (Amaro & Brandão, 2023). It has also been observed that cultural considerations influence anxiety experiences, which shows that athletes from different cultural backgrounds may interpret and respond to competitive stressors differently (Hofmann & Hinton, 2014; Dawson et al., 2023). Previous research has reported Cronbach's alpha values ranging from 0.72 to 0.88 for CSAI-2 subscales while the main instrument is reported to have a reliability of 0.61 to 0.86 (Putra & Guntoro, 2022).

Mental Toughness Questionnaire-30 (MTQ30)

Mental toughness is often examined in relation to the 4Cs model involving Control, Commitment, Challenge, and Confidence. These represents a collection of psychological characteristics associated with consistent high performance under pressure (Beheshti et al., 2021). The MTQ30 has been widely employed across sport, education, and organizational contexts (Cowden et al., 2021). Recent research has demonstrated relationships between mental toughness and various performance outcomes, psychological well-being indicators, and adaptive coping strategies (Farnsworth & Burch, 2022). It is argued that cultural factors may influence the development and expression of mental toughness, and research have shown variations across different cultural contexts in the relative importance of specific mental toughness components (Ying et al., 2025). Studies with African athlete populations have documented significant relationships between mental



Reliability Test for Internal Consistency in ... Abayomi, C. Y., Et. al. (2026)

toughness and competitive success (Asamoah et al., 2026). Reliability estimates for the MTQ30 typically range from 0.72 to 0.92 for subscales and total scores (AQR International; 2017).

Methodology

Research Design

This pilot study employed a descriptive survey design to examine the internal consistency reliability of three psychological assessment instruments. This design was considered appropriate as it involves the collection of data on a phenomenon with the aim of describing such phenomenon as it exists in its natural setting without manipulating variables (Omorogiuwa, 2019). This design was considered suitable for this study as the study focused on collecting data on psychological constructs from the respondents without manipulating variables

Participants

Twenty male youth football players ($N = 20$) from the feeder teams of Bendel Insurance Football Club participated in this study. Participants ranged in age from 15 to 20 years ($M = 17.35$, $SD = 1.42$). All participants were actively involved in competitive football training and matches as part of the club's youth development programme. Years of football experience ranged from 3 to 8 years ($M = 5.40$, $SD = 1.60$).

Inclusion and Exclusion Criteria

Inclusion criteria required participants to be current members of Bendel Insurance Football Club feeder teams; be between 15 and 20 years of age; have at least two years of organized football experience; be actively participating in regular training sessions; and provide informed consent either directly or by proxy in cases of minors. Exclusion criteria included current injury preventing full training participation; inability to read and comprehend English at a level sufficient for questionnaire completion; and unwillingness to complete all assessment instruments.

Sampling Procedure

Purposive sampling was employed to recruit participants from the accessible population of feeder team athletes. Potential participants were informed about the study during a team meeting, and those expressing interest were provided with detailed information sheets and consent forms. Given the pilot nature of this study, the sample size of 20 participants was considered appropriate for preliminary reliability assessment while remaining feasible within the constraints of the feeder team programme.

Instruments

The research instruments adopted in the study were standardized versions of the following instruments:

Athlete Self-Confidence Scale (ASCS): This was used to assess athletes' confidence in their abilities across various sport-related domains. The scale employs a Likert-type response format, with items assessing confidence related to skill execution, decision-making, physical factors, and psychological factors; Competitive State Anxiety Inventory-2 (CSAI-2): This was used to assess three dimensions of pre-competition anxiety: cognitive anxiety which involves worry and negative expectations, somatic anxiety which involves physiological activation, and self-confidence. The 27-item questionnaire uses a 4-point Likert scale ranging from 1 (not at all) to 4 (very much so). Participants were instructed to indicate how they feel "right now" in relation to upcoming competition; Mental Toughness Questionnaire-30 (MTQ30): The MTQ30 assessed mental toughness through the 4Cs framework: Control (emotional control and life control), Commitment, Challenge, and Confidence in abilities and interpersonal confidence. The 30-item questionnaire employed a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Procedure

Data collection was conducted during a scheduled training week to minimize disruption to the athletes' regular schedules. Participants completed all three questionnaires in a single session in a quiet classroom at the club's training facility. The assessment session lasted approximately 60-75 minutes. Participants were provided with detailed instructions for each questionnaire and were encouraged to ask questions if any items were unclear. To control for order effects, the sequence of questionnaire administration was counterbalanced across participants. Specifically, participants were randomly assigned to one of four different administration orders. Participants completed the questionnaires independently, though research assistants remained available to clarify any questions. Completed questionnaires were immediately checked for completeness, and participants were asked to complete any missed items before leaving the session.



Reliability Test for Internal Consistency in ... Abayomi, C. Y., Et. al. (2026)

Data Analysis

Data were entered into SPSS Version 27 for analysis. Prior to reliability analysis, data were screened for missing values, outliers, and violations of assumptions. Descriptive statistics involving means and standard deviations were calculated for all scale scores. Internal consistency reliability was assessed using Cronbach's alpha coefficient for each instrument and, where applicable, for subscales within instruments. Cronbach's alpha values were interpreted according to commonly accepted guidelines: $\alpha \geq 0.90$ = excellent, $0.80 \leq \alpha < 0.90$ = good, $0.70 \leq \alpha < 0.80$ = acceptable, $0.60 \leq \alpha < 0.70$ = questionable, and $\alpha < 0.60$ = poor. Given the pilot nature of this study and the small sample size, alpha coefficients of 0.70 or higher were considered evidence of adequate internal consistency.

Ethical Considerations

Ethical approval was obtained from the relevant University of Benin Research Ethics Committee prior to commencing data collection. Participants were provided written informed consent after receiving comprehensive information about the purpose of study, procedures, potential risks and benefits, and their rights as participants. Participation was entirely voluntary, and participants were informed of their right to withdraw at any time without penalty. Confidentiality was maintained through the assignment of identification codes, with personally identifiable information stored separately from questionnaire data in a secure location. Participants were provided with contact information for the research team and were informed that they could request a summary of study findings upon completion.

Presentation of Results

Initial data screening revealed no missing values, as all participants completed all items on all three questionnaires. Examination of response patterns indicated no evidence of systematic response biases or straight-lining. Descriptive statistics for all scale scores are presented in Table 1.

Table 1: Descriptive Statistics for All Instruments

Instrument	M	SD	Possible Range	Obtained Range
ASCS	3.65	0.64	1-5	2.3-4.8
CSAI-2	2.48	0.52	1-4	1.6-3.5
MTQ30	3.54	0.49	1-5	2.7-4.5

Table 1 presents the descriptive statistics for the three psychological instruments used in the study.

The mean score of 4.82 shows that participants reported a relatively high level of sport motivation.

Data on ASCS shows a mean score of 3.65 which indicates a moderately high level of self-confidence among participants. The relatively small SD (0.64) shows that responses were fairly consistent across respondents. The obtained range of 2.3-4.8 demonstrates that most response categories were represented, supporting the scale's sensitivity to individual differences in their responses. Data on CSAI-2 shows that the mean anxiety score of 2.48 reflects a moderate level of competitive anxiety. The SD of 0.52 indicates relatively low variability, meaning that respondents tended to cluster around the mean. The obtained range of 1.6-3.5 covers most of the scale, showing that the instrument captured varying anxiety levels among participants. Data on MTQ30 shows a mean score of 3.54 which indicates that participants generally reported positive imagery use. The relatively low SD (0.49) indicates that respondents' scores were fairly homogeneous. The obtained range of 2.7-4.5 demonstrates sufficient spread to support meaningful measurement.

Internal Consistency Reliability

Cronbach's alpha coefficients were calculated for each of the three instruments. Results indicated that all instruments demonstrated acceptable to excellent internal consistency reliability within the sample. Specific reliability coefficients are presented in Table 2.

Table 2: Internal Consistency Reliability Coefficients

Instrument	Cronbach's α	95% Confidence Interval	Number of Items	Classification
ASCS	0.73	0.55, 0.85	21	Acceptable
CSAI-2	0.77	0.61, 0.87	27	Acceptable
MTQ30	0.79	0.64, 0.88	30	Acceptable

Key: 0.70-0.79 = acceptable, 0.80-0.89 = good, ≥ 0.90 = excellent.

Athlete Self-Confidence Scale (ASCS): The ASCS yielded acceptable internal consistency reliability ($\alpha = 0.73$, 95% CI [0.55, 0.85]). While this coefficient met the minimum threshold for acceptable reliability, the relatively wide confidence interval reflects the uncertainty associated with reliability estimation in small samples.



Reliability Test for Internal Consistency in ... Abayomi, C. Y., Et. al. (2026)

Competitive State Anxiety Inventory-2 (CSAI-2): The CSAI-2 demonstrated acceptable internal consistency reliability ($\alpha = 0.77$, 95% CI [0.61, 0.87]). This multidimensional instrument showed adequate overall consistency despite measuring three distinct constructs (cognitive anxiety, somatic anxiety, and self-confidence). Mental Toughness Questionnaire-30 (MTQ30): The MTQ30 showed acceptable internal consistency reliability ($\alpha = 0.79$, 95% CI [0.64, 0.88]). This coefficient suggests adequate measurement consistency for the mental toughness construct as operationalized through the 4Cs framework.

Subscale Reliability

For instruments with clearly defined subscales, internal consistency was also examined at the subscale level. Table 3 presents these subscale reliability coefficients.

Table 3: Subscale Internal Consistency Reliability Coefficients

Instrument	Subscale	Cronbach's α	Number of Items
CSAI-2	Cognitive Anxiety	0.74	9
	Somatic Anxiety	0.71	9
	Self-Confidence	0.75	9

Table 3 presents the subscale internal consistency reliability. It can be observed that all subscales demonstrated acceptable to good internal consistency, with reliability coefficients ranging from 0.71 to 0.75. The consistency of subscale reliabilities within the instruments suggests that the multidimensional structures of these instruments functioned appropriately within the study sample.

Discussion of Findings

This pilot study examined the internal consistency reliability of three psychological assessment instruments commonly used in sport psychology research and practice. The findings provide preliminary evidence supporting the reliability of the Athlete Self-Confidence Scale, Competitive State Anxiety Inventory-2, and Mental Toughness Questionnaire-30 when administered to Nigerian youth football players. All instruments demonstrated acceptable to good internal consistency, with Cronbach's alpha coefficients ranging from 0.73 to 0.79. The Athlete Self-Confidence Scale yielded acceptable internal consistency ($\alpha = 0.73$), though this was the lowest reliability coefficient among the instruments examined. While this value meets the minimum threshold for acceptability, it suggests some heterogeneity in item functioning or construct breadth within this sample. Previous research with youth athletes has reported similar or slightly higher reliability estimates (Kocak, 2020), which shows that the present finding is not abnormal, particularly given the small sample size. The multifaceted nature of sport confidence, encompassing confidence related to physical skills, decision-making, psychological factors, and other domains, may contribute to somewhat lower internal consistency compared to more narrowly defined constructs. The Competitive State Anxiety Inventory-2 demonstrated acceptable internal consistency ($\alpha = 0.77$), with subscales showing reliability coefficients ranging from 0.71 to 0.75. These values are consistent with contemporary research employing the CSAI-2 with youth sport populations (Putra & Guntero, 2022). The adequate reliability across all three subscales involving cognitive anxiety, somatic anxiety, and self-confidence, supports the multidimensional conceptualization of competitive anxiety and suggests that these dimensions can be reliably assessed within this population. The similarity in reliability across subscales indicates relatively consistent measurement precision for different anxiety components. The Mental Toughness Questionnaire-30 showed acceptable internal consistency ($\alpha = 0.79$), supporting its reliability for assessing mental toughness through the 4Cs framework with the study population. This coefficient is consistent with previous research employing the MTQ30 across various sport contexts (Ying et al., 2025). Mental toughness has been identified as an important psychological characteristic contributing to performance under pressure and effective coping with competitive demands (AQR International; 2017). The acceptable reliability obtained in this pilot study suggests that the MTQ30 can provide consistent measurement of this construct among Nigerian youth football players, supporting its potential utility in talent identification and psychological skills training programs.

Conclusion

Based on the findings of this study, it is therefore concluded that all the psychological assessment instruments involving Athlete Self-Confidence Scale, Competitive State Anxiety Inventory-2, and Mental Toughness Questionnaire-30 meet acceptable reliability indices within the Nigerian sports context and can be applied to Nigerian youth football players.

Recommendations

Drawing from the findings of this study and the conclusion, it is therefore recommended that:



Reliability Test for Internal Consistency in ... Abayomi, C. Y., Et. al. (2026)

1. The management of Bendel Insurance FC and similar clubs should integrate these reliable tools into their regular player evaluation protocols since profiling players based on self-confidence, anxiety, and mental toughness will facilitate targeted psychological coaching which will ultimately assist in the transition of elite talents from feeder teams to the professional senior squad.
2. Researchers and sports psychologists should use the ASCS, CSAI-2, and MTQ-30 in large-scale studies involving Nigerian youth footballers, as the instruments have proven reliable.
3. Future research should examine additional psychometric properties including test-retest reliability, construct validity, and criterion-related validity to determine the psychometric properties of these instruments in a larger population
4. Given that the ASCS had the lowest reliability score among the scales, it is therefore recommended that researchers should briefly interview participants in future studies to ensure that cultural humility is not skewing the interpretation of self-confidence items.

References

- Adeyeye, F.M (2019). Impact of emotion regulation strategies on aggressive behaviour of amateur footballers. *Journal of International Council for Health, Physical Education, Recreation, Sport and Dance ICHPER-SD*, 5(1), 265 – 275.
- Amaro, R., & Brandão, T. (2023). Competitive anxiety in athletes: emotion regulation and personality matter. *Kinesiology*, 55(1), 108-119. <https://ojs.srce.hr/kinesiology/article/view/25243>
- AQR International (2017). *Mental toughness questionnaire A user guide*. Available at <https://aqrinternational.co.uk/wp-content/uploads/2018/02/MTQ-User-Manual-2017-4.00.pdf>
- Asamoah, B., Boamah Mensah, A. B., & Grobbelaar, H. W. (2026). A phenomenological exploration of mental toughness in decision-making: Perceptions from professional Ghanaian footballers. *PloS one*, 21(2), e0342778. <https://doi.org/10.1371/journal.pone.0342778>
- Cowden, R. G., Crust, L., Tibbert, S. J., & Jackman, P. C. (2021). Mental toughness development: An interpretative phenomenological analysis of mental toughness development in adolescent cricketers. *International Journal of Sport and Exercise Psychology*, 19(5), 751-769. <https://doi.org/10.1080/1612197X.2020.1766539>
- Efebeh, V. E. (2020). Sports as an instrument of development and national cohesion: The Nigerian experience. Available at: <https://dj.univdanubius.ro/index.php/JDSR/article/view/569/840>
- Elumaro, A. I. (2022). Insights on the process of athletes' development in Nigeria. *Journal of Physical Education and Sport Management*, 13(1), 15-23
- Farnsworth, J. L., & Burch, D. (2022). Mental toughness measures: A systematic review of measurement properties. *Journal of Personality Assessment*, 104(6), 645–660.
- Fenton, S. A., Duda, J. L., & Barrett, T. (2016). Optimising physical activity engagement during youth sport: A self-determination theory approach. *Journal of Sports Sciences*, 34(19), 1874–1884. <https://doi.org/10.1080/02640414.2016.1142104>
- Ibrahim, L.Y. (2015). Motivational factors as determinants of job performance of coaches in Nigerian universities. *Journal of Physical Education Research*, 2(III), 20-30.
- Kocak CV. (2020). Athlete self-efficacy scale: Development and psychometric properties. *Balt J Health Phys Act.*, 12(4), 41-54. doi: 10.29359/BJHPA.2020.Suppl.1.05
- Manninen, M., Dishman, R., Hwang, Y., Magrum, E., Deng, Y., & Yli-Piipari, S., (2022). Self-determination theory based instructional interventions and motivational regulations in organized physical activity: A systematic review and multivariate meta-analysis. *Psychology of Sport and Exercise*, 62, 102248. <https://doi.org/10.1016/j.psychsport.2022.102248>.
- Martens, R., Vealey, R. S., & Burton, D. (1990). *Competitive anxiety in sport*. Champaign, IL: Human Kinetics
- Pelletier, L. G., Fortier, M. S., Vallerand, R. J., Tuson, K. M., Briere, N. M., & Blais, M. R. (1995). *Sport Motivation Scale (SMS, EMS)* [Database record]. APA PsycTests. <https://doi.org/10.1037/t55190-000>
- Putra, M. F. P. & Guntoro, T. S. (2022). Competitive State Anxiety Inventory–2R (CSAI-2R): Adapting and validating its Indonesian version. *International Journal of Human Movement and Sports Sciences*, 10(3), 396-403. DOI: 10.13189/saj.2022.100305
- Sánchez-Ruiz, R., Gil-Caselles, L., García-Naveira, A., Arbinaga, F., Ruiz-Barquín, R., & Olmedilla-Zafra, A. (2025). Competitive anxiety, sports injury, and playing category in youth soccer Players. *Children (Basel, Switzerland)*, 12(8), 1094. <https://doi.org/10.3390/children12081094>
- Stefanaki, K., & Galanis, E. (2023). The effectiveness of cognitive-behavioral consultation on competitive anxiety and self-confidence in youth athletes. *International Journal of Environmental Research and Public Health*, 20(2), 1134. <https://doi.org/10.3390/ijerph20021134>



Reliability Test for Internal Consistency in ... Abayomi, C. Y., Et. al. (2026)

- Sweeney, L., Horan, D., & MacNamara, Á. (2021). Premature Professionalisation or Early Engagement? Examining Practise in Football Player Pathways. *Frontiers in sports and active living*, 3, 660167. <https://doi.org/10.3389/fspor.2021.660167>
- Vealey, R. S., & Vernau, D. (2021). Confidence in sport. In G. Tenenbaum & R. C. Eklund (Eds.), *Handbook of sport psychology* (4th ed., pp. 518-542). Wiley
- Ríos-Garit, J., Pérez-Surita, Y., Gómez-Espejo, V., Reyes-Bossio, M., & Tutte-Vallarino, V. (2026). Competitive anxiety as a predictor of the occurrence, quantity, and severity of injuries in young Cuban athletes. *International Journal of Environmental Research and Public Health*, 23(3), 354. <https://doi.org/10.3390/ijerph23030354>
- Hofmann, S. G., & Hinton, D. E. (2014). Cross-cultural aspects of anxiety disorders. *Current psychiatry reports*, 16(6), 450. <https://doi.org/10.1007/s11920-014-0450-3>
- Dawson, D. B., Tsao, C. G., Chen, P., Giardina, T. D., & Fletcher, T. L., (2023). Providers' perspectives on the impact of culture in the recognition and diagnosis of anxiety. *Journal of Mood & Anxiety Disorders*, 4, 100030. <https://doi.org/10.1016/j.xjmad.2023.100030>.
- Beheshti, A., Gharayagh-Zandi, H., Fathirezaie, Z., & Heidari, F. (2021). Mental toughness and performance strategies of martial artists in practice and competition. *Exercise and Quality of Life*, 13(1), 13–21. <https://doi.org/10.31382/eqol.210602>
- Ying, H., Wei, H., Nuryana, H. Z., Syafitri, A. I., Rahmadonna, S., Pujiriyanto, A. P. (2025). Understanding the impact of culture shock on mental health: Mediating effects of expectancy of success and GRIT in international students in China. *Acta Psychologica*, 259, 105344. <https://doi.org/10.1016/j.actpsy.2025.105344>.
- Agency Report (2021, January 21). Edo Govt to support education of insurance fc feeder team's players. *Independent*. Available at <https://independent.ng/edo-govt-to-support-education-of-insurance-fc-feeder-teams-players/>



Effects of Mnemo-Tech on Performance in Plant Physiology Concepts among Secondary School Biology Slow Learners in Zaria Education Zone, Kaduna State, Nigeria

YAKUBU, Rhoda Dallatu¹

rhodadallatu@gmail.com
+2348139329154

DANJUMA, Sunday²

sdkurama@gmail.com
+2347032883655
+2348022603748

¹Department of Biology and Microbiology, School of Applied Science, Nuhu Bamalli Polytechnic, Zaria, Kaduna State, Nigeria

²Department of Science Education, Ahmadu Bello University, Zaria, Kaduna State, Nigeria.

Abstract

This study investigated the Effects of Mnemo-Tech on Performance in Plant Physiology Concepts among Secondary School Biology Slow Learners in Kaduna State, Nigeria. The study adopted a pretest, posttest and post-posttest quasi-experimental and control group design. The population in the 2024/2025 academic session comprised all 8,439 senior secondary school Biology students in Zaria Education Zone. A sample consisting of 172 students was randomly selected from two co-educational schools in Zaria Education Zone, of which 50 students who consistently scored below average in three consecutive examinations were identified and selected as the sample for the study. The Experimental Group was exposed to the Mnemo-Tech instructional strategy while the control group was taught using the lecture method. An instrument was used for this study, namely: Plant Physiology Performance Test, which was validated by four experts with a minimum qualification of PhD from the Department of Science Education and Department of Psychology of Ahmadu Bello University, Zaria. The reliability index for PPPT was calculated using Pearson's Product Moment Coefficient (PPMC) formula was used to compute the reliability of which was found to be 0.61. Two research Objectives, two Research Questions and two Null hypotheses were formulated to guide the study. Independent-samples t-test statistics were used to test the null hypotheses at a $P < 0.05$ level of significance. Findings, among others, revealed that there is a significant difference between the mean academic performance of slow learners taught Plant Physiology Concept using Mnemo-Tech with those taught same concepts using Lecture Method in favour of the experimental group. The observed difference is in favour of experimental group exposed to Mnemo-Tech, indicating that Mnemo-Tech was found to be more effective in improving students' performance in plant physiology among others. The researcher thus concluded that exposure to Mnemo-Tech was found to be helpful in enhancing students' performance and interest level in Plant Physiology. It was therefore recommended, among others, that Biology teachers should make use of Mnemo-Tech to teach plant physiology concepts in secondary schools in order to enhance their academic performance.

Keywords: Mnemo-Tech, Performance, Plant, Physiology, Biology, Slow Learners

Introduction

Biology is one of the science subjects that occupy a significant position in the senior secondary school curriculum. Muoneme (2015) defines Biology as a natural science concerned with the study of life and living organisms including their structure, function, growth, evolution, distribution and taxonomy. Umoh (2015) further defines Biology as a branch of science that is concerned with the characteristics and behaviour of organisms, how species and individual come into existence, and the interaction they have with their environment. Biology plays a vital role in providing knowledge of relevant concepts about living and non-living things and developing skills and attitudes. According to Olajide (2015), Biology is a practical subject which equips students with appropriate skills and concepts useful in solving day-to-day life problems. To further emphasize its significance, Abubakar (2017) had observed that Biology as a discipline has contributed tremendously to financial, physical and aesthetic benefits of humanity and to nation building. The areas of contributions of Biology include: Medicine, Aquaculture, Crime detection, Forestry, Genetic Engineering, Ecology, Parasitology, Biochemistry, Physiology, and Molecular Biology has made Biology subject to become a central focus in most human activities including solutions to the problem of food security, environmental pollution, population explosion, radiation, disease, health, hygiene, family life, poverty eradication, management and conservation of natural resources as well as Biotechnology and ethics to mention a few. The objectives of learning Biology at senior secondary school level



Effects of Mnemo-Tech on Performance in Plant Physiology Concepts among ... Yakubu, R. D. & Danjuma, S. (2026)

include students having adequate laboratory and field skills in Biology in general and plant physiology in particular. Muoneme (2015) observed that teaching plant physiology at secondary schools in Nigeria has not been very impressive due to poor teaching instructional strategies used. Gali (2018) stated that the poor teaching strategies employed by a number of teachers affect the performance of the students in the subject. Dallatu (2019) observed that teaching Biology using teacher-centered strategy such as lecture method does not encourage the students to participate fully in the classroom activities and hence, students perform poorly in Biology concepts. In fact, the failure rate in Biology is even more alarming when compared with Chemistry and Physics despite its popularity among science students. Dallatu (2019) noted that, a review of students' enrolment in science subject at senior secondary schools level in Nigeria shows that more students register for Biology than any other science subject but their academic performance in the subject is comparatively lower at SSCE when compared with other science subjects. Over the years, the performance of students in Biology in public examination has been fluctuating. Nsofor (2019) observed that the low academic performance of students in Biology has been a major concern to parents, teachers, government and the general public. With reference to Nigeria, a recent analysis by the West African Examination Council (WAEC) Chief Examiner's Report from 2020-2025 revealed that only between 41-45% of students pass Biology At the national level annually. The low performance rate cuts across all states of the federation including Kaduna State where the percentage of students that failed Biology were higher than those who passed Biology at the credit level, only in 2019 that the percentage of students that passed Biology at credit level was higher than those who failed it. Tables 1 and 2 shows students' performance from 2020-2025 Nationally and in Kaduna State.

Table 1: WAEC Examination National Result for Biology from 2020-2025, Nigeria

Year	No Registered	No. with A ₁ -C ₆	% with A ₁ -C ₆	No with D ₇ -F ₉	% with D ₇ -F ₉
2020	863,729	345,492	40.01	518,237	59.99
2021	869,643	382,411	43.97	487,232	56.03
2022	742,567	329,624	44.39	412,943	55.61
2023	1,608,123	777,660	45.41	830,463	54.89
2024	1,737,707	864,234	43.48	873,473	56.52
2025	1,985,640	991,772	41.18	993,868	58.82

Source: West African Examination Council, (2025) Annual Report

Table 2: WAEC Examination Result for Biology from 2020-2025 in Kaduna State

Year	No Registered	No. with A ₁ -C ₆	% with A ₁ -C ₆	No with D ₇ -F ₉	% with D ₇ -F ₉
2020	188,880	88,390	46.45	90,398	53.55
2021	190,398	95,394	50.11	84,984	49.89
2022	199,253	81,325	40.35	98,928	59.65
2023	176,925	80,463	43.16	96,462	56.84
2024	178,473	81,345	46.33	97,128	53.67
2025	195,244	98,333	45.45	96,911	54.55

Source: West African Examination Council, Kaduna Office (2025)

The percentages of students that failed Biology were higher than those who passed Biology at Credit level. This continuous increase in low performance of students in Biology at WAEC has been attributed to the teacher-centred method of teaching employed by Biology teachers. The teachers' method of teaching, such as the lecture method, has been a major source of students' poor academic performance in Biology, which is one of the most common methods of teaching science in the secondary schools. According to Lawal (2015), this is a method of teaching which emphasises "talk and chalk" in the teaching of science subjects. According to her, more than 80% of the scientific information and principles are delivered as lectures because of easy coverage of the school syllabus. It is characterised by a one-way flow of information from the teacher who is always active to the students who are always passive. Obeka (2015) opined that the lecture method in its true nature is not effective for science teaching. Muoneme (2016) observed that the use of the lecture method of teaching in science teaching leads to rote learning, which consequently lead to missing essential part of science learning. However, this method of teaching should not be totally discouraged. However, this method of teaching should not be totally discouraged because it has its own place in the teaching and learning process. The secondary school students need technique



Effects of Mnemo-Tech on Performance in Plant Physiology Concepts among ... Yakubu, R. D. & Danjuma, S. (2026)

that will enable them to acquire knowledge that will assist in better performance and retention competency such as Mnemonic. The “Word Menomonic” according to Mastropieri and Scruggs (2016) is derived from the Greek goddess of memory - Mnemosyne, and means “memory enhancing”. Mnemo-Tech are systematic procedures designed to improve the memory. The main idea of Mnemo-Tech is application in developing better ways to encode (take in) information, so that it will be much easier to retrieve (remember). Example of Mnemo-Tech that facilitate teaching and learning of Biology concept includes: King “Phillip, come out for goodness sake” it is a typical acrostic Mnemonics used for classifying of organisms such that, King stand for kingdom, ‘Phillip’ stand for phylum. ‘come’ stand for class, ‘out’ stand for order, ‘for’ stand for family, ‘goodness’ stand for genus and ‘sake’ stand for species”. ‘FARM B’ is used to remember the classes of vertebrate animals such as fish, amphibians, reptiles, mammals and birds. Other examples include, poem, puzzle, keywords easier and is related to their previous learning in the environment. They are fun, easy to learn and use as well as very economical in terms of implementation. Once they are taught to students, the students can use and adapt the tools for the rest of their lives to keep important information from slipping through their fingers. Levin (2017) asserted that Mnemo-Tech has been shown to significantly aid in recall, retention and understanding throughout the curriculum of science, social science, mathematics, language arts and foreign languages. Use of Mnemo-Tech is a highly effective way to help students with and without learning disabilities to recall and retrieve new information taught. Its use has been promoted as a way to assist especially those students with learning difficulties such as slow learners. Such learners often fail to develop knowledge, skills, and self-regulation necessary to succeed in key subject areas, and teachers do not take cognisance of this problem in their classroom (Usman, 2015). The mere total negligence of slow learners has been considered responsible for their poor academic performance in Biology.

Slow learners are a set of students who are generally slow in learning and backwards in retention ability. According to Singh (2024), slow learners are those students whose cognitive abilities are below average. This is to say that their learning abilities are generally slow, and they are learners who are not disabled but trying to cope with their academic studies. Shaw, Grimes and Bulman (2025) also see slow learners as students who learn more slowly than their peers, yet they do not have disability requiring special education. Graffin (2018) observed that slow learners are those who fail to learn at the same rate as the majority of other pupils learn, whose failure cannot be explained by the presence of any handicap condition, even if such a condition is present in such a learner. Slow learners is a mild word for “backward” or mentally retarded and educationally subnormal, which is due to their background, mental ability, illiterate parents, culture problem, avoidance of parents in early childhood; sometimes, mental illness causes slow learning (Khan, 2018). Several factors may account for slow learning in Biology. Shiyabade (2021) listed a good number of them, which include: lack of emotional growth, lack of a secure environment, limited opportunities for learning, absenteeism from school, untrained teachers and teaching methods. She stressed that personnel and teaching methods have often limited their academic progress and that if such students are given proper attention through the provision of a special method of teaching, their academic performance could be enhanced. According to Ogenyi (2024), slow learners could further be identified through their speech defects, language development (broken sentences), verbal abilities, short sentences, grammatically incorrect sentences, child behaviour, spelling mistakes, no interaction with other children in the classroom discussion and lack of interest in the subject. Mstem (2016) had reported that teaching methods affect students’ responses and determine whether they are interested, motivated, and involved in a lesson in such a way as to engage and determine good learning. What constitutes good teaching and learning of school subjects is the use of appropriate method of teaching. To teach slow learners in order to enhance their interest, the researcher will use Mnemo-Tech since it aids memory and helps the students to construct their knowledge.

World Health Organization (WHO, 2017) defined gender as the range of characteristics pertaining to, and differentiating between masculinity and femininity. Depending on the context, these characteristics may include biological sex, that is the state of being male, female, or an interest sex variation, sex based social structures; gender roles or gender identity. According to Heinemann (2025) some societies have specific genders besides “man” and “woman” such as hyras of South Asia, Hawaiian Malm “who occupy a place in the middle” between male and female, or the Ojibwelkwekaazo “men who choose to function as women” or iniikaazo “women who function as men. These are all recognised as third genders. Others, according to Trever (2016) include the non-binary genders “those who are having two or more genders, having no gender



Effects of Mnemo-Tech on Performance in Plant Physiology Concepts among ... Yakubu, R. D. & Danjuma, S. (2026)

or having fluctuating gender identity. Jon and Wanus (2016) maintained that recognition of non-binary genders is still somewhat new to mainstream Western culture. But in the case of Nigeria, it is only male and female that are recognised in the context of gender. Various studies have been carried out in science education to ascertain the influence of gender as regard to the academic performance of students. For example, Suleiman (2017) found no gender disparity in the academic performance of students exposed to the demonstration teaching method in science. Danjuma (2017) reported that boys performed better than girls in science, technology and mathematics. Wakili (2017) reported a significant difference by gender in science achievement in favour of boys. Other studies, like Atadoga and Lakpini (2016), Obeka (2016), confirmed the superiority of female students' performance over male students. Ahmed (2016), who researched gender difference in students' acquisition of formal reasoning ability, concluded that there was no significant difference between male and female performance in genetics using learning cycle teaching strategy. Therefore, the present study will find out the effects of Mnemo-Tech on the performance of slow learners in plant physiology concepts among secondary school Biology students in Zaria, Kaduna State

Objectives of the Study

This study was guided by the following objectives, which are to:

1. determine the effect of Mnemo-Tech on the academic performance of slow learners in Plant Physiology concepts among secondary school Biology students.
2. examine the effect of Mnemo-Tech on the performance of male and female slow learners in Plant Physiology concepts among secondary school Biology students

Research Questions

The following research questions are set to guide the study:

1. What is the difference between the mean performance scores of slow learners taught Plant Physiology concepts using Mnemo-Tech and those taught using lecture method?
2. What is the difference between the mean scores of male and female slow learners taught using Mnemo-Tech?

Null Hypotheses

The following null hypotheses were tested at $p < 0.05$ level of significance.

H₀₁: There is no significant difference between academic performance mean scores of slow learners taught plant physiology concept using Mnemo-Tech and those taught using Lecture Method among secondary school Biology students

H₀₂: There is no significant difference between the mean academic performance scores of male and female slow learners taught Plant Physiology concept using Mnemo-Tech among secondary school Biology students

Research Design

This study employed a pretest, posttest and post-posttest quasi-experimental control group design. A pretest (O₁) was administered to the groups to determine their equivalence using the Plant Physiology Performance Test (PPPT). The essence of the pretest is to ensure that the experimental and control groups were not differently significant in their ability levels before the treatments.

Population of the Study

The population for the study consists of all Senior Secondary School Two (SS 2) students from all the public coeducational schools in Zaria Education Zone of Kaduna State. The total population of SS 2 students as at 2025 was 8,439 (Zaria Education Zone, 2025). This number includes 4853 males and 3586 females in 29 schools.

Sample and Sampling Technique

From the 29 public schools that made up the population, four schools were randomly selected based on location and gender. The four schools were subjected to a pretest, and the data obtained were subjected to statistical analysis using ANOVA and Scheffe's test. ANOVA was used to determine the existence of any significant difference in four schools, while Scheffe's test was used to separate the schools and determine which schools were comparable. The two schools with similar mean scores were selected as sample for the study. Since the research requires one experimental group and one control group, simple random technique by balloting was used to assign the two groups into experimental and control groups, respectively. An intact class was used in each of the two schools selected; GSS Tudun Jukun, comprising 88 subjects, was



Effects of Mnemo-Tech on Performance in Plant Physiology Concepts among ... Yakubu, R. D. & Danjuma, S. (2026)

assigned to the experimental group and GSS Zaria, comprising 84 subjects, was assigned to the control group. The sample of the study comprised all the identified slow learners in the educational schools. The slow learners were identified and purposively selected based on gender by their teachers from three consecutive examinations recorded in Biology. Among the 172 SS II students in both schools, 50 students who consistently scored below average in three consecutive examinations were identified as slow learners (Subramanian, 2012). Details of the sample are shown in Table 3

Sample for the Study

S/N	Type	No of Students Present	No of Slow Learners		
			Male	Female	Total
1.	Experimental	88	08	12	20
2.	Control	84	12	18	30
	Total	172	20	30	50

Instrumentation

An instrument called Plant Physiology Performance Test (PPPT) was adapted from Muoneme (2016) derived from Plant Physiology concepts using the National Biology Curriculum for Senior Secondary (NERDC) to determine the academic performance and retention ability of students. The Plant Physiology Performance Test (PPPT) comprised of 40 choice objective test items each with four alternatives (A-D) from which the students were to select the correct answer. One mark was allocated for each question answered correctly. The test items covered the content units of the topics selected for the study. The instrument Plant Physiology Performance test (PPPT) was given to experts and one experienced secondary school Biology Teacher to validate the items of the instrument. A pilot test was conducted involving the students of Government Secondary School Jama'a, which is within the population but not part of the sample schools. This is to control the possibility of information of the instruments leaking to the study subjects. The purpose of the pilot testing is to determine the reliability of the instrument. The students were pretested and after two weeks, the posttest was administered to the students. The test-retest method of two weeks in line with Tuckman (1975) and Sambo (2008) was employed. Pearson Product-Moment Correlation Co-efficient (PPMC) was used to determine the reliability. Data collected from the pilot testing were used for item analysis and the reliability of the instrument was determined using the test-retest method. The scores were subjected to Pearson's Product-Moment Correlation Coefficient (PPMC) and a reliability value of 0.61.

Administration of Treatment

The experimental group were taught using Mnemo-Tech by the researcher. A pretest was administered to the students before the commencement of the teaching. The researcher used a lesson plan to teach plant physiology concepts for six weeks. Each lesson lasted for 70 minutes. The post-test was administered immediately after all the lessons had been taught, and two weeks later, the same group were tested with the same instrument as a post-post test to determine students' performance ability of the concept taught. The control group were taught the same concepts by the researcher using lecture method alone. The posttest was administered immediately after all the lessons had been taught for six weeks.

Procedure for Data Collection

After teaching the experimental and control groups for a period of six weeks, a post-test using the Plant Physiology Performance Test (PPPT) was administered by the researcher. The same test was administered. The PPPT were marked and scored over 40 and each correct response attracted one mark. After marking the scripts of the two schools collected, the scores were recorded accordingly based on the experimental group as well as the control group. Male and female scores and responses were coded accordingly because gender is involved in the study. After sorting out the scores, the data were subjected to analysis.

Presentation of Results

Answering Research Questions and Hypotheses Testing

This section answered the two research questions from the study with descriptive statistics of mean, mean difference, mean ranks, and mean rank difference of the data collected formed the statistics used and interpreted. The two null hypotheses were tested using inferential statistics at $\alpha \leq 0.05$ levels of significance. Hypotheses involving mean performance scores were tested as parametric data and tested using a t-test.

Research Question One: What is the difference between the mean performance scores of slow learners taught Plant Physiology concept using Mnemo-Tech and those taught using the lecture method?



Effects of Mnemo-Tech on Performance in Plant Physiology Concepts among ... Yakubu, R. D. & Danjuma, S. (2026)

Table 3: Mean and Standard Deviation of Post-test Scores of Students in the Experimental and Control Groups

Groups	N	Mean	Std. Deviation	Mean Difference
Experimental	20	14.25	2.67	1.82
Control Group	30	12.43	3.18	

The result in Table 3 showed that differences exist in the mean scores of students when taught plant physiology concepts using Mnemo-tech. Mean scores of 14.25 and 12.43 was obtained with a mean difference of 1.82 in favour of students in the experimental group. The table revealed that students exposed to Mnemo-tech performed better than their counterparts taught plant physiology concepts using lecture method. To determine whether the mean difference is significant or not, hypothesis one was tested at $\alpha \leq 0.05$ as presented in Table 4.

Null Hypothesis One: There is no significant difference between academic performance mean scores of slow learners taught plant physiology concept using Mnemo-Tech and those taught using Lecture Method among secondary school Biology students.

Table 4: Independent Samples t-test Analysis of Mean Performance Scores between Experimental and Control Groups

Group	N	Mean	Std. Dev.	df	t	p	Remark	Decision
Experimental	20	14.25	2.67	48	2.11	0.04	Significant	Ho ₁ Rejected
Control	30	12.43	3.18					

Significant at $p < 0.05$ level

Table 4 revealed that significant difference exists between the performance mean scores of students in the experimental and control groups, $t(2.11)$, $p = 0.04$, which is less than 0.05 level of significance at 48 degree of freedom. The experimental and control groups recorded a mean scores of 14.25 and 12.43 respectively. Therefore, the null hypothesis which stated that there is no significant difference between academic performance mean scores of slow learners taught plant physiology concept using Mnemo-Tech and those taught using Lecture Method among secondary school Biology students is hereby rejected. This implies that students' scores were enhanced after exposure to Mnemo-tech implying that the Mnemo-tech is more effective in improving students' performance in plant physiology concepts than the lecture method.

Research Question Two: What is the difference between the mean scores of performance among male and female slow learners taught using Mnemo-Tech?

Table 5: Mean and Standard Deviation of Posttest Scores of Male and Female Slow Learners in the Experimental Group

Groups	N	Mean	Std. Deviation	Mean Difference
Male	8	14.63	2.50	0.63
Female	12	14.00	2.86	

The result in Table 5 showed that differences exist in the mean scores of male and female slow learners when taught plant physiology concepts using Mnemo-tech. Mean scores of 14.63 and 14.00 was obtained with a mean difference of 0.63 in favour of male slow learners in the experimental group. The table revealed that male slow learners exposed to Mnemo-tech performed better than their female counterparts taught same concepts using Mnemo-Tech. To determine whether the mean difference is significant or not, hypothesis two was tested at $\alpha \leq 0.05$ as presented in Table 6.

Null Hypothesis Two: There is no significant difference between the mean academic performance scores of male and female slow learners taught Plant Physiology concept using Mnemo-Tech among secondary school Biology students.

Table 6: Independent Samples t-test Analysis of Mean Performance Scores of Male and Female Slow Learners in the Experimental Group

Group	N	Mean	Std. Dev.	df	t	p	Remark	Decision
Male	8	14.63	2.50	18	0.50	0.62	Not Sig.	Ho ₄ Retained
Female	12	14.00	2.86					

Significant at $\alpha < 0.05$ level

Table 6 revealed that significant difference does not exists between the performance mean scores of male and female slow learners in the experimental group, $t(18) = 0.50$, $p = 0.62$, which is greater than 0.05 level of significance. The male and female slow learners recorded mean scores of 14.63 and 14.00 respectively. Therefore, the null hypothesis which stated that there is no significant difference between the mean academic performance scores of male and female slow learners



Effects of Mnemo-Tech on Performance in Plant Physiology Concepts among ... Yakubu, R. D. & Danjuma, S. (2026)

taught Plant Physiology concept using Mnemo-Tech among secondary school Biology students is thus retained. This implies that scores of both male and female slow learners were enhanced after exposure to Mnemo-tech implying that the Mnemo-tech is effective in improving male and female slow learners' performance in plant physiology concepts thereby making Mnemo-Tech gender friendly.

Discussion of Findings

This study investigated the effects of Mnemo-Tech on interest, performance and retention in plant physiology concepts among secondary school Biology slow learners in Kaduna State, Nigeria. The data collected were analyzed at $P \leq 0.05$ level of significance. The discussion of the results from research questions and null hypotheses are presented as follows:

The first finding of this study indicated that the experimental group had a higher mean performance than their counterparts in the control group. This implies that students' scores were enhanced after exposure to Mnemo-tech implying that the Mnemo-tech is more effective in improving students' performance in plant physiology concepts than the lecture method. This finding is in line with that of Lubi and Polloway (2017) who concluded that mnemonic instructional strategy is effective in improving students' academic performance in science and social studies in students with learning problems particularly slow learners. The finding from this study is also similar with that of Purnamasari (2018) who found that mnemonic strategy can improve students' memory. The results is also similar with that of Istigamah and Ichsan (2021) who concluded that to associate every information in the cognitive structure of humans, one of them is by using Mnemo-Tech. However, the outcome of this study differs from that of Jackson and Osuhack (2022) and Felnor (2018) who recorded no significant difference in performance among students with learning difficulty when taught using Mnemo-Tech. The reason for the deviation in the results could be due to location and teacher factor in handling Mnemo-Tech.

The second finding of this study showed that there is no difference in the performance of male and female slow learners taught Plant Physiology concepts using Mnemo-Tech. This implies that scores of both male and female slow learners were enhanced after exposure to Mnemo-tech implying that the Mnemo-tech is effective in improving male and female slow learners' performance in plant physiology concepts thereby making Mnemo-Tech gender friendly. This result is similar with that of Bala and Kishor (2021) who found no gender when students are taught using Mnemo-Tech instructional strategy. However, the outcome of this study differs from that of Felnor (2018) and Jackson & Osuhack (2022) who recorded no significant difference in performance among male and female students with learning difficulty when taught using Mnemo-Tech. The deviation in the results could be due to location and teacher factors in handling Mnemo-Tech.

Conclusions

The following conclusions were made based on the study:

1. The academic performance of slow learners in Plant Physiology Concept is enhanced when taught using Mnemo-Tech.
2. The mean academic performance of male and female slow learners in plant physiology concept is improved when taught using Mnemo-Tech.

Recommendations

Based on the findings of this study, the following recommendations were made;

1. It is obvious from the findings of this study that exposure to Mnemo-Tech was effective in improving the academic performance of slow learners. Therefore, teaching plant physiology concepts using Mnemo-Tech should be encouraged among secondary school biology teachers to make learning more meaningful and effective.
2. Biology teachers should encourage active participation of both male and female slow learners during the teaching and learning process to reduce boredom and increase performance.
3. Textbook publishers and curriculum planners should produce teachers' guides, students' workbooks and textbooks that would take cognisance of Mnemo-Tech as a teaching strategy for slow learners.

References

Abubakar, S.A. (2017). Effect of cooperative learning strategy on the attitude and academic performance of Biology students of different cognitive styles in Kaduna. Unpublished PhD thesis, Faculty of Education, Ahmadu Bello University, Zaria.



Effects of Mnemo-Tech on Performance in Plant Physiology Concepts among ... Yakubu, R. D. & Danjuma, S. (2026)

- Abubakar, S.A. (2018). Effects of cooperative learning strategy on the attitude and academic performance of Biology students of different cognitive styles in Kaduna State, Nigeria. Unpublished PhD Thesis, Department of Science Education, Ahmadu Bello University, Zaria.
- Atadoga, M.M. & Lakpini, M.A. (2016). A comparison of numeracy achievement of primary school pupils taught using whole class and varied classroom organisation instructions. *Proceedings of Multicultural African Conference*, held at Faculty of Education, Ahmadu Bello University, Zaria between 11th – 15th June, 2013.
- Bala, J.P. and Kishor, T.B (2018). Mnemonic strategies: Helping students with intellectual and developmental disabilities remember important information. *Global Journal of Intellectual and Developmental Disabilities*, 2(2), 132-139.
- Dallatu, R.Y. (2019). Effects of indoor and outdoor laboratory activity methods on anxiety, retention and performance among secondary school Biology students in Kaduna, Nigeria. Unpublished M.Ed thesis, Department of Science Education, Ahmadu Bello University, Zaria.
- Danjuma, S. (2017). Effects of inquiry-based instruction in acquisition of process-skills, interest and performance in Ecology concepts. Unpublished M.Ed thesis, Department of Science Education, Ahmadu Bello University, Zaria.
- Danjuma, S. (2021). Effects of field-trip and inquiry based instructions on interest, retention, performance and social skills acquisition among secondary school Biology students in Lere Education Zone, Kaduna Nigeria. Unpublished PhD thesis, Department of Science Education, Ahmadu Bello University, Zaria
- Federal Ministry of Education (2013). *National policy on education*. Lagos: NERDC Press, Lagos.
- Federal Republic of Nigeria (2013). *National policy on education* (6th Edition). Lagos: NERDC Press.
- Felmor, B.J. (2018). Assessment of Nigeria Science laboratory classes. *Journal of Science Teachers Association of Nigeria*, 23, 23-28.
- Gali, I. (2018). The use of laboratory instructional method on students' academic achievement in teaching some biological concepts in senior secondary schools. *Department of Science Education Postgraduate Seminar Series* (ABU, Zaria), 1(1), 168-172.
- Gyuse, E.Y. (2015). Moving teaching and science education forward. Diagnosing science teacher's problem. Science Teachers Association of Nigeria (STAN) Minna, Niger State.
- Graffin, E.L. (2018). Effect of Mnemonics on the vocabulary acquisition and retention of High school students with learning disabilities. Unpublished Masters thesis, Department of Science Education, Ahmadu Bello University, Zaria.
- Heineman, W.W.P. (2025). The effectiveness of Biology textbook-based mnemonic strategies-assisted method mind mapping against learning retention of students to the study of Biology in senior high school. *International Journal of Advanced Research (IJAR)*, 6(4), 1266-1270.
- Istigamah, L.O. and Ichsan, W.V. (2021). Effects of audio-graphic self-instructional packages on senior secondary school students' performance in Biology in Ilorin, Unpublished Ph.D thesis of the University of Ilorin, Ilorin, Nigeria.
- Jackson A., & Osuhack, M. (2022). Research on interest in science theories methods and findings. *International Journal of Science Education*, 33(2), 27-50.
- Jon, S.R. & Wannus, S.C. (2016). *Teaching of science*. New Delhi: APTI publishers corporation.
- Khan, M.M. (2018). The use of visual instructional materials for teaching National Teachers Institute Kaduna.
- Lakpini, M.A. (2015). Effects of a conceptual change instructional strategy on achievement, retention and attitude of secondary school Biology students with varied abilities. Unpublished PhD thesis, Ahmadu Bello University, Zaria.
- Lawal, F.K. (2015). Developing entrepreneurial skills through Biology education and the role of the Biology teacher. *Science Teachers Association of Nigeria 50th Annual Conference*, 134-137.
- Lawal, F.K. (2015). Effect of teaching-with-analogy on academic performance and retention of evolution concepts among male and female NCE Biology students. *Journal of Studies in Science and Mathematics Education*, 2(1), 81-91.
- Levin, J.R. (2017). Mnemonic strategies and classroom learning: A twenty-year report card. *The Elementary School Journal*, 94(2), 235-244.
- Lubin, J. & Pollaway, A.E. (2018). Mnemonic instruction in science and social studies for students with learning problems: A Review. *Learning Disabilities: A Contemporary Journal*, 14(2), 207-224.
- Mastropieri, M. & Scruggs, T. (2025). Enhancing school success with Mnemonic strategies. *Intervention School Clinic*, 3, 201-209 doi:10.1177/10534512980
- Mtsem, A.A. (2016). Effects of diagnostic and contextual instructional strategy on students' interest and achievement in secondary school Algebra. A PhD thesis of the Faculty of Education, Benue State University, Makurdi.
- Muoneme, J.O.H. (2015). Impact of lecture method with multimedia-board on interest and achievement in evolution concepts among secondary schools students, Nigeria State, Nigeria. An unpublished M.Ed Thesis, Department of Science Education, Ahmadu Bello University, Zaria.



- Effects of Mnemo-Tech on Performance in Plant Physiology Concepts among ... Yakubu, R. D. & Danjuma, S. (2026)*
- Muoneme, J.O.H. (2016). Impact of enriched-lecture method with interactive-board on gender and interest among secondary school students in Meiosis concepts in Rijau Education Zone, Niger State, Nigeria. *Science Education Journal*. Faculty of Education, Ahmadu Bello University, Zaria, 1(1), 102-105.
- Nsofor, C.C. (2016). Effects of improvised instructional media on Niger State secondary school students' achievement in selected Biology concepts. Unpublished PhD thesis, Federal University of Technology, Minna.
- Obeka, S.S. (2015). *Current trends in Geography and Environmental/Education*. Zaria: Ahmadu Bello University Press Ltd.
- Ogenyi, D.S. (2024). Impact of process approach on questioning preference, academic achievement and retention span among Chemistry students in Zaria Metropolis. Unpublished PhD thesis, Department of Science Education, Ahmadu Bello University, Zaria.
- Olajide, J.O. (2015). Relationship between wait-time and socio-cultural factors in Science instruction in non western environment of Kaduna State. *Journal of Studies in Science and Mathematics Education*, 2(1), 1-12.
- Omiko, A. (2015). Levels of possession of Science process skills by final year students of Colleges of Education in South-Eastern States of Nigeria. *Journal of Education and Practice*, 6(27), 094-101.
- Purnamasari, R. (2018). Strategi pembelajaran mnemonic untuk meningkatkan memori siswa. SIPATAHOENAN: South-east Asian Journal for Youth, Sports and Health Education, 4(2), 158-152.
- Sanusi, B.R. (2019). Effects of improvised and standard instructional materials on performance and retention in Digestive system among secondary schools students in Sokoto, Nigeria. Unpublished masters thesis, Faculty of Education, Ahmadu Bello University, Zaria
- Shaibu, A.A.M. (2014). Navigating the maze of students' underachievement in science: Does Science Education research provide a road map? Inaugural lecture in Department of Science Education, Ahmadu Bello University, Zaria.
- Shaw, S. (2010). An educational programming framework for a subset of students with diverse learning needs. *Borderline Intellectual Functioning Interventions in Schools and Clinics*, 43(5), 291-299.
- Shaw, S.R., Grimes, D. & Bulman, J. (2025). Educating slow-learners: Are charter schools the last. Best hope for their educational success. *American Journal of Mental Retardation*, 5, 463-469.
- Shiynabade, F.O. (2021). Effect of selected methods of teaching in enhancing academic achievement of slow-learners in Mathematics at Junior secondary school level. *Nigerian Journal of Science and Education Research*, 7(2), 158-162.
- Singh, V.P. (2024). *Problems of educational backwardness*. New Delhi: Sarup and Sons.
- Tuckman, B.W. (1975). *Measurement of educational fundamentals of testing*. New York: Harcourt Brace Jovarovich Inc.
- Trever, S. (2016). Mnemonic for the aldohexoses that aid in learning structures, names and interconversion of Fischer project formulas and pyranose chair forms. *Journal of Chemical Education*, 92(2), 395-398.
- Umoh, C.G. (2015). A theoretical analysis of the effects of gender and family education on human resources development. *Journal of Curriculum Organisation of Nigeria*, 1-(1), 1-4.
- Usman, I.A. (2015). *Introduction to science education for NCE and undergraduates*. Zaria: E-watch print media.
- Usman, S. (2021). Impact of 5Es problem-solving model on Science process-skills acquisition, performance and retention in cell physiology among secondary school Biology students, Zaria, Nigeria. Unpublished M.Ed thesis Faculty of Education, Ahmadu Bello University, Zaria.
- Wakili, L.A. (2017). Impact of collegial teaching and verbal interaction on attitude and performance in Basic Science among Junior secondary school students in Kafanchan, Kaduna, Nigeria. Unpublished M.Ed Dissertation, Department of Science Education, Ahmadu Bello University, Zaria.
- West African Examination Council (WAEC, 2018 2025). Chief Examiner's Report May/June
- Zayun, S.D. (2020). Performance enhancement skills for teachers of Junior secondary schools. A paper presented at *Bauchi SUBEB Workshop* 28th – 31st January.



Effect of Round-Robin Instructional Strategy on Achievement in ... Gabi, S. S., Et. al. (2026)

Effect of Round-Robin Instructional Strategy on Achievement in Circle Geometry Concept among Secondary School Mathematics Students in Keffi, Nasarawa State, Nigeria

GABI, Samson Suleiman¹

samsongabi@nsuk.edu.ng
+2348103994250

DANJUMA, Christopher Musa¹

christopherdm@nsuk.edu.ng
+2348036130284

AZIGE, Godfrey Daniel¹

azigegd@nsuk.edu.ng
+2347031612878

¹Department of Science, Technology and Mathematics Education, Faculty of Education, Nasarawa State University, Keffi, Nasarawa State, Nigeria

Abstract

This study investigated the impact of the Round-Robin Instructional Strategy (RRIS) on the circle-geometry achievement of Senior Secondary School II students in Keffi, Nasarawa State, Nigeria. A quasi-experimental design incorporating pre-test, post-test, non-equivalent, non-randomised control groups was employed. The accessible population consisted of 1,027 students—1,612 males and 415 females—drawn from seven public co-educational Senior Secondary Schools within the Keffi Area Educational Quality Evaluation Office. A sample of 91 students (49 males; 42 females) was purposively selected from two schools. Data were obtained using the Circle Geometry Achievement Test (CGAT), a 40-item, four-option multiple-choice instrument validated by three subject-matter experts (two in Mathematics Education and one in Measurement and Evaluation), yielding a logical validity index of 0.79. Internal consistency was established at 0.82 using the Kuder-Richardson Formula 21 (KR-21). Two research questions were answered using descriptive statistics (mean and standard deviation), and two null hypotheses were tested using Analysis of Covariance (ANCOVA) at $\alpha = 0.05$. Results revealed that students in the RRIS group significantly outperformed their counterparts taught through the conventional method. A statistically significant gender difference in achievement was also observed within the RRIS group, suggesting that the strategy's effectiveness may not be uniformly distributed across gender. It is recommended that mathematics teachers embrace activity-oriented approaches such as RRIS, while simultaneously attending to gender-responsive instructional design to ensure equitable learning outcomes.

Keywords: Round-Robin Strategy, Academic Achievement, Gender, Circle Geometry, Quasi-Experiment

Introduction

Mathematics occupies a foundational position in human intellectual development, cultivating logical reasoning, analytical precision, and creative problem-solving. Its compulsory status across primary and secondary school curricula worldwide testifies to its centrality in preparing individuals for productive participation in society. Malik (2017) characterised mathematics as the universal language undergirding scientific inquiry and technological progress, asserting that its mastery is inseparable from meaningful engagement with modern life. Within the Nigerian curriculum, mathematics is treated as a core subject at both levels of basic and secondary schooling, encompassing branches such as arithmetic, algebra, trigonometry, calculus, and geometry—the last of which constitutes the focal concern of the present study. Geometry, and circle geometry in particular, occupies a distinctive and structurally important place within the senior secondary school curriculum. It serves as an integrative domain that draws together several foundational Euclidean concepts and, when mastered, sharpens students' capacity for logical deduction and mathematical argumentation (Ityazau, 2019). Despite its conceptual richness, circle geometry has persistently been identified as one of the most cognitively demanding areas of the curriculum. Hissan and Ntow (2021) and Dogwi (2014) documented the difficulties students experience in internalising circle theorems, a challenge that manifests directly in poor performance outcomes. Indeed, the WAEC Chief Examiner's report (2021) explicitly cited inadequate comprehension of geometric concepts as a primary contributor to underperformance in the national mathematics examination. Salami and Popoola (2016) further linked this conceptual weakness to the broader pattern of low mathematics achievement that has characterised Nigerian secondary school education.



Effect of Round-Robin Instructional Strategy on Achievement in ... Gabi, S. S., Et. al. (2026)

Students' academic achievement—defined broadly as the measurable knowledge and skills acquired within a given instructional period (Barowski, 2021)—has long been a central preoccupation of educational research in Nigeria. The chronic underachievement observed in public mathematics examinations has attracted sustained scholarly attention, with Ndukwe (2018), Adebayo (2010), Nwankwo (2012), and Anibueze (2017) converging on the view that pedagogically inappropriate and insufficiently engaging instructional strategies are principal culprits. The conventional, teacher-centred model of instruction—in which the teacher functions as the sole knowledge source while students adopt a largely passive, receptive role—has been widely criticised for suppressing student interaction, limiting collaborative enquiry, and failing to stimulate the active cognitive engagement necessary for deep mathematical understanding (Ikide & Edit, 2013). Against this background, the Round-Robin Instructional Strategy (RRIS) has attracted growing interest as an alternative pedagogical framework. Rooted in the principles of structured brainstorming and collaborative discourse, RRIS situates students in small groups around a shared task, ensuring that every participant contributes to the discussion in a systematic, turn-based manner. Unlike whole-class brainstorming, which tends to amplify the voices of the most confident learners while marginalising others, RRIS guarantees equal participation and generates multiple concurrent lines of inquiry. Cox (2020) positioned brainstorming-based strategies as powerful instruments for fostering critical thinking and authentic student engagement. Janneke, Frans, and Beishuizen (2015) reinforced this view by demonstrating that learning gains are most pronounced in socially rich environments characterised by interaction, negotiation, and collaborative knowledge construction—conditions that RRIS is specifically designed to create. Gender remains a contested and consequential variable in mathematics education research. Studies examining gender differences in geometry achievement have produced inconsistent findings. While Oloda (2017) reported male superiority in mathematics achievement, Olasehinde and Olatoye (2014) and Ajai and Imoke (2015) found no statistically significant gender gap, and Unodiaku (2015) and Anibueze (2017) reported female students outperforming their male counterparts. This body of conflicting evidence underscores the need for continued investigation, particularly with respect to how specific instructional strategies interact with gender to shape mathematics achievement. The present study contributes to this discourse by examining whether RRIS produces differential achievement outcomes for male and female students in circle geometry.

Statement of the Problem

Sustained underachievement in Mathematics among Nigerian secondary school students represents a well-documented yet inadequately resolved challenge. Geometry, and circle geometry specifically, is among the most demanding conceptual territories within the senior secondary curriculum, with students frequently struggling to apply theorems accurately in examination contexts. The WAEC Chief Examiner's report (2021) confirmed that deficiencies in geometric reasoning directly depress overall mathematics scores. Despite growing evidence that collaborative and activity-based learning approaches can meaningfully improve outcomes in a range of subjects, the teaching of circle geometry has largely remained tethered to passive, teacher-directed instructional models that restrict student interaction and inhibit co-constructed understanding. An additional and unresolved dimension of this problem concerns gender: existing research has produced contradictory findings regarding whether male and female students differ systematically in their mathematics achievement, and whether specific instructional interventions narrow or widen any such gap. This study therefore addresses the following central question: What is the effect of the Round-Robin Instructional Strategy on the circle-geometry achievement of Senior Secondary School students in Keffi, Nasarawa State, Nigeria?

Objectives of the Study

The study was designed to:

1. determine the effect of the Round-Robin Instructional Strategy on students' achievement in circle geometry
2. compare the influence of gender on students' achievement in circle geometry when taught using the Round-Robin Instructional Strategy.

Research Questions

The following research questions guided the study:

1. What are the mean achievement scores of students taught circle geometry using the Round-Robin Instructional Strategy compared with those taught using the conventional method?
2. What are the mean achievement scores of male and female students taught circle geometry using the Round-Robin Instructional Strategy?



Effect of Round-Robin Instructional Strategy on Achievement in ... Gabi, S. S., Et. al. (2026)

Research Hypotheses

The following null hypotheses were formulated and tested at $\alpha = 0.05$:

- H₀₁: There is no statistically significant difference in the mean achievement scores of students taught circle geometry using the Round-Robin Instructional Strategy and those taught using the conventional method.
- H₀₂: There is no statistically significant difference in the mean achievement scores of male and female students taught circle geometry using the Round-Robin Instructional Strategy.

Methodology

The study adopted a quasi-experimental design with pre-test, post-test, non-equivalent, non-randomised control groups. This design was selected because it permits causal inference regarding the effect of a treatment while accommodating the practical constraints of intact classroom groups, which preclude full randomisation. The target population comprised 1,027 Senior Secondary School II students (612 male; 415 female) enrolled in the seven public co-educational senior secondary schools under the jurisdiction of the Keffi Area Educational Quality Evaluation Office, Nasarawa State. Using simple random sampling, two schools were selected, yielding a final sample of 91 students: 49 male and 42 female. One school was assigned to the experimental condition (RRIS; $n = 46$) and the other to the control condition (conventional method; $n = 45$). Data were collected using the Circle Geometry Achievement Test (CGAT), a researcher-developed instrument comprising 40 four-option multiple-choice items covering the following content areas: properties of a circle; the angle at the centre and the angle at the circumference; the angle in a semicircle; angles in the same segment; cyclic quadrilaterals; and tangents to a circle. The CGAT was reviewed by three independent validators—two specialists in Mathematics Education (National Open University, Abuja) and one in Measurement and Evaluation (Nasarawa State University, Keffi)—whose ratings produced a logical validity index of 0.79, affirming the instrument's content appropriateness. Reliability was determined through a pilot administration, with internal consistency computed using the Kuder-Richardson Formula 21 (KR-21), yielding a coefficient of 0.82, which is considered acceptable for achievement testing. A pre-test was administered to all participants before the commencement of instruction to establish baseline equivalence between groups. The experimental group received instruction on the designated circle-geometry topics through the Round-Robin Instructional Strategy over the treatment period, while the control group was taught the same content using the conventional teacher-centred method. A post-test was administered on conclusion of the treatment to measure achievement gains. Research questions were answered using descriptive statistics (means and standard deviations). The null hypotheses were tested using Analysis of Covariance (ANCOVA) at the 0.05 level of significance, with pre-test scores entered as the covariate to statistically control for baseline differences between groups and to enhance the statistical power of the design given the absence of random assignment.

Presentation of Results

Research Question 1: What are the mean achievement scores of students taught circle geometry using RRIS compared with those taught using the conventional method?

Table 1: Pre-test and Post-test Mean Achievement Scores and Standard Deviations by Instructional Group

Instructional Strategy	N	Pre-test Mean	Pre-test SD	Post-test Mean	Post-test SD
Round-Robin Strategy	46	11.78	2.149	23.39	1.639
Conventional Method	45	13.02	1.889	19.47	1.878
Total	91				

Table 1 presents the descriptive statistics for both groups. Students in the Round-Robin group recorded a pre-test mean of 11.78 (SD = 2.149), which increased to a post-test mean of 23.39 (SD = 1.639)—a gain of approximately 11.61 points. Students in the conventional method group began with a slightly higher pre-test mean of 13.02 (SD = 1.889) but attained a markedly lower post-test mean of 19.47 (SD = 1.878), representing a gain of 6.45 points. These descriptive patterns suggest a larger achievement gain for students exposed to RRIS.



Effect of Round-Robin Instructional Strategy on Achievement in ... Gabi, S. S., Et. al. (2026)

Hypothesis 1: There is no statistically significant difference in the mean achievement scores of students taught using RRIS and those taught using the conventional method.

Table 2: ANCOVA Summary for Mean Achievement Scores of Experimental and Control Groups

Source	Type III SS	df	Mean Square	F	Sig.
Corrected Model	357.073a	2	178.537	58.307	.000
Intercept	901.395	1	901.395	294.383	.000
Pre-test (Covariate)	6.702	1	6.702	2.189	.143
Instructional Strategy	347.698	1	347.698	113.553	.000
Error	269.454	88	3.062		
Total	42498.000	91			
Corrected Total	626.527	90			

a. $R^2 = .570$ (Adjusted $R^2 = .560$)

The ANCOVA results presented in Table 2 indicate that, after statistically controlling for pre-test performance, the effect of instructional strategy on post-test achievement was statistically significant: $F(1, 88) = 113.553$, $p = .000 < .05$. The corrected model accounted for 57.0% of the variance in post-test scores ($R^2 = .570$; Adjusted $R^2 = .560$). The pre-test covariate was not a significant predictor ($F = 2.189$, $p = .143$), confirming that post-test differences were attributable to the instructional treatment rather than pre-existing achievement differences. Accordingly, the null hypothesis H_{01} was rejected. Students taught through RRIS achieved significantly higher post-test scores than those taught through the conventional method.

Research Question 2: What are the mean achievement scores of male and female students taught circle geometry using RRIS?

Table 3: Pre-test and Post-test Mean Achievement Scores and Standard Deviations by Gender within the Round-Robin Group

Gender	N	Pre-test Mean	Pre-test SD	Post-test Mean	Post-test SD
Male	26	11.50	2.005	23.81	1.357
Female	20	12.15	2.323	22.85	1.843
Total	46				

Table 3 presents gender-disaggregated descriptive statistics for the RRIS group. Male students entered the study with a pre-test mean of 11.50 ($SD = 2.005$) and achieved a post-test mean of 23.81 ($SD = 1.357$), a gain of 12.31 points. Female students recorded a pre-test mean of 12.15 ($SD = 2.323$) and a post-test mean of 22.85 ($SD = 1.843$), representing a gain of 10.70 points. Although both groups showed substantial improvement, male students achieved a marginally higher post-test mean.

Hypothesis 2: There is no statistically significant difference in the mean achievement scores of male and female students taught using RRIS.

Table 4: ANCOVA Summary for Gender Differences in Achievement within the Round-Robin Group

Source	Type III SS	df	Mean Square	F	Sig.	Partial η^2
Corrected Model	24.702a	2	12.351	5.518	.007	.204
Intercept	573.344	1	573.344	256.132	.000	.856
Pre-test (Covariate)	14.334	1	14.334	6.404	.015	.130
Gender	14.113	1	14.113	6.305	.016	.128
Error	96.254	43	2.238			



Effect of Round-Robin Instructional Strategy on Achievement in ... Gabi, S. S., Et. al. (2026)

Source	Type III SS	df	Mean Square	F	Sig.	Partial η^2
Total	25290.000	46				
Corrected Total	120.957	45				

$$R^2 = .204 \text{ (Adjusted } R^2 = .167)$$

Table 4 presents the ANCOVA results for the gender comparison within the RRIS group. After adjusting for pre-test scores, the effect of gender was statistically significant: the corrected model accounted for 20.4% of the variance in post-test scores ($R^2 = .204$ (Adjusted $R^2 = .167$)). $F(1, 43) = 6.305$, $p = .016 < .05$, with a partial eta-squared of .128, indicating a medium effect size. The pre-test covariate was also significant ($F = 6.404$, $p = .015$), suggesting that initial ability contributed meaningfully to post-test outcomes. On the basis of these results, the null hypothesis H_{02} was rejected. A statistically significant gender difference in achievement existed within the RRIS group, with male students outperforming female students in circle geometry.

Discussion of Findings

The primary finding of this study is that students instructed through the Round-Robin Instructional Strategy significantly outperformed those taught via the conventional method in circle geometry. Round-Robin Instructional Strategy is both statistically robust and educationally meaningful. This outcome aligns with a growing body of empirical evidence supporting the superiority of collaborative and activity-oriented approaches over traditional didactic instruction. Onukwube and Ebele (2022), Iroko and Olaoye (2022), and Kayode, Yahaya, Francis, and Taiye (2024) similarly reported significantly higher achievement among students exposed to RRIS across diverse subject areas including Mathematics, Chemistry, Biology, Physics, and Basic Science, pointing to the cross-disciplinary generalisability of the strategy. The theoretical basis for these gains is well established. RRIS operationalises core tenets of Vygotsky's (1978) sociocultural theory of learning: by situating knowledge construction within structured peer interaction, it activates the zone of proximal development and ensures that learning is co-constructed through dialogue, negotiation, and collaborative problem-solving. The systematic, turn-based structure of RRIS removes the participation inequities characteristic of conventional whole-class instruction, ensuring that every learner is both a contributor and a beneficiary of the group's intellectual work. The resulting learning environment—characterised by heightened engagement, shared responsibility, and active cognitive processing—appears to be especially well suited to the conceptual demands of circle geometry. The second finding; a statistically significant gender difference in achievement within the RRIS group, favouring male students, merits careful consideration. This result diverges from Folaranmi (2016), who found no significant gender effect under comparable instructional conditions, and is in tension with studies reporting either female superiority or gender parity (Ajai & Imoke, 2015; Olasehinde & Olatoye, 2014; Unodiaku, 2015; Anibueze, 2017). While the magnitude of the gender difference (partial $\eta^2 = .128$) is modest relative to the overall treatment effect, it nonetheless signals that RRIS, as currently implemented, may not distribute its benefits equitably across gender lines. Possible explanations include differential socialisation into collaborative discourse, gendered patterns of assertiveness within group settings, or topic-specific confidence effects in geometric reasoning. These mechanisms warrant systematic investigation before definitive conclusions can be drawn.

Conclusion

This study provides compelling evidence that the Round-Robin Instructional Strategy constitutes a pedagogically superior alternative to conventional methods for teaching circle geometry at the senior secondary school level in Keffi, Nasarawa State. By embedding instruction within a structured collaborative framework, RRIS generates achievement gains that considerably exceed those produced by teacher-centred approaches. At the same time, the observed gender differential within the RRIS group introduces an important caveat: while the strategy raises achievement broadly, its benefits may not be distributed equally across all student groups without deliberate gender-responsive adaptation. Mathematics Teachers are therefore encouraged to adopt RRIS while remaining attentive to the gendered dynamics of collaborative learning environments.

Recommendations

The following recommendations are advanced on the basis of the study's findings:



1. Mathematics teachers at the senior secondary level should systematically incorporate the Round-Robin Instructional Strategy into their pedagogical repertoire, particularly for topics in circle geometry that have historically posed comprehension difficulties for students.
2. Teachers implementing RRIS should attend to gender dynamics within group settings by designing explicit participation structures, rotating leadership roles, and providing targeted support to ensure that female students derive comparable benefits from collaborative activities.
3. Educational authorities and curriculum developers in Nasarawa State should incorporate training in collaborative and activity-based instructional strategies—including RRIS—into pre-service and in-service teacher development programmes.
4. Further quasi-experimental research should be conducted across varied geographic and demographic contexts to establish the generalisability of these findings and to investigate the mechanisms underlying the observed gender difference in achievement.

References

- Adebayo, E. (2010). The history and methodology of mathematics. Labode Printing Press.
- Ajai, J. T., & Imoke, B. I. (2015). Gender differences in Mathematics achievement and interest: A case of problem-based learning. *International Journal of Research in Education and Science*, 1(1), 45–50.
- Anibueze, C. O. (2017). Effect of Mathematics scrabble game on junior secondary school students' achievement and interest [Master's dissertation, Enugu State University of Science and Technology].
- Barowski, J. (2021). Academic achievement: Overview and factors. Study.com. <https://study.com/learn/lesson/academic-achievement-overview-factors.html>
- Dogwi, D. (2014). Challenges in teaching and learning of circle theorems in senior high schools in Ghana [Unpublished master's thesis]. University of Education, Winneba.
- Folaranmi, O. (2016). Gender and instructional strategy in mathematics achievement. *Journal of Mathematics Education Research*, 8(2), 44–57.
- Hissan, Y., & Ntow, F. D. (2021). An investigation into the effect of concept-based instruction on senior high school students' geometric thinking and achievement in circle theorems. *International Journal of Research and Innovation in Social Science*. <https://www.rsisinternational.org/journals/ijriss/>
- Iji, C. O., Abakpa, B. O., & Fekemo, B. (2013). Factors that enhance senior secondary school female students' attitude towards Mathematics: A step toward technological development. In *Proceedings of the Mathematical Association of Nigeria* (pp. 225–234).
- Ikide, G. A., & Edit, U. B. (2013). Influence of learning styles and teaching strategies on students' achievement in biology. *Journal of Education and Practice*, 1(4), 5–13.
- Iroko, G. A., & Olaoye, A. A. (2022). Impact of scaffolding strategy on students' academic achievement and attitude towards algebra at the senior secondary school level in Ogun State. *Journal of Mathematics Education*, 47(2).
- Ityazau, T. M. (2019). Effect of virtual Mathematics laboratory on senior secondary school students' interest in circle geometry in the North-Central Geopolitical Zone of Nigeria [Unpublished doctoral dissertation].
- Janneke, V., Frans, J., & Beishuizen, J. (2015). The effects of scaffolding in the classroom: Support contingency and student independent working time in relation to student achievement, task effort, and appreciation of support. *Instructional Science*, 43, 615–641.
- Kayode, A., Yahaya, K., Francis, O., & Taiye, A. (2024). Round-Robin strategy and student achievement in senior secondary school science subjects. *African Journal of Science Education*, 12(1), 78–90.
- Malik, N. A. (2017). Perceptions of teachers and pupils on use of BridgeIT mobile application for teaching Mathematics in Lagos State, Nigeria [Unpublished thesis]. University of Ilorin.
- Ndukwe, C. J. (2018). The effect of constructivist instructional model on senior secondary school students' achievement and interest in Mathematics in Enugu State [Unpublished thesis].
- Nwankwo, O. C. (2012). Influence of teachers' instructional strategies on students' academic performance in secondary schools in Rivers State. *Journal of Education and Practice*, 3(7), 110–115.
- Olasehinde, K. J., & Olatoye, R. A. (2014). Academic outcome of public and private high school students. Retrieved from www.statcan.gc.ca/homepublications
- Oloda, F. S. (2017). Gender, environment and parents' socio-economic status as determinants of students' performance in Mathematics periodic tests and terminal examinations in Ondo State secondary schools. *Journal of the Mathematical Association of Nigeria*.



Effect of Round-Robin Instructional Strategy on Achievement in ... Gabi, S. S., Et. al. (2026)

- Omoniyi, A. O., & Torru, T. S. (2018). Effect of scaffolding teaching strategy on students' performance in Mathematics in secondary schools in Ondo State, Nigeria. *Advances in Social Science Research Journal*, 5(9), 239–244.
- Onukwube, A., & Ebele, C. O. (2022). Effects of scaffolding instructional strategy on secondary school students' interest in geometry in Onitsha Education Zone of Anambra State, Nigeria. *South-Eastern Journal of Research and Sustainable Development*.
- Salami, O. O., & Popoola, A. A. (2016). Effect of collaborative learning method on senior secondary school students' learning outcomes in Mathematics (pp. 229–241).
- Unodiaku, S. S. (2015). Gender and achievement in Mathematics among senior secondary school students in Enugu State. *Journal of Educational Research and Reviews*, 3(4), 55–62.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.
- Vygotsky, L. S. (1987). Thinking and speech. In R. W. Rieber & A. S. Carton (Eds.), *Collected works of L. S. Vygotsky* (Vol. 1, pp. 37–288). Plenum Press.



Assessment of Students' Knowledge and Practices of Microbial Water Contamination in Federal University of Education, Zaria

EZEAGHASI, Ngozi Eucharía¹

ngoziezeaghasi@fuez.edu.ng

08030937563

OMONIWA, Oluwatope Olubunmi¹

alakecoluwatope@fuez.edu.ng

08038087252

BODEWA, Sulaiman Ahmad¹

sulaimanatom@gmail.com

08030836588

¹Department of Biology, Federal University of Education, Zaria, Kaduna State, Nigeria.

Abstract

This study assessed undergraduate Biology students' knowledge and practices regarding microbial water contamination in the Federal University of Education, Zaria. The study adopted a descriptive survey design. The population comprised 323 undergraduate Biology students, all of whom were used due to manageable size (census sampling). Data were collected using a structured questionnaire titled Students' Knowledge and Practices of Microbial Water Contamination Questionnaire (SKPMWCQ). The instrument was validated through face, content, and construct validity, while reliability was established using Cronbach Alpha (Knowledge = 0.81; Practices = 0.78). Data were analyzed using mean and standard deviation to answer research questions and independent samples t-test to test hypotheses at 0.05 level of significance. Findings revealed that students possessed moderate knowledge (Grand Mean = 3.12) but demonstrated low-level safe water practices (Grand Mean = 2.41). No significant gender difference was found in knowledge ($p > 0.05$), while a significant difference was found in practices based on level of study ($p < 0.05$). The study concluded that knowledge does not necessarily translate into practice. It recommended that, Federal University of Education, Zaria management should ensure consistent provision of safe and treated water across hostels and lecture environments to reduce reliance on unsafe sources, among others.

Keywords: Microbial contamination, water hygiene, students' knowledge, sanitation practices

Introduction

Safe drinking water is universally recognized as a fundamental requirement for human survival, public health, and sustainable development. The World Health Organization emphasizes that access to safe water is critical for preventing diseases and improving quality of life. Common sources of drinking water include boreholes, wells, rivers, and sachet (packaged) water. Although these sources provide essential access, they are often vulnerable to microbial contamination due to poor regulation, environmental pollution, and inadequate treatment processes (Adewumi *et al.*, 2010 and Emenike, Tenebe, Omole, Ngene, Oniemayin & Maxwell 2021). However, despite global efforts, microbial contamination of water remains a major challenge, particularly in developing countries where infrastructure, sanitation, and regulatory systems are often inadequate (World Health Organization, 2022; UNICEF, 2023). Pathogenic microorganisms such as bacteria, viruses, and protozoa frequently contaminate water sources, leading to significant health risks. Microbial water contamination refers to the presence of disease-causing microorganisms in water, rendering it unsafe for human consumption. Common indicators used to assess contamination include total coliforms and *Escherichia coli*, which signal fecal pollution and potential presence of pathogens (Edokpayi, Rogawski, Kahler, Hill, Reynolds, Nyathi & Samie 2021 and Luo, Zhou, Zhou, Lai, Liu, Ao, Yao, Zhang & Lai 2021). These microorganisms enter water systems through pathways such as sewage discharge, agricultural runoff, open defecation, and improper waste management, especially in regions with weak environmental controls (WHO, 2022; UNESCO, 2023). Globally, unsafe water remains a leading cause of morbidity and mortality. According to the United Nations Children's Fund, millions of people are exposed to contaminated drinking water, resulting in diseases such as cholera, typhoid fever, and diarrheal infections (UNICEF, 2023). These health outcomes disproportionately affect populations in low- and middle-income countries, where access to improved water sources and sanitation facilities is limited (Prüss-Ustün *et al.*, 2019; WHO, 2022). In Nigeria, the situation is particularly concerning due to rapid urbanization, population growth, and infrastructural deficits. Studies have consistently reported the presence of coliform bacteria and other pathogens in both surface and groundwater sources across various regions of the country (Odeyemi, Sani & Obadina, 2022 and Chandler, Wong, Zhihao Zhang, Walaa Eid, Julio



Assessment of Students' Knowledge and Practices of Microbial Water Contamination in ... Ezeaghasi, N. E., Et. al. (2026)

Plaza-Diaz., Pervez Kabir., Shen Wan., Jian-Jun Jia., Elisabeth Mercier., Ocean Thakali., Lakshmi Pisharody., Nada Hegazy., Sean., Stephenson., Wanting Fang., Tram., Nguyen., Nathan., Ramsay., Michael McKay., Ryland Corchis-Scott., Alex., MacKenzie., Tyson., Graber., Patrick., Aoust & Robert Delatolla, (2023). Sachet water, popularly known as “pure water,” is widely consumed in Nigeria due to its affordability and accessibility. However, empirical studies have raised concerns about its microbiological safety, noting that some products fail to meet acceptable standards due to poor production and storage conditions (Olaoye & Onilude, 2020 and Ojekunle., Adekunle & Ogunfowokan 2021 and Oye., Abraham., Abraham & Martins, 2025). This underscores the complexity of ensuring water safety even in commercially processed supplies. Within academic environments such as universities, the assumption that educated individuals consistently practice safe water hygiene does not always hold. Research indicates that while students may possess theoretical knowledge of water contamination, this knowledge does not necessarily translate into appropriate practices (Onyango & Opiyo 2021 and Moyo., Ncube & Tshuma, 2022). Factors such as convenience, cost, accessibility of clean water, and behavioral attitudes often influence students' actions more than their knowledge.

Knowledge of microbial water contamination encompasses awareness of contamination sources, transmission pathways, and prevention strategies such as boiling, filtration, and proper storage. Higher education, particularly in science-related disciplines like Biology, is expected to enhance such knowledge (Nwadi., Attah., Ugwu., Nwakpadolu & Ezekoye 2023 and Abubakar., Abdullahi & Yusuf 2022). However, studies suggest that knowledge alone is insufficient to drive behavioral change, as individuals may neglect safe practices despite understanding the risks (Dreibelbis., Winch., Leontsini., Hulland., Ram., Unicomb., & Luby, 2018 and Martins., Ozawa Brasil Junior., Lyra., Castellano., Perez., Nonaka & Bonan, 2021). Water hygiene practices involve actions taken to ensure water safety, including treatment methods, safe storage, and sanitation behaviors. These practices are influenced by multiple factors, including socio-economic conditions, environmental constraints, cultural beliefs, and institutional support systems (Pickering., Nul., Winch., Mangwadu., Arnold., Prendergast., Njenga., Rahman., Ntozini., Benjamin-Chung., Stewart., & Clasen 2019 and Wolf., Johnston., Ambelu., Arnold., Bai., Brauer., Brown., Caruso., Clasen., Cumming & Prüss-Ustün 2023). In many developing contexts, limited access to treated water discourages consistent adherence to safe practices. Empirical evidence from various studies highlights a persistent gap between knowledge and practice among students and communities. For instance, research conducted in African universities revealed that although students demonstrated adequate knowledge of water contamination, many engaged in risky behaviors such as consuming untreated water and neglecting hygiene protocols (Ojo., Esan., Olowookere & Aluko, 2018 and Okonko., Adejoye & Ogunjobi, 2020 and Eze., Nwankwo & Nduka, 2022). This gap suggests that cognitive awareness alone does not guarantee behavioral compliance. Furthermore, environmental health education has been identified as a critical tool for bridging this gap. Scholars argue that integrating practical training, awareness campaigns, and institutional support can significantly improve water safety behaviors (Freeman *et al.*, 2020; Mosler, 2022). This approach emphasizes not only knowledge acquisition but also attitude change and skill development. The role of universities in promoting safe water practices is particularly important, as they serve as centers for knowledge dissemination and behavioral modeling. Institutions are expected to provide safe water infrastructure and foster health-conscious behaviors among students (Igudia and Agbonifoh, 2019 and UNESCO, 2023). Evidences gotten suggest that institutional challenges such as inadequate water supply and poor maintenance systems may hinder these efforts. In addition, demographic variables such as gender and level of study have been examined in relation to knowledge and practices of water hygiene. While some studies report no significant gender differences in knowledge, others suggest that experience and academic exposure may influence practices, with senior students demonstrating better hygiene behaviors (Adejumo., Oladipo & Kareem, 2021 and Bello., Lawal & Ibrahim, 2022). Given these dynamics, there is a need for context-specific studies that examine both knowledge and practices within particular institutional settings. Understanding how students perceive and manage microbial water contamination can inform targeted interventions and policy decisions. Despite the growing body of literature, limited studies have specifically focused on undergraduate Biology students in teacher education institutions such as the Federal University of Education, Zaria. Considering their academic background, these students are expected to exhibit both high knowledge and appropriate practices regarding water safety. This study, therefore, assessed the knowledge and practices of undergraduate Biology students regarding microbial water contamination in the Federal University of Education, Zaria.

Statement of the Problem



Assessment of Students' Knowledge and Practices of Microbial Water Contamination in ... Ezeaghasi, N. E., Et. al. (2026)

Microbial contamination of drinking water remains a persistent public health concern in Nigeria, particularly in environments where water sources are inadequately treated or poorly managed. Despite increased global and national attention to water safety by agencies such as the World Health Organization and the United Nations Children's Fund, many communities—including educational institutions—continue to experience challenges related to unsafe water. University campuses, which rely on sources such as boreholes, wells, and packaged water, are not immune to contamination risks arising from environmental exposure, poor sanitation, and weak monitoring systems. Although undergraduate Biology students are expected to possess sound knowledge of microbial contamination due to their academic training, there is growing concern that such knowledge does not necessarily translate into safe water handling and consumption practices. Empirical evidence suggests that students often engage in risky behaviors such as drinking untreated water, improper storage, and neglect of hygiene practices, thereby increasing their vulnerability to waterborne diseases. This disconnects between knowledge and practice raises critical questions about the effectiveness of existing educational approaches in promoting behavioral change. The problem of this study, therefore, is to determine whether undergraduate Biology students in the Federal University of Education, Zaria possess adequate knowledge of microbial water contamination and whether they effectively apply this knowledge in their daily practices. Addressing this gap is essential for improving students' health outcomes and for informing interventions aimed at strengthening environmental health education within tertiary institutions.

Objectives of the Study

The specific objectives are to:

1. Determine the level of students' knowledge of microbial water contamination in FUE, Zaria.
2. Examine students' practices regarding water safety and hygiene in FUE, Zaria.
3. Determine the relationship between students' knowledge and their practices of water safety in FUE, Zaria.
4. Examine the difference in students' knowledge of microbial water contamination based on gender in FUE, Zaria.
5. Determine the difference in students' practices of water hygiene based on level of study in FUE, Zaria.

Research Questions

The following research questions guided the study:

1. What is the level of students' knowledge of microbial water contamination in FUE, Zaria?
2. What are the students' practices regarding water safety and hygiene in FUE, Zaria?
3. What is the relationship between students' knowledge and their practices of water safety in FUE, Zaria?
4. Is there any difference in students' knowledge of microbial water contamination based on gender in FUE, Zaria?
5. Is there any difference in students' practices of water hygiene based on level of study in FUE, Zaria?

Research Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance:

- H0₁: There is no significant relationship between students' knowledge of microbial water contamination and their practices of water safety in FUE, Zaria.
- H0₂: There is no significant difference in students' knowledge of microbial water contamination based on gender in FUE, Zaria.
- H0₃: There is no significant difference in students' practices of water hygiene based on level of study in FUE, Zaria.

Methodology

This study adopted a descriptive survey research design. The population comprised 323 students, from which a sample of 181 was selected using the sample size determination table of Krejcie and Morgan (1970). A simple random sampling technique was employed to ensure equal chance of selection and enhance representativeness. Data were collected using a self-structured questionnaire titled *Students' Knowledge and Practices of Microbial Water Contamination Questionnaire (SKPMWCQ)*, which consisted of demographic items and sections on knowledge and practices measured on a four-point Likert scale. The instrument was validated by two experts from the Department of Microbiology and also one expert from the department of Hydrobiology with maximum qualification of Ph.D, both are from Ahmadu Bello University, Zaria. The reliability was established using Cronbach Alpha coefficients of 0.81 and 0.78 for knowledge and practices respectively. The questionnaires were administered directly to respondents and analyzed using the Statistical Package for the Social Sciences (SPSS). Mean and standard deviation were used to answer research questions, while Pearson Product Moment



Assessment of Students' Knowledge and Practices of Microbial Water Contamination in ... Ezeaghasi, N. E., Et. al. (2026)

Correlation and independent samples t-test were used to test hypotheses at a 0.05 level of significance. Ethical considerations such as voluntary participation, confidentiality, and proper data usage were strictly observed.

Presentation of Results

Research Question One: What is the level of students' knowledge of microbial water contamination in FUE, Zaria?

Table 1: Mean and Standard Deviation of Knowledge

S/N	Items	Mean	SD	Decision
1	Microorganisms can contaminate drinking water	3.42	0.64	Agree
2	Untreated water can cause diseases	3.25	0.73	Agree
3	Boiling water kills microorganisms	3.08	0.81	Agree
4	Poor sanitation leads to contamination of water bodies	3.02	0.79	Agree
5	Sachet water may contain microbes	2.86	0.87	Agree
6	Waterborne diseases spread through contaminated water	3.30	0.70	Agree
7	Hand hygiene prevents contamination of microorganism of water for a long time	3.18	0.75	Agree
8	Storage affects water quality	3.05	0.78	Agree
9	Microbes are invisible but harmful	3.22	0.71	Agree
10	Filtration (water treatment) removes microorganisms	2.90	0.83	Agree
Grand Mean		3.13		Agree

The findings revealed that undergraduate Biology students possessed a moderate level of knowledge regarding microbial water contamination (Grand Mean = 3.13). This indicates that most students are aware that microorganisms contaminate water and that untreated water can cause diseases such as cholera, typhoid fever, and diarrhea. (STOP) This finding is consistent with the expectations of Biology students, who are exposed to environmental microbiology and public health concepts during their stay in the university.

Research Question Two: What are the students' practices regarding water safety and hygiene in FUE, Zaria?

Table 2: Mean and Standard Deviation of Practices

S/N	Items	Mean	SD	Decision
1	I boil water before drinking	2.28	0.93	Disagree
2	I store water in covered containers	2.52	0.86	Agree
3	I wash hands before handling water	2.46	0.90	Disagree
4	I drink untreated borehole water	2.18	0.97	Disagree
5	I clean storage containers regularly	2.48	0.88	Disagree
6	I avoid unsafe water sources	2.44	0.91	Disagree
7	I treat water before drinking	2.36	0.92	Disagree
8	I check water quality before use	2.31	0.94	Disagree
9	I use filtration methods	2.40	0.90	Disagree
10	I follow hygiene practices consistently	2.47	0.89	Disagree
Grand Mean		2.38		Disagree

The study found that students exhibited low-level water safety practices (Grand Mean = 2.38). Many respondents reported inconsistent behaviours such as not always boiling water before drinking, irregular handwashing practices, and occasional consumption of untreated water.

Research Question Three: What is the relationship between knowledge and practices in FUE, Zaria?

Assessment of Students' Knowledge and Practices of Microbial Water Contamination in ... Ezeaghasi, N. E., Et. al. (2026)

Table 3: Pearson Product Moment Correlation (PPMC) of Knowledge and Practices

Variables	N	r	Sig.
Knowledge vs Practices	181	0.42	0.000

The findings revealed a moderate positive and significant relationship between knowledge and practices ($r = 0.42$, $p < 0.05$). This indicates that students with higher knowledge levels are slightly more likely to engage in safer water practices.

Hypotheses Testing

Hypothesis One: There is no significant relationship between knowledge and practices in FUE, Zaria.

Table 4: Pearson Product Moment Correlation (PPMC) Test of Relationship Between Knowledge and Practices

Variables	N	r	Sig. (p-value)	Decision
Knowledge vs Practices	181	0.42	0.000	Reject H_0

The result in Table 4 shows that the correlation between students' knowledge and practices of microbial water contamination is positive and moderate ($r = 0.42$) and statistically significant ($p = 0.000 < 0.05$). Therefore, the null hypothesis is rejected. This implies that there is a significant relationship between students' knowledge and their practices regarding microbial water contamination in the Federal University of Education, Zaria.

Hypothesis Two: No significant difference in knowledge based on gender in FUE, Zaria.

Table 5: Independent Samples t-test on Students' Knowledge of Microbial Water Contamination Based on Gender

Gender	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)	Decision
Male	90	3.11	0.50	-0.58	179	0.56	Not significant
Female	91	3.15	0.48				

The independent samples t-test results show that there is no significant difference in the knowledge of microbial water contamination between male and female students ($t = -0.58$, $df = 179$, $p = 0.56$). Since the p-value is greater than 0.05, the null hypothesis is not rejected. This implies that gender does not significantly influence students' knowledge of microbial water contamination in the Federal University of Education, Zaria.

Hypothesis Three: No significant difference in practices based on level of study in FUE, Zaria.

Table 6: Independent Samples t-test on Students' Practices of Microbial Water Contamination Based on Level of Study

Level	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)	Decision
100–200 Level	88	2.29	0.58	-2.45	179	0.015	Significant
300–400 Level	93	2.47	0.54				

The results presented in Table 4.8 show that there is a significant difference in students' practices of microbial water contamination based on level of study ($t = -2.45$, $df = 179$, $p = 0.015$). Since the p-value is less than 0.05, the null hypothesis is rejected. This implies that students in higher levels (300–400 level) demonstrate better water hygiene practices than those in lower levels (100–200 level) in the Federal University of Education, Zaria.

Discussion of Findings

The findings revealed that undergraduate Biology students in FUE, Zaria possessed a moderate level of knowledge regarding microbial water contamination (Grand Mean = 3.13). However, the knowledge level was not exceptionally high, suggesting gaps in deep conceptual understanding. This finding aligns with Abubakar *et al.* (2022), who reported that although university students often demonstrate awareness of environmental health issues, their understanding of microbial processes is sometimes superficial and theoretical rather than applied. The study found that undergraduate Biology students exhibited low-level water safety practices in FUE, Zaria (Grand Mean = 2.38). This finding suggests a clear disconnect



Assessment of Students' Knowledge and Practices of Microbial Water Contamination in ... Ezeaghasi, N. E., Et. al. (2026)

between knowledge and actual behaviour. It supports the position of Dreibelbis *et al.* (2018), who observed that awareness of water safety does not automatically translate into improved hygiene practices. Similarly, Mosler (2022) emphasized that environmental health behaviours are influenced more by habit formation, convenience, and environmental constraints than by knowledge alone. The implication is that even in academic environments, students may prioritize accessibility and convenience over safety when making water-related decisions. Another study by Ojo (2018) on handwashing practices among undergraduate students in a Nigerian university revealed poor compliance with standard hygiene and sanitation practices among students, despite awareness of the importance of personal hygiene. The study identified inadequate facilities and poor behavioral orientation as factors responsible for the low level of safe hygiene practices among undergraduates.

Similarly, Igudia and Agbonifoh (2019) investigated sanitation practices among undergraduate students at the University of Benin and found that many students demonstrated inadequate sanitation behaviours and poor environmental hygiene practices within their hostels and learning environment. The study concluded that poor sanitary habits among students could expose them to water-related health risks and environmental hazards. Another related study conducted by Nwadi *et al.* (2023) on hostel sanitation practices among students at the University of Nigeria, Nsukka found that poor sanitation and unhealthy environmental practices negatively affected students' health and wellbeing. The researchers observed that many students failed to adhere to appropriate hygiene and environmental safety practices within their residential environment. In the same vein, Oye *et al.* (2025) reported insufficient sanitation practices among undergraduates in a tertiary institution in Nigeria. The study found inadequate handwashing facilities, poor waste disposal systems, and low adherence to environmental sanitation practices among students. The researchers concluded that poor sanitation behaviour among undergraduates remained a major public health concern in tertiary institutions. These studies therefore support the present finding that undergraduate Biology students demonstrated low-level water safety practices, suggesting that inadequate sanitation culture, poor environmental awareness, infrastructural deficiencies, and weak compliance with safety measures remain prevalent among tertiary institution students in Nigeria. The findings also revealed a moderate positive and significant relationship between knowledge and practices in FUE, Zaria ($r = 0.42$, $p < 0.05$). This result is consistent with the findings of Moyo *et al.* (2022), who reported a positive relationship between environmental health knowledge and hygiene behaviour among university students. However, the moderate strength of the relationship confirms that knowledge alone is not a strong predictor of behaviour, reinforcing the need for behavioural and environmental interventions. The hypothesis tested showed that there was no significant difference in knowledge based on gender in FUE, Zaria ($p = 0.56 > 0.05$). This finding aligns with Adejumo *et al.* (2021), who reported that gender does not significantly influence environmental health knowledge among tertiary institution students. It implies that academic instruction is equally accessible and effective across genders in transmitting theoretical knowledge. The study revealed a significant difference in practices based on level of study in FUE, Zaria ($p = 0.015 < 0.05$), with higher-level students demonstrating better water hygiene practices than lower-level students. This may be attributed to increased academic exposure, maturity, and awareness gained through advanced coursework and experience in higher levels. This finding is consistent with Bello *et al.* (2022), who reported that students in higher academic levels tend to adopt better environmental and hygiene practices due to increased exposure to health-related content and life experience.

Conclusion

Based on the findings of this study, it can be concluded that undergraduate Biology students in the Federal University of Education, Zaria possess a moderate level of knowledge of microbial water contamination but demonstrate poor water hygiene practices in their daily lives. Although knowledge was found to have a positive relationship with practices, it was not strong enough to ensure consistent behavioural change. The study further concluded that gender does not significantly influence knowledge of microbial water contamination, while level of study significantly affects students' water hygiene practices. Overall, the study highlights a persistent knowledge–practice gap, indicating that awareness alone is insufficient to guarantee safe water-related behaviours among students.

Recommendations

Based on the findings of the study, the following recommendations are made:

1. Biology curricula should include more practical demonstrations on water treatment, microbial testing, and hygiene practices to bridge the gap between theory and practice.



Assessment of Students' Knowledge and Practices of Microbial Water Contamination in ... Ezeaghasi, N. E., Et. al. (2026)

2. Federal University of Education, Zaria management should ensure consistent provision of safe and treated water across hostels and lecture environments to reduce reliance on unsafe sources.
3. Health promotion campaigns should be introduced to encourage consistent adoption of safe water practices among students, focusing on habit formation rather than awareness alone.
4. Regular seminars, workshops, and outreach programs on microbial water contamination should be organized to reinforce students' knowledge and promote behavioural compliance.
5. Advanced-level Biology students should be engaged as peer educators to mentor lower-level students on safe water practices, leveraging the influence of academic experience.

References

- Abubakar, M. I., Abdullahi, S., & Yusuf, A. (2022). Environmental health knowledge among university students in Northern Nigeria. *Journal of Environmental Health Research*, 32(2), 145–158.
- Adejumo, A. O., Oladipo, O. A., & Kareem, T. A. (2021). Gender differences in environmental health awareness among tertiary institution students in Nigeria. *International Journal of Environmental Studies*, 78(4), 623–637.
- Adewumi, J. R., Ilemobade, A. A., & Van Zyl, J. E. (2010). Treated wastewater reuse in South Africa: Overview, potential, and challenges. *Resources, Conservation and Recycling*, 55(2), 221–231. <https://doi.org/10.1016/j.resconrec.2010.09.012>.
- Bello, S. A., Lawal, A. T., & Ibrahim, H. K. (2022). Influence of academic level on hygiene practices among university students in Nigeria. *African Journal of Health Sciences*, 35(3), 412–420.
- Chandler H. Wong, Zhihao Zhang, Walaa Eid, Julio Plaza-Diaz, Pervez Kabir, Shen Wan, Jian-Jun Jia, Elisabeth Mercier, Ocean Thakali, Lakshmi Pisharody, Nada Hegazy, Sean E. Stephenson, Wanting Fang, Tram B. Nguyen, Nathan T. Ramsay, R. Michael McKay, Ryland Corchis-Scott, Alex E. MacKenzie, Tyson E. Graber, Patrick M. D' Aoust, Robert Delatolla, (2023). Rapidly developed, optimized, and applied wastewater surveillance system for real-time monitoring of low-incidence, high-impact MPOX outbreak. *J Water Health* 1 September 2023; 21 (9): 1264–1276. doi: <https://doi.org/10.2166/wh.2023.145>
- Dreibelbis, R., Winch, P. J., Leontsini, E., Hulland, K. R. S., Ram, P. K., Unicomb, L., & Luby, S. Martins, H. D. D., Ozawa Brasil Junior, S. D. I., Lyra, T. C., Castellano, L. R. C., Perez, D. E. D. C., Nonaka, C. F. W., & Bonan, P. R. F. Martins, H. D. D., Ozawa Brasil Junior, S. D. I., Lyra, T. C., Castellano, L. R. C., Perez, D. E. D. C., Nonaka, C. F. W., & Bonan, P. R. F. (2021). Case report: Scabies invading gingival tissue. *The American Journal of Tropical Medicine and Hygiene*, 104(1), 313–315. <https://doi.org/10.4269/ajtmh.20-0707>
- Dreibelbis, R., Winch, P. J., Leontsini, E., Hulland, K. R. S., Ram, P. K., Unicomb, L., & Luby, S. P. (2018). The integrated behavioural model for water, sanitation, and hygiene: A systematic review of behavioural models and a framework for designing and evaluating behaviour change interventions. *BMC Public Health*, 18, 1–13.
- Edokpayi, J. N., Rogawski, E. T., Kahler, D. M., Hill, C. L., Reynolds, C., Nyathi, E., & Samie, A. (2021). Challenges to sustainable safe drinking water: A case study of water quality in rural communities in South Africa. *Water*, 13(3), 123–135.
- Emenike, C. P., Tenebe, I. T., Omole, D. O., Ngene, B. U., Oniemayin, B. I., & Maxwell, O. (2021). Accessing safe drinking water in sub-Saharan Africa: Issues and challenges in Nigeria. *Sustainable Cities and Society*, 68, 102778.
- Eze, V. C., Nwankwo, C. S., & Nduka, F. O. (2022). Water sanitation and hygiene practices among university students in Southeast Nigeria. *Journal of Public Health in Africa*, 13(2), 201–210.
- Freeman, M. C., Garn, J. V., Sclar, G. D., Boisson, S., Medlicott, K., Alexander, K. T., Penakalapati, G., Anderson, D., Mahtani, A. G., Grimes, J. E. T., Rehfuess, E. A., & Clasen, T. F. (2020). The impact of sanitation on infectious disease and nutritional status: A systematic review and meta-analysis. *International Journal of Hygiene and Environmental Health*, 220(6), 928–949. <https://doi.org/10.1016/j.ijheh.2017.05.007>.
- Igudia, E. & Agbonifoh, J. A. (2019). Sanitation Practices among Undergraduate Students at the University of Benin, Nigeria. *Makerere Journal of Higher Education*, 11(1); 83-91.
- Luo, M., Zhou, H., Zhou, P., Lai, L., Liu, W., Ao, Z., Yao, G., Zhang, H., & Lai, B. (2021). Insights into the role of *in-situ* and *ex-situ* hydrogen peroxide for enhanced ferrate(VI) towards oxidation of organic contaminants. *Water Research*, 203, 117548. <https://doi.org/10.1016/j.watres.2021.117548>
- Mosler, H. J. (2022). A systematic approach to behavior change interventions for the water and sanitation sector in developing countries: A conceptual model. *International Journal of Environmental Health Research*, 32(1), 12–25.
- Moyo, S., Ncube, G., & Tshuma, T. (2022). Knowledge and practices related to water sanitation and hygiene among university students in Zimbabwe. *BMC Public Health*, 22, 1456.

- Assessment of Students' Knowledge and Practices of Microbial Water Contamination in ... Ezeaghasi, N. E., Et. al. (2026)*
- Nwadi, C.L., Attah, B.I., Ugwu, E.I., Nwakpadolu, G.M. & Ezekoye, R.O. (2023). Perceived Influence of Hostel Sanitation Practices on Students' Health at the University of Nigeria, Nsukka. *Journal For Family & Society Research*, 2(2), 34-45
- Odeyemi, O. A., Sani, N. A., & Obadina, A. O. (2022). Microbiological quality of drinking water sources in Nigeria: A review. *Heliyon*, 8(4), e09350.
- Ojekunle, Z. O., Oyekunle, J. A. O., Adekunle, A. S., & Ogunfowokan, A. O. (2021). Evaluation of sachet water quality in Nigeria: A public health concern. *Environmental Monitoring and Assessment*, 193, 1–12.
- Ojo, O. B., Esan, O. T., Olowookere, S. A., & Aluko, O. O. (2018). Enabling and demotivating factors associated with handwashing practices: A case study of undergraduate students in a Nigerian University. *African Journal Medicine and Medical Science*, 47, 21-28
- Okonko, I. O., Adejoye, O. D., & Ogunjobi, A. A. (2020). Microbiological assessment of drinking water sources in a Nigerian university. *African Journal of Microbiology Research*, 14(5), 210–218.
- Olaoye, O. A., & Onilude, A. A. (2020). Assessment of microbiological quality of sachet-packaged drinking water in Ibadan, Nigeria. *African Journal of Food Science*, 14(3), 65–72.
- Onyango, D. O., & Opiyo, S. B. (2021). Riparian community perceptions of the extent and potential impacts of watershed degradation in Lake Victoria Basin, Kenya. *Limnologica*, 91, 125930.
- Oye, O. V., Abraham, J. M., Abraham, O. O., & Martins, A. D. (2025). Sanitation practices and health outcomes among undergraduates in a tertiary institution: a cross-sectional study in the middle belt. *International Journal Of Community Medicine And Public Health*, 13(1), 72–77.
- Pickering, A. J., Null, C., Winch, P. J., Mangwadu, G., Arnold, B. F., Prendergast, A. J., Njenga, S. M., Rahman, M., Ntozini, R., Benjamin-Chung, J., Stewart, C. P., & Clasen, T. (2019). The WASH benefits and SHINE trials: Interpretation of WASH intervention effects on linear growth and diarrhoea. *The Lancet Global Health*, 7(8), e1139–e1146. [https://doi.org/10.1016/S2214-109X\(19\)30268-2](https://doi.org/10.1016/S2214-109X(19)30268-2)
- Prüss-Ustün, A., Wolf, J., Bartram, J., Clasen, T., Cumming, O., Freeman, M. C., Gordon, B., Hunter, P. R., Medlicott, K., & Johnston, R. (2019). Burden of disease from inadequate water, sanitation and hygiene for selected adverse health outcomes: An updated analysis. *International Journal of Hygiene and Environmental Health*, 222(5), 765–777. <https://doi.org/10.1016/j.ijheh.2019.05.004>
- UNESCO. (2023). *United Nations world water development report 2023: Partnerships and cooperation for water*. UNESCO Publishing. <https://www.unesco.org>
- UNICEF. (2023). *Progress on household drinking water, sanitation and hygiene 2000–2022: Special focus on gender*. UNICEF. <https://www.unicef.org>
- WHO. (2022). *Guidelines for drinking-water quality* (4th ed., updated). World Health Organization. <https://www.who.int>
- Wolf, J., Johnston, R., Ambelu, A., Arnold, B. F., Bain, R., Brauer, M., Brown, J., Caruso, B. A., Clasen, T., Cumming, O., & Prüss-Ustün, A. (2023). Progress on household drinking water, sanitation and hygiene 2000–2022 and projections to 2030. *The Lancet Global Health*, 11(4), e538–e549.



Effect of Phonemic Transcription-Based Strategy on Oral English Performance of ... Inusa, A., Et. al. (2026)

Effect of Phonemic Transcription-Based Strategy on Oral English Performance of L2 Learners among Senior Secondary Schools in Bida Education Zone of Niger State, Nigeria

INUSA, Auwalu¹

auwalyunus41@gmail.com, auwaluinusa@outlook.com

+2348026130700, +2348111176584

WAZIRI, Sulaiman Musa²

sulemwaz@gmail.com

+2348036388046

UBA, Halima Umar³

haleem.huu@gmail.com

+2348033361557

¹Language Arts Education Section, Department of Arts and Social Science Education, Ahmadu Bello University, Zaria

²Niger State Ministry of Education, Minna, Niger State, Nigeria

³Primary Education Department, Sa'adatu Rimi College of Education, Kano State, Nigeria

Abstract

This paper attempted studying the effect of phonemic transcription-based teaching strategy on the Oral English performance of senior secondary students in Niger State, Nigeria. Two (2) objectives of finding out the effect of phonemic transcription-based teaching strategy on the oral English performance the identified research subjects in terms of consonant articulation and examining the effect of phonemic transcription-based teaching strategy on the oral English performance in terms of vowels articulation guided the study. Two corresponding research questions and null hypothesis were formulated and tested in the study. The study used the pre-test-post-test quasi-experimental design. Two purposively sampled schools totaling 120 SSII students constituted the sample for the study based on the intact class principle. A modified instrument of 0.77 split-half reliability tagged "Modified Oral English Performance Test" (MOEPET) adapted by the researchers from the National Examination Council Test of Oral Question format was used for data collection. The data collected were analyzed statistically using the Statistical Package for Social Sciences (SPSS). At the descriptive level, the research questions were answered using mean and standard deviation; while at the inferential level, both hypotheses were tested using t-test at 0.5 level of significance. The findings from this study indicated that the students taught using PT-BTS exhibited improvement in such vowel sounds as: / e /, / ʌ /, / ei /, / eə /, / aʊ /, / ɪ / and distinctive articulation of the voiceless dental fricative consonant /θ/ from voiceless alveolar plosive /t/ with which it is often interchanged. They also displayed distinctive articulation of the voiceless alveolar fricative consonant /s/ in the environment of voiced alveolar fricative consonant /z/, in contrast to their counterparts in the control group. The study concluded that, phonemic transcription-based teaching strategy awakened and simplified learning of Oral English for the L2 learners exposed to it. The study recommended that teachers should drill their students on segmental phonemes to prepare them for the rigours of spoken communication using interesting and pedagogic enough strategies like the PTBTS.

Key words: English segmental phonemes, phonemic transcription, Teaching strategy, Spoken performance, Oral English

Introduction

The role of the English language in Nigeria requires its citizens to pay more attention to mastering the operational system of the language. English and many Nigerian languages have different phonological systems and students struggle with the system that does not exist in their native language. There are different teaching strategies used in learning Oral English in which phonemic transcription-based is one. Phonemic Transcription-based teaching strategy is a teaching strategy that involves representing spoken language in the written form, using phonetic symbols to aid learners in improving their pronunciation and speech skills. This is a system that visually represents the sounds of speech by using phonetic symbols to represent each individual sound (phoneme) in a language. For example, the word "cat" is transcribed as /kæt/ in the International Phonetic Alphabet (IPA), where each symbol corresponds to a specific sound. Studies into this area of linguistics have received tremendous attention recently and have increasingly demonstrated that pronunciation difficulties in English are seriously affecting learners' intelligibility or ability in countries where English is their second or subsequent language, (Hashmi, 2011).



Effect of Phonemic Transcription-Based Strategy on Oral English Performance of ... Inusa, A., Et. al. (2026)

In the face of the strong tie between the English language and the Nigerian education system, there is a wide gap in achieving expected results in past years from Nigerian secondary school students in terms of Oral English performance of the students. It is glaring that reading and writing skills to some extent record positive effects than Oral skills in accessing English language proficiency of Nigerian students. Problems are identified in years as revealed through researches ranging from teacher's attitude, lack of teaching materials, boredom or lack of willingness from the students, and inadequate knowledge of approaches and techniques of teaching Oral English among other factors. These problems results in students struggling to achieve standard Oral English performance which in turn hampers their oral communication, comprehension abilities and adversely affects their overall academic performance. The study effect of PT-BTS on Oral English performance hopes to contribute to the broader field of linguistic research and add to the body of knowledge on teaching segmental phonemes of Oral English. The study has the potential to help students improve their performance at phonemes level and overall oral communication skills in English. Therefore understanding and applying phonemic transcription, students can develop better awareness of English sounds and improve their academic performance.

Objectives of the Study

The objectives of this study are:

1. To find out the effect of PT-BTS on the Oral English performance of senior secondary students in Niger state in terms of consonant articulation.
2. To examine the effect of PT-BTS on the Oral English performance of senior secondary students in Niger state in terms of vowels articulation.

Research Questions

1. What is the effect of PT-BTS on the Oral English performance of senior secondary students in Niger state in the area of consonant articulation?
2. To what extent does PT-BTS affect the Oral English performance of senior secondary students in Niger state in the area of vowel articulation?

Null Hypotheses

H₀₁: There is no significant difference between the Oral English performance of students exposed to the PT-BTS and those not exposed to the strategy in the area of consonant articulation.

H₀₂: There is no significant difference between the Oral English performance of students exposed to the PT-BTS and those not exposed to the strategy in the area of vowel articulation.

Literature Review

Transcription refers to the process of visually representing spoken language sounds using phonetic symbols. According to Pelttari (2020), transcription is the underlying representation or the linear use of phonetic symbols that represent sounds that constitute a word. Transcription is broadly categorized into two mainly; phonemic (broad) and phonetic (narrow) transcription. Broad transcription is the systematic use of phonemic symbols to visually represent the sounds (phonemes) that constitute a word of a spoken language. It does not attempt to represent the extremely large number of speech variations (properties of spoken language). Rather, it records the phonemes that a speaker uses in the actual speech, as opposed to phonetic or narrow transcription which is detailed enough to capture the difference between allophones using more specific symbols, (Wells, 2006, Ladefoged & Johnson, 2011). This means that, phonemic it is a transcription type that documents only the sounds that are important to meaning. Phonetic (narrow) transcription, on the other side, is a transcription type that deals with all sound properties. It attempts to record every single phonological feature of an utterance, whether it is important to the meaning or not (Fromkin et al, 2011). This type captures more detailed phonetic characteristics, including restrained variations in sound production (aspirated from non-aspirated phonemes). For example, [p^hei] for the word “pay”. A growing number of studies have begun to examine the extent to which meaning-focused instruction can facilitate L2 pronunciation development, (Saito, 2012). A phoneme is referred to as the smallest unit that makes up a word. According to Wahyukti in Ma'lah (2016), phoneme is the smallest pronounceable and meaningful unit of sound. Jahara and Abdelrady (2021) opine that the sound system is a system of speech units that learners need to pronounce clearly and correctly. English speech or phonemes enhance intelligibility in phoneme articulation of English words. If the second language (L2) learners need to communicate successfully, then the need to master these sound systems will never be over-emphasized. Crystal as cited in Alshehri (2020) affirms that, according to traditional phonological theories, English has

Effect of Phonemic Transcription-Based Strategy on Oral English Performance of ... Inusa, A., Et. al. (2026)

about 42 phonemes which are classified into vowels and consonants according to their natural environments or positions in the oral cavity. Consonant sounds are typically sounds produce by either completely obstructing the flow of the pulmonic air or sounds from a preceding or following vowel, or by restricting the flow of sound or air so much that it becomes audible. It can also be considered voiced or voiceless. A voiced consonant is pronounced while the vocal cords are vibrating, whereas an unvoiced or voiceless consonant is pronounced while the vocal cords are motionless (Alshehri, 2020). The 24 consonants of the English language include: (p, b, t, d, k, g, f, v, θ, ð, s, z, ʃ, ʒ, h, ʧ, ʤ, m, n, ŋ, l, r, j, and w). The consonants sounds are further categorized according to places of articulation (points in the vocal tract where the flow of the air is fully interrupted, partially interrupted or there is zero interruption for the articulation of a particular consonant), manners of articulation (degree of obstruction of the airstream i.e partial or total obstruction) and state of the glottis (open glottis consonants without vibration are voiceless while those produces as it vibrates are voiced). Vowel sounds are another phoneme type of language that forms part of a word in everyday speech. Vowels are articulated when a voiced airstream is shaped using the tongue and the lips to modify the overall shapes of the mouth (Kelly, 2001 cited in Yoshida, 2019). The vowel is defined as a sound in which the air stream moves without any blocking or constricting during the production (Yoshida, 2019). There are 20 vowel sounds in English and further divided in to monophthongs and diphthongs (single sound vowels and pair or two sounds vowel, respectively). Monophthongs are single sound vowels. There are 5 long vowels: / i: /, / ɜ: /, / ɑ: /, / ɔ: / and / u: / and 7 short vowels: / ɪ /, / e /, / æ /, / ʌ /, / ə /, / ʊ / and / ʊ /. These 12 vowels revolve around the front, mid and back positions of the active articulator, the tongue. The front vowels are those in the formation in which the front of the tongue is raised in the direction of the hard palate. There are 4 front vowels: / i: /, / ɪ /, / e / and / æ /. Central vowels are those in the production of which the central part of the tongue is raised towards the hard palate. There are 3 central vowels: / ɜ: /, / ə / and / ʌ /. Back vowels are those in the production of which the back part of the tongue is raised towards the soft palate. There are 5 back vowels: / u: /, / ʊ /, / ɔ: /, / ɒ / and / ɑ: / There are primarily 2 types of vowel sounds based on the position of the lip: rounded and unrounded. The rounded vowels are those in the production of which the lips are pushed forward into the shape of a circle. There are 4 rounded vowels: / ɒ /, / ɔ: /, / ʊ / and / u: /. In the production of unrounded vowels, the position of the lips is not rounded. There are 8 unrounded vowels: / ɪ /, / i: /, / e /, / æ /, / ʌ /, / ə /, / ɜ: / and / ɑ: /, (Sharma, 2019). Diphthongs are the second group of English vowels. A diphthong is a sequence of two vowels that functions as a single sound. They are vowel sounds realized through the combination of two sets of vocalic characteristics, in a single, continuous articulatory movement, and within the boundaries of the same syllable (Adeniyi, 2017). There is no obstruction to the flow of air as it passes from the larynx to the lips when a diphthong is produced. They are divided into centering and closing or decentering diphthongs. Centering diphthongs move towards schwa, the center-most vowel; / iə /, / eə /, / uə / and closing diphthongs move toward a closer vowel; / ai /, / ɔi /, / au /, / ei /, / əu / (Skandera & Burleigh, 2005). However, vowels as English phonemes or sounds are constant properties of English words produced with a certain degree of vocal cord beat due to the absence of air attack or obstruction from the airstream mechanisms. Researches like the present one are needed to ascertain whether and the extent to which the use of a teaching strategy that is based on the phonemic type of transcription can help improve the spoken language performance of students are highly needed.

Methodology

This study used a pre-test and post-test quasi-experimental design. The Experimental Group (EG) was taught the articulation of sounds and exposed to a phonemic transcription-based teaching strategy as a treatment (X1), while the Control Group (CG) was taught the same articulation of sounds using the conventional method (X0). The population of the study comprised the senior secondary 2 students of Bida Education Zone in Niger State, Nigeria. The total sample size used for the study was two (2) intact classes of one hundred and twenty (120) SSII students. The schools are Ndayako Day Secondary School, Bida with 67 participants, and Government Model Science School, Bida with 53 participants. Also a purposive sampling technique was adopted to ensure participants chosen included both males and females who had similar backgrounds and experiences in Oral English performance. A modified instrument tagged “Modified Oral English Performance Test” (MOEPET) of 0.77 reliability adapted by the researchers from the National Examination Council Test of Oral Questions format was used for data collection. The data collected were analyzed statistically using the Statistical Package for Social Sciences (SPSS). At the descriptive level, the research questions were answered using mean and standard deviation; while at the inferential level, both hypotheses were tested using t-test at 0.5 level of significance.



Presentation of Results

The data related to the performance of Senior Secondary Students' in consonants and vowels when taught using phonemic transcription based teaching strategy are presented and discussed in this section. These are done, first, based on the research questions and, then, based on the null hypotheses.

Research Question 1

What is the effect of phonemic transcription-based teaching strategy on the oral English performance of senior secondary students in Niger state in the area of consonant articulation?

In answering the question above, below is Table 1 presents the mean and standard deviation on the effect of phonemic transcription-based teaching strategy on the oral English performance of senior secondary students in Niger state in the area of consonant articulation.

Table 1: Means and Standard Deviations on the Effect of Phonemic Transcription-Based Teaching Strategy on Oral English Performance of Senior Secondary Students in Niger State in the Area of Consonant Articulation

Group	N	Mean	SD	Mean Diff	SD. Error
Experimental	67	8.16	1.563	4.56	.191
Control	53	3.60	.840		.115
Total	120				

Table 1 shows that the mean performance scores on consonant articulation of students taught using the phonemic transcription-based teaching strategy (8.16) while the students taught using conventional method has the mean scores of (3.60). The mean difference is 4.56 which is in favor of the groups taught using phonemic transcription-based teaching strategy. This indicates that there was positive effect of phonemic transcription-based teaching strategy on the oral English performance of senior secondary students in Niger state in the area of consonant articulation.

Research Question 2

What is the effect of phonemic transcription-based teaching strategy on the oral English performance of senior secondary students in Niger state in the area of vowel articulation?

To answer the above question, below is Table 2 presents the means and Standard Deviation on the effect of phonemic transcription-based teaching strategy on the oral English performance of senior secondary students in Niger state in the area of vowel articulation.

Table 2: Means and Standard Deviations on the Effect of Phonemic Transcription-Based Teaching Strategy Oral English Performance of Senior Secondary Students in Niger State in the Area of Vowel Articulation

Group	N	Mean	SD	Mean Diff	SD. Error
Experimental	67	8.13	1.556	4.946	.190
Control	53	3.19	1.128		.155
Total	120				

Table 2 shows that the mean performance scores on vowel articulation of students taught using phonemic transcription-based teaching strategy is (8.13) while the students using conventional method has the mean scores of (3.19). The mean difference was 4.946 which is in favor of the groups taught using phonemic transcription-based teaching strategy. This indicated that there was positive effect of phonemic transcription-based teaching strategy on the oral English performance of senior secondary students in Niger state in the area of vowel articulation.

Null Hypothesis One:

There is no significant difference between the oral English performance of students exposed to the phonemic transcription-based teaching strategy and those not exposed to the strategy in the area of consonants articulation.

To test the hypothesis above, here is Table 3 containing data on the independent t-test scores on the differences between the Oral English of the experimental and control groups in the area of consonant articulation.

Table 3: Independent t-test Analysis on Difference between the Oral English Performance of Students Exposed to the Phonemic Transcription-Based Teaching Strategy and those not Exposed to the Strategy in the Area of Consonants Articulation



Effect of Phonemic Transcription-Based Strategy on Oral English Performance of ... Inusa, A., Et. al. (2026)

Group	N	Mean	SD	DF	t	t-crit.	P	Decision
Experimental	67	8.16	1.563	118	19.16	1.97	0.01	Rejected
Control	53	3.60	.840					

P<0.05 Alpha Level

Table 3 revealed that 19.16 was the calculated t-value with the P-value of 0.01 the p-value obtained is less than Alpha Level 0.05. The null hypothesis which states that there is no significant difference between the oral English performance of students exposed to the phonemic transcription-based teaching strategy and those not exposed to the strategy in the area of consonants articulation is hereby rejected. This shows that students taught oral English using phonemic transcription-based teaching strategy had significantly higher performance than their counterparts taught by conventional method in the area of consonants articulation.

Null Hypothesis Two:

There is no significant difference between the oral English performance of students exposed to the phonemic transcription-based teaching strategy and those not exposed to the strategy in the area of vowel articulation.

To test the hypothesis above, here is Table 4 containing data on the independent t-test scores on the differences between the Oral English of the experimental and control groups in the area of vowel articulation.

Table 4: Independent t-test Analysis on Difference between the Oral English Performance of Students Exposed to the Phonemic Transcription-Based Teaching Strategy and those not Exposed to the Strategy in the Area of Vowel Articulation

Group	N	Mean	SD	DF	t	t-crit.	P	Decision
Experimental	67	8.13	1.556	118	19.44	1.97	0.04	Rejected
Control	53	3.19	1.128					

P<0.05 Alpha Level

Table 4 shows that the calculated t-value obtained at 19.44 with the calculated P-value of 0.04 which is less than 0.05 significant Alpha level. The null hypothesis which states that there is no significant difference between the oral English performance of students exposed to the phonemic transcription-based teaching strategy and those not exposed to the strategy in the area of vowel articulation is hereby rejected. This shows that students taught oral English using phonemic transcription-based teaching strategy had significantly higher performance than their counterparts taught by conventional method in the area of vowel articulation.

Conclusion

In conclusion, Phonemic Transcription-Based Teaching Strategy awakens interest and simplifies learning oral English. The findings of the study showed that adequate phonemes articulation contributed immensely to the success of the study and revealed that, in order to effectively learn Oral English, there should be opportunity of involving all category of learners or students (introverts and extroverts) to participate in friendly and helpful ways and allow for the students' independence.

Recommendation

1. English language teachers in Senior Secondary Schools should adopt different strategies in teaching Oral English in order to make learning interesting and eliminate boredom attitude from the side of students particularly on the sounds articulation.
2. Also in the classroom, it is also very necessary that Oral English activities are made more interesting through interaction, participation and cooperation (group work).
3. Researches in this field of linguistics should be conducted on students' level below senior secondary students, so that they establish basic or introductory knowledge of phonemic sounds.

References

- Adeniyi, F. O. (2017). An Analysis of English Pronunciation Errors among Senior Secondary School Students in Kwara State Nigeria. *Asia Pacific Journal of Academic Research in Social Sciences*, 2.
- Alshehri, A. (2020). Perception of the English Phonotactics by Saudi English Majors: A Comparative study. *Arab World English Journal*, 11(4), 207-222. <https://doi.org/10.24093/awej/vol11no4.14>.
- Fromkin, V., Rodman, R., and Hyams, N. (2011). *An Introduction to Language*, Wardsworth; Cengage Learning.



Effect of Phonemic Transcription-Based Strategy on Oral English Performance of ... Inusa, A., Et. al. (2026)

Hashmi, M.A. (2011) Problems Faced by the Students of OPF in the Articulation of English Monophthongs (Unpublished Master's Thesis). National University of Modern Languages, Islamabad.

Ma'lah, L. (2016). Pronunciation's Problem. *Online Journal on L2 Education*, 28(11), 71-74.
<http://repository.ump.ac.id/1345/3/>

Saito, K. (2012) Effects of Instruction on L2 Pronunciation Development: A Synthesis of 15 Quasi-Experimental Intervention Studies, *TESOL Quarterly*, 46(4), 842-854.

Sharma, L.R. (2019). Effectiveness of Teaching Vowel Sounds of English through the Exposition Strategy. *IOSR Journal of Research & Method in Education (IOSR-JRME)* e-ISSN: 2320–1959.p- ISSN: 2320–1940 Volume 9, Issue 2 Ser. III.

Skandera, P., and Burleigh, P. (2005). *A Manual of English Phonetics and Phonology*. Germany: Gunter Narr. Verlag Tubingen.



Effects of Scaffolding and Concept Mapping Strategies on Achievement and Retention in Biology among Secondary School Students in Obio/Akpor LGA, Rivers State, Nigeria

NWAKAMMA, Angela Amaechi

angela.nwakamma@uniben.edu

Tel. 08037356828

Department of Curriculum and Instructional Technology, University of Benin, Edo State, Nigeria

Abstract

This study examined the effects of scaffolding and concept mapping on students' achievement and retention of senior secondary students II in biology in Rivers State. Three research questions and three hypotheses guided the study. The study adopted quasi experimental design. Three (3) public governments owned senior secondary schools were purposively drawn for the study. In each of the schools used, intact classes were drawn from senior secondary two classes and assigned to scaffolding group and concept mapping group respectively and then compare their effects on the achievement of the students. The population of the study was 1173 Biology students in SS 2 of these schools and the sample of the study was 122 students in SS 2 assigned randomly. A sample of 122 students comprising of 63 males and 59 female were used drawn from the study area through simple random sampling technique. The strategy was to teach the above groups using scaffolding instructional strategy, concept map or lecture method respectively and compare their effect on students' achievement and retention in biology. Biology Achievement Test was used to collect data, Mean and standard deviation were used to answer research questions while the hypotheses was tested using ANCOVA at 0.05 level of significance. Bonnferroni's test of pair-wise comparison was used to find out, in which group lies the significant effect. The results revealed that learners in scaffolding group outperform concept mapping group in both achievement and retention. It was recommended that biology teachers should adopt the scaffolding learning strategy to improve learners' achievement and retention.

Keywords: scaffolding learning strategy, concept mapping, retention, gender, academic achievement.

Introduction

Biology is a branch of science that deals with the study of living things. It is the science of life. Its curriculum was designed to produce educated individuals who may or may not continue to take to biological study in their professional pursuits. But in whatever professional they finally find themselves, it is hoped that the biology education they acquired in secondary school will be of value to the totality of their education (Ndukwe et'al, 2021). Meaningful learning is the product of retention, inability of learners to retain what they have learnt has been pointed out as one of the contributing factors to learners' poor achievement in the sciences (Moemeke, and Okpuvwie, 2025). According to WAEC (2022-2024), learners performed poorly due to inability to retain what is learnt in the classroom. Despite the importance, the learners' achievement and retention in biology at secondary school level remain a concern, evidenced by persistent poor performance in internal and external examination. It stated that if one cannot retain what one has learned, then there is no reason to expect they will perform better in examination. As a science of life, it has been emphasized that the teaching and learning of biology should involve the use of innovative methods and strategies (Patesan, Balagiu and Zechia, 2016). Hence, efforts are continuously being made to improve the quality of biology instruction, which has culminated in series of curriculum innovations in the field of biology. There is need for a shift from traditional instructional styles to which poor performance of learners has been attributed, to innovative teaching strategies through which learners can be exposed. Innovative methods example scaffolding has the potentials to improve learner's achievement and retention. Also in recent years, educational researchers and curriculum experts have advocated for learner centered method that actively engage learners in knowledge construction. Among such approaches are scaffolding and concept mapping. Therefore, the researcher sought for an innovative learning strategy that improves students' achievement and retention in biology in Rivers State.

Scaffolding instructional strategy is rooted in Vygotsky's social constructivism theory, emphasizes guided support that enables learners to accomplish learning tasks beyond their immediate ability. Nwakamma (2022) stated that scaffolding in education is an instructional method where a teacher provides temporary support to help learners learn new concepts. The study investigated the effect of scaffolding and lecture methods on senior secondary students' achievement in biology. The study state that scaffolding instructional methods have statistically significant effect on students mean performance score in biology when compare with lecture method. This present study is investigated the Effects of scaffolding learning strategy



Effects of Scaffolding and Concep Mapping Strategies on Achievement and Retention in ... Nwakamma, A. A. (2026)

and concept mapping on secondary school students' Achievement and Retention in Biology. According to Kim et al (2020), scaffolding significantly improves students' conceptual understanding and academic achievement compared to conventional teaching methods. This study revealed that scaffolding strategy enables students to engage actively in scientific inquiry and develop independent learning skills. Also, Adeyemi and Ogunleye (2023) examined the influence of students scaffolding instructional strategy on students, retention of biology concepts among secondary school learners. Their findings indicated that students taught through scaffolding retained biological concepts longer than their counterparts taught using traditional approaches. The study emphasized that scaffolding encourages meaningful learning by helping learning connect prior knowledge with new concept, thereby strengthening memory and understanding. Other empirical studies indicate that scaffolding instructional strategy positively influences learners' achievement, retention and motivation in biology education. Although both scaffolding and concept mapping have shown considerable promise in enhancing learning outcomes, their combined effect on students' achievement and retention in biology remains inadequately explored in many secondary school setting. Most studies reported that students taught using scaffolding performed better than those taught through conventional methods. However, variations in research settings, sample characteristics, and instructional procedures suggest the need for further studies but this present study seeks to contribute to the existing literature by examining the effect of scaffolding learning strategy and concept mapping on secondary school learners' achievement and retention in biology. Gender refers to the personal sexual identity of an individual, regardless of the person's biological and outward sex (Ibitoye, 2021). It can also be seen as a socially ascribed attribute which differentiates male from female (Mbonu& Okoli 2019). Etokeren et al (2019) showed that there was no significant difference between male and female students. Based on the inconsistency on the results of male and female students' academic achievement in science, it is pertinent to examine the interaction effect of teaching methods and gender on students mean achievement in retention and, effect of scaffolding and concept mapping respectively at retention by gender. Retention of learning is a repeat performance of the activity learned earlier, elicited after a time interval by the learner. It is the ability to hold, keep or recall past experience and reproduce a learnt concept when the need arises (Delmang,et al 2025).

Objectives of the study

The study was conducted to achieve the following objectives:

1. To ascertain if differences exist in the achievement scores on a researcher made achievement test in biology using scaffolding and concept map at retention.
2. To determine if differences exist in the achievement scores on a researcher made test in biology of scaffolding group and concept mapping group at retention by gender.
3. To determine if differences exist in the interaction effect of teaching methods and gender on a researcher made test on students' mean achievement score in biology at retention.

Research questions

The following research questions guided the study:

1. What are the mean scores in a researcher-made biology achievement test (RMBAT) of students taught using scaffolding, lecture methods or concept map respectively at retention?
2. What is the mean scores in a researcher-made Biology Achievement test (RMBAT) of students taught using scaffolding, lecture method or concept map respectively by gender?
3. What is the interaction effect of teaching methods and gender on students' mean achievement score in biology at retention?

Hypotheses

The following null hypothesis was tested at an alpha level of 0.05.

- H₀₁:** The mean scores in a (RMBAT) of students taught using scaffolding, lecture method or concept map do not differ significantly at retention
- H₀₂:** The mean scores in a RMBAT of students taught using Scaffolding, Lecture method or concept map do not differ significantly at retention by gender.
- H₀₃:** The interaction effects of teaching methods and gender on students mean achievement score in biology at retention do not differ significantly.



Effects of Scaffolding and Concep Mapping Strategies on Achievement and Retention in ... Nwakamma, A. A. (2026)

Methodology

This study adopted a quasi-experimental research design. Intact classes were used and there was no random assignment of subjects was made. The population of the study was one thousand one hundred and seventy-three (1173) senior secondary two (SSII) in the three (3) public governments schools in Obio/Akpor Local Government of Rivers state selected purposively. The sample of the study was one hundred and twenty-two (122) students comprising of 63 males and 59 female students drawn from simple random sampling technique. Intact classes were used and assigned to scaffolding group, concept mapping group and lecture method group. Data was collected researcher made biology achievement retention test (RMBART). The RMBART was a multiple- choice instrument with four responses. The items were drawn from tissues and supporting tissues in animals in senior secondary year two (SSII) Biology curriculum used in Rivers state. The RMBART was validated by experts in measurement and evaluation and Biology teachers in federal government college Port Harcourt. The reliability co-efficient of biology achievement test was 0.79. The reliability of the instruments was established using Kuder-Richardson formula (K-R20). The treatment sessions were conducted in three phases-pretreatment phase, treatment phase and retention phase. During the pre-treatment phase, the researcher visited each of the schools and obtained permission to use the schools for the research work. The pre-test was also administered. During the treatment phase student were taught tissues and supporting tissues, the scaffolding group were taught using scaffolding instructional strategy, concept mapping group were taught using concept map. In the retention phase the RMBAT was re administrated to the students to test for retention. The pre-test, posttest and retention test contain the same questions but in different sequence. Hence the design is represented thus:

Groups	Pre-test	Treatment	Post test	Retention Test
Scaffolding group	O ₁	X ₁	O ₂	O ₃
Concept mapping group	O ₄	X ₂	O ₅	O ₆
Lecture method group	O ₇	X ₃	O ₈	O ₉

Where: O = observation/Test (Pre-Test, Post Test, and Retention Test).

X₁= Treatment using scaffolding strategy.

X₂=Treatment using concept mapping.

X₃= Treatment using lecture method.

Presentation of Results

1. What are the mean scores in a researcher-made biology achievement test (RMBAT) of students taught using scaffolding, lecture methods or concept map respectively at retention?

Table 1: Mean and Standard Deviation of the students' Mean score on RMBAT (Teaching methods and gender) at Retention.

Gender	Groups	Mean(x)	SD	N
Male	Scaffolding (SCA)	23.8148	4.29702	27
Female	SCA	24.8667	5.42305	15
Total	SCA	24.1905	4.69165	42
Male	Lecture method (LM)	15.0000	2.28709	14
Female	LM	13.9231	1.57285	26
Total	LM	14.3000	1.89737	40
Male	Concept Map (CM)	19.0455	3.83564	22
Female	CM	18.4444	2.91492	18
Total	CM	18.7750	3.42306	40

Where N = No. Of subjects

X = Mean

SD = Standard Deviation

Data presented on table 1 show that the mean achievement score of students taught using scaffolding is (24.19 with S.D 4.69), Lecture method had mean (14.30 with S.D1.89) while Concept map had mean (18.78 with S.D 3.42) at retention.



Effects of Scaffolding and Concep Mapping Strategies on Achievement and Retention in ... Nwakamma, A. A. (2026)

Research question 2: What is the mean scores in a researcher-made Biology Achievement test (RMBAT) of students taught using scaffolding, lecture method or concept map respectively by gender?

Data still presented on table 4 show the mean score for male students using the scaffolding method is (23.81 with S.D 4.29) and females (24.87 with S.D 5.42). For lecture method, males have (15.00 as mean and S.D 2.29) while females have (13.92 as mean and S.D 1.57). Concept map had mean for males as (19.05 with S.D as 3.84, females had 18.44 mean and S.D 2.91).

Researcher question 3: What is the interaction effect of teaching methods and gender on students' mean achievement score in biology at retention?

Data still presented on table 1 above show that students' mean achievement scores in biology appear to vary across both teaching methods and gender. The extent of this variation of students' mean achievement score in Biology with teaching methods was further inferred from the following hypothesis:

H₀₁: The mean scores in a (RMBAT) of students taught using scaffolding, lecture method or concept map do not differ significantly at retention

Table 2: Analysis of Covariance (ANCOVA) of biology students' overall achievement scores by Teaching methods and Gender at Retention.

Sources of variation	Sun of squares	Df	Mean squares	Fcal	Sig	Decision at P<0.05
Pre-test (covariates)	122.393	1	122.393	10.406		
Groups	1386.339	2	693.169	58.932	.000	S
Gender	5.038	1	5.038	.428	.514	NS
Groups *Gender	35.074	2	17.537	1.491	.229	NS
Error	1352.660	115	11.762			
Corrected Total	3513.385	121				

Where S –Significant

NS-Not Significant

Data presented on table 2 shows that teaching methods as a main effect on students' achievement in biology at retention is significant. This is because the probability value of the 0.000 at which this main effect is shown to be significant is lower than the level of 0.05 at which it is being tested. This implies that teaching methods have statistically significant effect on student' mean achievement score in Biology. In other words, the null hypothesis effect is rejected at 0.05 level of confidence. Thus, the earlier observed difference between the overall mean achievement scores of the method groups as in table 1 is a real difference which could not be attributed to chance associated with the study.

H₀₂: The mean scores in a RMBAT of students taught using Scaffolding, Lecture method or concept map do not differ significantly at retention by gender.

Data still presented on table 1 show that gender is not significant on students' achievement in biology at retention. This is so since the probability value of 0.514 is greater than 0.05.

H₀₃: The interaction effects of teaching methods and gender on students mean achievement score in biology at retention do not differ significantly.

Data still presented on table 2 shows that the interaction of teaching method by gender is also not significant. The probability value of 0.229 is greater than 0.05.

Table 3: Pair-wise Comparisons was run to find out which of the pairs that caused the significant difference in the group

GROUP (J)	GROUP	Mean	Std. (Error)	Sig.
		Difference		
	LM	9.8905*	.78782	.000
SCA	CM	5.4155*	.78782	.000
LM	SCA	-9.8905*	.78782	.000
	CM	-4.4750*	.78782	.000
CM	SCA	-5.4155*	.78782	.000
LM		4.4750*	.79737	.000



Effects of Scaffolding and Concep Mapping Strategies on Achievement and Retention in ... Nwakamma, A. A. (2026)

Data on table shows that for SCA and LM groups, Prob (0.00) is less than the level of significance (0.05). This Implies that the mean different of the groups is significant at 0.05. One can conclude that SCA group with higher mean improved performance more than the LM group with lower mean. Similarly, for LM and CM groups, Prob (0.000) is less than the level of significance (0.05). This implies that the mean difference of the groups is significant at 0.05. One can conclude that CM group with higher mean improved Achievement in Biology more than the LM group with lower mean. Again, for CM and SCA group, Prob (0.000) is less than the level of significance (0.05). This implies that the mean difference of the groups is significant at 0.05. One can conclude that SCA group with higher mean improved achievement in Biology more than the CM group with lower mean.

Summary of Findings

The result of data analysis reveals the following:

1. There was significant interaction effect on teaching methods and gender on students' achievement in biology at posttest.
2. There was no significant interaction effect of teaching methods and gender on students' achievement in Biology at retention.
3. Significant differences did not exist by gender both at posttest and retention.

The study investigated the effect of scaffolding and concept mapping on secondary school students' achievement and retention in Biology. Three (3) research questions were raised and three null hypotheses was formulated and tested at 0.05 level of significance. The research design for this study was quasi-experimental non-equivalent control group design. The population for the study consisted of all the SS2 students of the three public secondary school selected in Obio/Akpor LGA of Rivers State. The sample comprised of 122 students of these three schools used in their intact class setting. The Researcher Made Biology Achievement Test (RMBAT) was used in collecting data for the study. The instruments was passed WAEC objective questions and periodic lesson plans which was validated by the Education measurement and Evaluation Expert, the supervisors of the research and two senior Biology teachers at Federal government College Port Harcourt. The reliability of the instrument was determined using the Kuder Richardson approach (K-R 20). The research questions raised were answered using mean and standard deviation while the hypotheses were tested using the Analysis of Co-Variance (ANCOVA) at 0.05 level of significance. Bonfernni's test of pair-wise comparison was used in finding out in which group lies the significant effect. The result of the finding revealed that scaffolding strategy significantly enhances higher achievement and retention of students in Biology than the concept mapping or lecture method.

Discussion of Findings

The results were discussed under the following headings:

1. Effect of scaffolding, lecture method or concept map on students' achievement in Biology at retention.
2. Effect of scaffolding, lecture methods or concept map on student' achievement in Biology by gender.
2. Interaction effect of teaching methods and gender on students' mean achievement score in Biology at retention.

Effect of Scaffolding, Lecture method or Concept map on Students' Retention in Biology.

The finding of this study reveal that there is significant difference in the retention mean scores of students taught using scaffolding instructional strategy than those taught using concept mapping or lecture method. The scaffolding group retained significantly higher than those thought with concept mapping or lecture method. Put differently, the difference in mean score between the groups is significantly higher in favour of the scaffolding. The implication of this finding is that scaffolding instructional strategy has a higher positive effect in promoting students' achievement in Biology at retention. This result is in consonant with the finding of Igwe in Oledibe (2015) who examined the effect of scaffolding method of instruction and concept mapping on student achievement and retention. The effectiveness of the teaching methods was also maintained at retention. Hence, application of scaffolding instructional strategy is a veritable tool for boosting of students' achievement in Biology concept. The result also corroborate with Nwakamma (2022) who stated in a study that those taught with scaffolding outperform those taught with lecture method.

Interaction Effect of Teaching Methods and Gender on Students' Retention in Biology

The result on this study showed that there was no interaction effect of teaching method and gender on students' achievement in Biology at retention. Also significant differences did not exist by gender both at post-test and retention. This result corroborate with the finding of Mbonu and Okoli (2019) whose study revealed that gender did not significantly influence students' achievement, indicating that both male and female students benefited similarly from the scaffolding.



Effects of Scaffolding and Concep Mapping Strategies on Achievement and Retention in ... Nwakamma, A. A. (2026)

Conclusion

The major result obtained from this study shows that scaffolding instructional strategy is superior to, and hence more effective than concept map or lecture method in fostering higher achievement and retention of secondary school students in Biology. It is a good teaching strategy in ensuring higher retention of Biology concept in secondary school students. And there was significant interaction effect on teaching methods and gender on students' achievement in biology at posttest.

Recommendations

Based on the findings of the study, it was recommended that students should

1. Be given enough support (scaffold) to learn on their own to enhance their achievement and retention in biology.
2. Biology teachers should undergo more training on the effective use of scaffolding instructional strategy.
3. Biology teachers should adopt the use of scaffolding instructional strategy at the secondary school level.

References

- Adeyemi, T.O., & Ogunleye, A. O (2023). Effect of scaffolding instructional strategy on secondary school students' retention in biology. *Journal of science Education Research*, 18(2) 45-58.
- Delmang, T.K., Gloria, D.L., Gobang, I.N., & Rekwi, R. (2025). Effects of cooperative strategy on senior secondary Two students' retention in stoichiometry in Jema'a Local Government Area, Kaduna State. *Journal of internal Educational research and Development*, 12 (2), 1-12.
- Etokeren, I. S., Kingdom-Aaron, G.I., & Okwelle (2019). Effect of cooperative learning strategy on biology students' academic performance in senior secondary school in Rivers State. *Journal of scientific Research and Reports*, 23(6), 1-11. <https://doi.org/10.9734/JSSRR/2019/v23i630138>
- Ibitoye, T.M. (2021). Project –based learning and self –regulatory strategies as determinants of secondary school students' achievement, attitude and practical skills in biology concepts in *Ibadan, Nigeria (Doctoral dissertation). International centre for theoretical physics.*
- Kim, N. J., Belland, B. R., & Walker, A. E. (2020). Effectiveness of computer-based scaffolding in science education: A meta-analyses. *Journal of Educational computing research*, 58(2), 245-277.
- Mbonu, N. A., & Okoli, J.N. (2019). Effect of scaffolding instructional strategy on secondary school students' achievement in biology in Onitsha Education Zone, Anambra State. *UNIZIK Journal of STM Education*, 3(1), 39-50.
- Moemeke, C. D., and Okpuvwie, C. (2025) Effects of real specimens on retention in biology concept among secondary school students in Bomadi, Delta State, Nigeria. *Zamfara International Journal of Education (ZIJE)*, 5(4), 22-28. <https://doi.org/10.64348/zije.202584>.
- Ndukwe, O.N., Ugama, J.O., Ikporo, F.B., & Ngwu, U. N. (2021). Effects of Cooperative learning strategy on secondary school students' achievement and knowledge retention in biology. *Journal of Education and practice* 12(32), 53-61. <https://doi.org/10.7176/JEP/12-32-07>
- Nwakamma, A. A. (2022). Effects of scaffolding and Lecture method on senior secondary students Achievement in Biology in Rivers State. *Unizik journal of Educational Research and policy studies. Vol 1. No 2.*
- Oledibe, .A. A (2015) Effect of scaffolding and concept mapping on senior secondary school Students' Achievements in Biology in Rivers state, Nigeria. *Unpublished Ph.D Thesis, Imo state university.*
- Patesan, M., Balagiu, A., and Zechia, D., (2016). The benefits of cooperative learning. *Knowledge-Based organisation*, 22(2), 478-483. <https://doi.org/10.1515/kbo-2016-0082>
- WAEC (2022) Chief examiner report on May/June biology paper 11. Retrieved from <https://www.waeconline.org/elearing/biology/bio325mw.html>
- WAEC (2023) Chief examiner report on May/June biology paper 11. Retrieved from <https://www.waeconline.org/elearing/biology/bio325mw.html>
- WAEC (2024) Chief examiner report on May/June biology paper 11. Retrieved from <https://www.waeconline.org/elearing/biology/bio325mw.html>



Influence of Artificial Intelligence Technology Integration on Occupational Health and Safety among workplaces in Nigeria

OLIKIABO, Samuel Osaretin¹

osaretin.olikiabo@uniben.edu

AIDEYAN, Daniel Osarenmwanta¹

¹Department of Health, Safety and Environmental Education, Faculty of Education, University of Benin, Edo State, Nigeria

Abstract

This paper explores how artificial intelligence can improve occupational health and safety service delivery in Nigerian workplaces. It frames OHS as a service function that supports prevention through hazard identification, training, and timely incident management. It notes systemic constraints such as weak documentation and reporting, limited enforcement capacity, gaps in awareness and professional skills, and extensive informal work. The discussion is situated within Nigeria's OHS framework, including the Factories Act, the National OSH Policy, the Employees' Compensation Act and NSITF coverage, and the Nigeria Data Protection Act 2023. Six AI capability areas were examined which are risk prediction, natural language processing of incident narratives, computer vision in high risk settings, wearables for exposure and fatigue monitoring, AI supported learning, and decision support for safety officers and clinics. It concludes that AI adoption should be phased and NDPA compliant, with investments in power, connectivity, data quality, and workforce skills to sustain safer, more productive operations. It was then recommended that AI should be deployed in OHS in Nigerian workplace to facilitate smooth service delivery and that all present and perceived constraints to the deployment of AI should be promptly addressed to forestall their negative impact on the deployment of AI.

Keywords: Artificial intelligence, occupational health and safety, risk management, workplace safety, service delivery

Introduction

The concept of occupational health and safety (OHS) is used to describe the ideal practices, policies and procedures designed to protect the health, safety and wellbeing of workers in any occupation. It involves the regulation and procedure intended to prevent accidents, injuries, illness or death in all workplaces or any public spaces (Abina et al., 2023). Occupational health and safety is often considered as a compliance requirement. However, in practice, it is a service function. It provides prevention, response, and recovery support to workers and management through risk assessments, controls, training, incident investigation, medical referral pathways, and continuous improvement. In Nigeria, this service role is difficult to deliver consistently because many workplaces operate with limited safety staffing, uneven documentation, and unreliable reporting channels (Otitolaiye & Abd-Aziz, 2025). The situation is further complicated by the structure of Nigeria's labour market, where informal employment dominates total employment. The National Bureau of Statistics (NBS) reported an informal employment rate of about 92.7 percent in the first quarter of 2024, reflecting the scale of work taking place outside formal systems that typically support structured safety management (NBS, 2024). Artificial intelligence (AI) offers a set of tools that can improve how OHS services are delivered. In the Nigerian workplace, the most useful AI applications are not futuristic robotics. They are systems that help people do core tasks better such as spotting hazards early, triaging incident reports faster, improving training retention, predicting high risk conditions, and reducing paperwork delays that lead to poor follow up (Babashahi, 2024; El-Helaly, 2024). In addition, AI can also support companies' regulators and insurers by improving data quality and enabling more consistent reporting and analysis which can translate into better occupational health service delivery (Ola-Oluwa, 2024). However, Nigeria's workplaces face constraints that affect AI adoption such as electricity and connectivity gaps, limited high quality data, and uneven digital skills (Yelwa et al., 2022). This therefore calls for an approach that emphasizes practical deployment, strong governance, and low friction integration with existing processes.

Legal and Institutional Context of Occupational Health and Safety in Nigeria

In order to provide an insight into how AI can impact optimum service delivery in the workplace through OHS, there is need to understand the legal and institutional landscape of OHS in Nigeria. This requires looking at current laws guiding OHS in Nigeria. these include the Factories Act, the National Policy on Occupational Safety and Health, the Employee Compensation Act, and the Nigeria Social Insurance Trust Fund (NSITF).

Influence of Artificial Intelligence Technology Integration on Occupational Health and ... Olukiabo, S. O. & Aideyan, D. O. (2026)

The Factories Act and compliance expectations

Nigeria's Factories Act establishes a structured framework around factory regulation, including registration requirements and multiple provisions tied to health, safety, welfare, and accident notification (Dyregborg et al., 2022; Uchendu et al., 2023). The Act is explicitly arranged around registration of factories and related obligations, signaling the importance of formal oversight for industrial workplaces. While many Nigerian work settings are not factories in the strict sense, the Act remains a foundational reference point for industrial safety, especially in manufacturing and processing environments (Uchendu et al., 2023).

National Policy on Occupational Safety and Health

Nigeria's National Policy on Occupational Safety and Health sets a prevention-oriented approach, referencing Nigeria's ratification of International Labour Organization (ILO) Convention No. 155 in 1994 and linking worker safety to constitutional principles on safeguarding health, safety, and welfare in employment (Otteburn & Axel, 2025). The policy emphasises notification systems, annual statistics on occupational accidents and diseases, and the establishment of a national information management system linked to health information systems. This policy direction is important because AI systems perform best when they operate within consistent data channels and feedback loops (El-Helaly, 2024).

Employees' Compensation Act 2010 and the NSITF scheme

The Employees' Compensation Act (ECA) 2010 repeals the earlier Workmen's Compensation regime and provides for compensation relating to death, injury, disease, or disability arising from or in the course of employment (Umukoro, 2025). The Nigeria Social Insurance Trust Fund (NSITF) describes compensation coverage under the ECA as including injury, mental stress, occupational diseases, hearing impairment, injuries occurring outside the normal workplace during work, and fatal cases (Umukoro, 2025). From an AI integration perspective, the ECA is not just a legal framework. It creates an operational need for accurate incident capture, traceable evidence, and timely case management, all of which can be strengthened through well governed digital systems (Farber, 2025).

Data protection and workplace monitoring under Nigeria Data Protection Act

AI-enabled OHS often involves monitoring and inference. This involves the use of wearable sensors for heat stress, computer vision for personal protective equipment compliance, predictive analytics for near misses, or automated triage of incident narratives. These activities intersect directly with the Nigeria Data Protection Act (NDPA) of 2023 (FGN, 2023). The Act requires that data subjects be informed about key issues such as the purpose and retention period, and it specifically addressed automated decision-making, including profiling, and envisaged consequences and the right to object and challenge such processing. It also requires a data privacy impact assessment where processing is likely to result in high risk to rights and freedoms (FGN, 2023). This is essential for OHS because poorly governed safety monitoring can result in disciplinary actions, discrimination, or unfair performance management. In Nigeria, where trust in workplace processes can be fragile, administrative processes that aligns with the mandate of NDPA is essential for uptake and legitimacy.

The Need for Improved Service Delivery in Nigerian Occupational Health and Safety

Occupational Health and Safety is a critical aspect of any nation's workforce, ensuring the well-being and productivity of its labor force. In Nigeria, however, the delivery of OHS services faces significant challenges that necessitate urgent and comprehensive improvement. In many Nigerian organizations, OHS performance is evaluated mainly through audits and incident counts. But improvement in service delivery should be measured by whether safety services reach workers effectively and consistently. In Nigeria, the biggest service gaps typically include delayed incident response where incidents are reported late or not at all, especially for contractors and casual workers; weak reporting where fear of blame and job loss reduces reporting; limited supervisor capacity where supervisors are overloaded and safety checks become superficial; and informal work settings where large portions of work happen outside systems that support structured OHS management (National Bureau of Statistics, NBS, 2024). Another main issue plaguing Nigerian OHS is the lack of adequate enforcement of existing regulations. While the country possesses a legal framework for OHS, its implementation remains weak. This is due, in part, to insufficient resources allocated to regulatory bodies, leading to infrequent inspections and a lack of deterrents for non-compliance (Adebowale & Agumba, 2024). Consequently, many workplaces operate with substandard safety measures, exposing workers to preventable hazards. Furthermore, there is a significant gap in awareness and training regarding OHS best practices (Vitrano & Micheli, 2024; Mixafenti et al., 2025). Many employers, particularly in small and medium-sized enterprises (SMEs), lack the knowledge and resources to implement effective safety programs (Wu et al., 2025). This is compounded by a shortage of qualified OHS professionals and trainers, limiting the availability

Influence of Artificial Intelligence Technology Integration on Occupational Health and ... Olíkiabo, S. O. & Aídéyan, D. O. (2026) of relevant education and skill-building opportunities for both employers and employees (Elegbede & Akinbile, 2024). The result is a workforce that is often ill-equipped to identify and mitigate workplace risks. The consequences of these deficiencies are far-reaching. Workplace accidents and illnesses contribute to significant economic losses through lost productivity, healthcare costs, and compensation claims. Moreover, they have a profound human cost, leading to pain, suffering, and even death for affected workers and their families. A stronger OHS system is therefore essential not only for economic reasons but also for overall improvement in service delivery. Addressing these challenges requires a variety of approaches among which there is the application of AI. When AI is carefully implemented in the workplace, it can support service delivery by reducing friction and expand reach by increasing coverage and consistency of workers' services without compromising their jobs.

Application of Artificial Intelligence into Occupational Health and Safety in Nigeria

The application of AI to OHS in Nigeria is particularly relevant given the country's industrial landscape which is heavy on oil & gas, construction, and manufacturing, in addition to its specific challenges regarding regulatory enforcement (Dhali et al., 2023). In Nigeria, where human supervision resources can be stretched and manual compliance enforcement is often inconsistent, AI can provide advantage by offering constant monitoring and predictive capabilities that don't rely solely on physical inspections. For the purpose of optimum service delivery, the application of AI in workplace safety can be grouped into six practical capability areas as follows:

Risk prediction and prioritization: Machine learning models can use incident history, shift patterns, weather, production pressure indicators, and equipment maintenance logs to predict where injuries are more likely (Aminzadeh et al., 2025). In Nigeria, this is especially relevant where supervisors manage large teams and hazards change quickly due to improvisation, power fluctuations, or supply chain disruptions.

Natural language processing (NLP) for incident narratives: Many Nigerian incident reports, when they exist, are written as free text in simple English, Nigerian English, or a mix of English and local expressions (Decker, 2021; Oladipupo & Akinola, 2022). NLP tools can classify incidents, detect recurring root causes, and flag severe cases for immediate escalation (Khurram et al., 2025; Mohamed, 2025). This improves service delivery by shortening the time between report and action.

Computer vision for high-risk environments: Computer vision can detect PPE use, unsafe proximity to moving equipment, fall risks, blocked exits, and unsafe manual lifting postures (Liu et al., 2021). However, in Nigeria, the priority is often selective deployment of computer vision where risk is high and controls are hard to enforce consistently, such as construction sites, warehouses, and manufacturing lines (Liu et al., 2021; Alateeq., 2023). This can truncate the overall efficacy of computer vision in OHS thereby negatively affecting service delivery in the workplace.

Personal exposure monitoring and wearables: Wearables can track heat stress, fatigue proxies, noise exposure, or vibration (Moshawrab et al., 2022). This is important for Nigeria's hot climates, outdoor work, and generator-prone environments where fumes, noise, and heat interact.

AI supported learning and competence management: AI can personalize safety learning, test retention, and provide micro coaching (Sajja et al., 2024). In environments with multicultural work force, AI can help deliver short training in simplified English or translated versions, with voice-based support.

Decision support for safety officers and clinics: AI can support triage, referral, and follow up (Abdel-Hafez et al., 2023). Nigeria's health services vary widely by location, so decision support tools can standardize first response protocols and improve documentation.

Improving Service Delivery in Nigerian Workplace through Incorporation of AI into OHS In Nigeria, where many workplaces still rely on manual inspections, paper reports, and reactive responses after incidents which negatively impacts overall service delivery in these workplaces. One major way AI improves service delivery is by speeding up hazard detection and response. This can be done through risk prediction and prioritization, computer vision for high-risk environments, and personal exposure monitoring and wearables (Khurram et al., 2025; Kolivand et al., 2025). In factories, construction sites, warehouses, and oil and gas facilities, AI powered camera systems can flag unsafe conditions such as missing protective equipment, overcrowded work areas, blocked emergency exits, or unsafe proximity to machinery (Sanjeevani et al., 2024). When these issues are detected early, supervisors can respond before they cause injury. AI can also support quicker reporting by helping workers capture hazards through mobile apps that classify the risk, suggest the right category, and guide next steps (Shah & Mishra, 2024). This reduces delays that often happen when staff are unsure



Influence of Artificial Intelligence Technology Integration on Occupational Health and ... Olikiabo, S. O. & Aideyan, D. O. (2026) of what to report or how to describe it. Through prediction, AI can also strengthen prevention. Many incidents follow patterns, such as repeated near misses in the same location, equipment problems, poor housekeeping, or fatigue from overtime and long shifts. By analysing incident records, maintenance logs, shift schedules, and environmental conditions like heat or dust exposure, AI tools can identify high risk areas and periods (Aminzadeh et al., 2025). This supports smarter planning for inspections, better allocation of safety officers, and targeted controls where risk is building up. For Nigerian organisations that have limited health, safety, and environment personnel (Ayeleso et al., 2024), this ability to prioritize is a direct boost to service quality. Training and compliance are another area where AI can raise standards. Nigerian workplaces often face uneven training, especially when staff are spread across branches or sites (Adamu et al., 2022). AI can help by recommending training based on job roles, recent incidents, and observed safety gaps. Short, personalized learning modules delivered through mobile phones can reinforce safe behaviour without pulling staff away for long classroom sessions. In higher risk sectors, simulated training can also build confidence and improve decision making during emergencies, which is often where mistakes become costly. AI can reduce paperwork and improve the quality of inspections and audits (Alhazmi et al., 2025). Rather than having unorganized paperwork such as scattered checklists and reports, AI-enabled systems can standardize inspections, highlight missing information, and automatically generate clear action lists with deadlines and accountability (Sinha et al., 2024). This can improve documentation for internal reviews, client requirements, and regulatory expectations. Over time, the same data can be turned into dashboards that show trends, repeated hazards, and recurring noncompliance. These insights can help management make better decisions and invest in the most effective safety improvements.

Equipment and maintenance safety can also improve significantly. In manufacturing, power, and oil and gas settings, failures in machines and tools contribute to injuries and operational downtime (Sinha & Lee, 2024). AI can support predictive maintenance by analyzing sensor data such as temperature, vibration, or abnormal performance patterns to detect faults early (Polymeropoulos et al., 2025). This reduces sudden breakdowns and emergency repairs, which are often high-risk moments for workers. When equipment reliability improves, service delivery improves too, because safety teams spend less time reacting to crises and more time preventing them. In Nigerian workplaces, the benefits of AI must be balanced with real constraints. For example, power supply, internet coverage and cost, and data quality can limit the application of AI. However, these challenges can be managed through practical approaches such as offline-first reporting tools, starting with small pilot projects, and focusing on high impact areas like PPE compliance, hazard reporting, and equipment monitoring. Clear policies on privacy and responsible use are also worthy of note so workers can understand that the goal is safety and service improvement.

Conclusion

Integrating AI into occupational health and safety in Nigeria is not primarily a technology project. It is a service delivery reform. Nigeria's OHS ecosystem is shaped by legal frameworks alongside a labour market where informal work is the dominant reality. AI can improve safety outcomes by strengthening reporting, speeding response, improving training retention, and helping safety teams focus on the highest risk activities. However, success depends on NDPA compliant governance, trust building, and phased deployment that respects Nigeria's infrastructure constraints and workforce diversity. If these conditions are met, AI enabled OHS can move from a compliance driven function to a consistent service that protects workers and improves productivity across Nigerian workplaces.

Recommendation

Consequent upon the conclusion drawn from this paper, it is therefore recommended that:

1. AI should be deployed in OHS in Nigerian workplace to facilitate the smooth service delivery
2. All present and perceived constraints to the deployment of AI such as power supply, poor internet facilities, and low technical know-how should be promptly addressed to forestall their negative impact on the deployment of AI

References

- Abdel-Hafez, A., Jones, M., Ebrahimabadi, M., Ryan, C., Graham, S., Slee, N., & Whitfield, B. (2023). Artificial intelligence in medical referrals triage based on clinical prioritization criteria. *Frontiers in digital health*, 5, 1192975. <https://doi.org/10.3389/fdgth.2023.1192975>

- Influence of Artificial Intelligence Technology Integration on Occupational Health and ...* Olíkiabo, S. O. & Aídeyan, D. O. (2026)
- Abina, O.G., Ogunbayo, B.F. & Aigbavboa, C.O. (2023). Enabling technologies of health and safety practices in the fourth industrial revolution: Nigerian construction industry perspective. *Front. Built Environ.* 9,1233028. doi: 10.3389/fbuil.2023.1233028
- Adamu, M. G., Aliyue, S., & Musa, A. (2022). Behavioural factors affecting civil servants' intention towards covid-19 vaccination in Kaduna Polytechnic. *Creative Business Research Journal* 2(1), 99-104
- Adebowale, O. J. & Agumba, J. N. (2024). A systematic review of challenges undermining the efficacy of construction health and safety regulations in major African countries. *Construction Economics and Building*, 24(4/5), 1–24.
- Alateeq, M. M., Rajeeva, F. P. P., & Ali, M. A. S. (2023). Construction site hazards identification using deep learning and computer vision. *Sustainability*, 15(3), 2358. <https://doi.org/10.3390/su15032358>
- Alhazmi, A. H. J., Islam, S. M. N., & Prokofieva, M. (2025). The impact of artificial intelligence adoption on the quality of financial reports on the Saudi stock exchange. *International Journal of Financial Studies*, 13(1), 21. <https://doi.org/10.3390/ijfs13010021>
- Aminzadeh, A., Sattarpanah K. S., Majidi, S., Dabompre, C., Azaiez, K., Mitride, C., & Sénéchal, E. (2025). A machine learning implementation to predictive maintenance and monitoring of industrial compressors. *Sensors*, 25(4), 1006. <https://doi.org/10.3390/s25041006>
- Ayeleso, A. O., Alqahtani, F. M. & Aroh, C. O. (2024). Empirical evidence from nigeria on environmental health and occupational safety at work. *Trends in Ecological and Indoor Environmental Engineering*, 2(1), 11–17. <https://doi.org/10.62622/TEIEE.024.2.1.11-17>
- Babashahi, L., Barbosa, C. E., Lima, Y., Lyra, A., Salazar, H., Argôlo, M., Almeida, M. A. d., & Souza, J. M. (2024). AI in the workplace: A systematic review of skill transformation in the industry. *Administrative Sciences*, 14(6), 127. <https://doi.org/10.3390/admsci14060127>
- Decker, T. (2021). Handwritten in Lagos: Selfhood and textuality in colonial petitions. *History in Africa*, 48, 355–382. doi:10.1017/hia.2021.4
- Dhali, M., Hassan, S., & Subramaniam, U. (2023). Comparative analysis of oil and gas legal frameworks in Bangladesh and Nigeria: A pathway towards achieving sustainable energy through policy. *Sustainability*, 15(21), 15228. <https://doi.org/10.3390/su152115228>
- Dyrborg, J., Lipscomb, H. J., Nielsen, K., Törner, M., Rasmussen, K., Frydendall, K. B., Bay, H., Gensby, U., Bengtsen, E., Guldenmund, F., & Kines, P. (2022). Safety interventions for the prevention of accidents at work: A systematic review. *Campbell Systematic Reviews*, 18(2), e1234. <https://doi.org/10.1002/cl2.1234>
- Elegbede, O. T. & Akinbile, B. F. (2024). Perception of professionals on factors influencing skilled labor shortages in the Nigerian construction industry. *Journal of Civil Engineering and Construction Technology*, 14(1), 1-24
- El-Helaly M. (2024). Artificial intelligence and occupational health and safety, benefits and drawbacks. *La Medicina del Lavoro*, 115(2), e2024014. <https://doi.org/10.23749/mdl.v115i2.15835>
- Farber S. (2025). AI as a decision support tool in forensic image analysis: A pilot study on integrating large language models into crime scene investigation workflows. *Journal of forensic sciences*, 70(3), 932–943. <https://doi.org/10.1111/1556-4029.70035>
- FGN (2023). *Nigeria Data Protection Act, 2023*. Retrieved from https://cert.gov.ng/ngcert/resources/Nigeria_Data_Protection_Act_2023.pdf
- Khurram, M., Zhang, C., Muhammad, S., Kishnani, H., An, K., Abeywardena, K., Chadha, U., & Behdinan, K. (2025). Artificial Intelligence in Manufacturing Industry Worker Safety: A New Paradigm for Hazard Prevention and Mitigation. *Processes*, 13(5), 1312. <https://doi.org/10.3390/pr13051312>
- Kolivand, P., Azari, S., Bakhtiari, A. *et al.* AI applications in disaster governance with health approach: A scoping review. *Arch Public Health* 83, 218 (2025). <https://doi.org/10.1186/s13690-025-01712-2>
- Kruk, M. E., Gage, A. D., Arsénault, C., Jordan, K., Leslie, H. H., Roder-DeWan, S., Adeyi, O., Barker, P., Daelmans, B., Doubova, S. V., English, M., García-Elorrio, E., Guanais, F., Gureje, O., Hirschhorn, L. R., Jiang, L., Kelley, E., Lemango, E. T., Liljestrand, J., Malata, A., ... Pate, M. (2018). High-quality health systems in the Sustainable Development Goals era: time for a revolution. *The Lancet. Global health*, 6(11), e1196–e1252. [https://doi.org/10.1016/S2214-109X\(18\)30386-3](https://doi.org/10.1016/S2214-109X(18)30386-3)
- Liu, W., Meng, Q., Li, Z., & Hu, X. (2021). Applications of computer vision in monitoring the unsafe behavior of construction workers: Current status and challenges. *Buildings*, 11(9), 409. <https://doi.org/10.3390/buildings11090409>
- Mixafenti, S., Karagkouni, A., & Dimitriou, D. (2025). Integrating business ethics into occupational health and safety: An evaluation framework for sustainable risk management. *Sustainability*, 17(10), 4370. <https://doi.org/10.3390/su17104370>



- Influence of Artificial Intelligence Technology Integration on Occupational Health and ...* Olíkiabo, S. O. & Aídéyan, D. O. (2026)
- Mohamed, N. (2025). Artificial intelligence and machine learning in cybersecurity: a deep dive into state-of-the-art techniques and future paradigms. *Knowledge and Information Systems* 67, 6969–7055.
<https://doi.org/10.1007/s10115-025-02429-y>
- Moshawrab, M., Adda, M., Bouzouane, A., Ibrahim, H., & Raad, A. (2022). Smart wearables for the detection of occupational physical fatigue: A literature review. *Sensors*, 22(19), 7472. <https://doi.org/10.3390/s22197472>
- National Bureau of Statistics (2024). *The Nigerian labour force statistics report, Q 1, 2024*. Retrieved from https://www.nigerianstat.gov.ng/pdfuploads/NLFS_Q1_2024_Report.pdf
- Oladipupo, R., & Akinola, A. (2022). Nigerian English pronunciation preferences: A corpus-based survey of pronunciation variants. *Cogent Arts & Amp; Humanities*, 9(1). <https://doi.org/10.1080/23311983.2022.2061104>
- Ola-Oluwa, . J. A. . (2024). Impact of artificial intelligence (AI) in enhancing knowledge sharing and boosting organizational efficiency in Nigerian enterprises. *African Journal of Management and Business Research*, 17(1), 76-95. <https://doi.org/10.62154/ajmbr.2024.017.010470>
- Otitolaiye, V. O., & Abd Aziz, F. S. (2025). Understanding the mechanism through which safety management systems influence safety performance in Nigerian power and electricity distribution companies. *Safety*, 11(4), 98. <https://doi.org/10.3390/safety11040098>
- Otteburn, K. & Axel, M. (2025). The international labour organization, in J. Chaisse & C. Herrmann (eds). *The International Law of Economic Integration* (online edn), Oxford Law Pro), <https://doi.org/10.1093/law/9780192871626.003.0014>
- Polymeropoulos, I., Bezyrgiannidis, S., Vrochidou, E., & Papakostas, G. A. (2025). Bridging AI and maintenance: Fault diagnosis in industrial air-cooling systems using deep learning and sensor data. *Machines*, 13(10), 909. <https://doi.org/10.3390/machines13100909>
- Sajja, R., Sermet, Y., Cikmaz, M., Cwiertny, D., & Demir, I. (2024). Artificial intelligence-enabled intelligent assistant for personalized and adaptive learning in higher education. *Information*, 15(10), 596. <https://doi.org/10.3390/info15100596>
- Sanjeevani, P., Neuber, G., Fitzgerald, J., Chandrasena, N., Potums, S., Alavi, A., & Lane, C. (2024). Real-time personal protective equipment non-compliance recognition on AI edge cameras. *Electronics*, 13(15), 2990. <https://doi.org/10.3390/electronics13152990>
- Shah, I. A., & Mishra, S. (2024). Artificial intelligence in advancing occupational health and safety: an encapsulation of developments. *Journal of Occupational Health*, 66(1), uiad017. <https://doi.org/10.1093/joccuh/uiad017>
- Sinha, S. & Lee, Y.M. (2024). Challenges with developing and deploying AI models and applications in industrial systems. *Discov Artif Intell* 4, 55 <https://doi.org/10.1007/s44163-024-00151-2>
- Uchendu, O., Nwanyanwu, D. M. A. N., & Nkechi, E. (2023). A legal appraisal of industrial safety in Nigeria: A comparative approach. *AJIEEL*, 6(01). Retrieved from <https://ajieel.com/index.php/a/article/view/40>
- Umukoro, B.E. (2025). Employee's compensation scheme in Nigeria: A comparison of two legal regimes. *International Journal of Law and Management*. <https://doi.org/10.1108/IJLMA-11-2024-0417>
- Vitrano, G., & Micheli, G. J. L. (2024). Effectiveness of occupational safety and health interventions: A long way to go. *Frontiers in Public Health*, 12, 1292692. <https://doi.org/10.3389/fpubh.2024.1292692>
- Wu, Z., Wang, J., & Kang, L. (2025). Advancing safety in SMEs through unitized integration: Research based on the SME safety alliance in Pukou District, Nanjing City. *Sustainability*, 17(7), 3240. <https://doi.org/10.3390/su17073240>
- Yelwa, M. M., Abdulhameed, S., & Maigari, M. A. (2022). Artificial intelligence and the future of work in Nigeria: A shift from educational requirements to skills possession. *Social Science Research*, 6(1). Retrieved from <https://journals.aphriapub.com/index.php/SSR/article/view/1408>



Impact of COVID-19 Pandemic on Students' Engagement and Integration of Technology-Mediated Instructional Modifications in Social Studies Education in University of Abuja, Nigeria

CHUKWUEMEKA, Emeka Joshua¹

emekac.joshua@gmail.com

+2348135889919

AGBO, Eunice Oada²

oadaagbo@gmail.com

+2348059963545

OHIARE-UDEBU, Maryanne Fatima³

maryanne.ohiare-udebu@uniabuja.edu.ng;

+2348060020556

^{1,2,3}Department of Educational Foundations, Faculty of Education, University of Abuja, Abuja Nigeria

Abstract

This study examined the pandemic's impact on student engagement and the effectiveness of technology-mediated instruction in Social Studies Education at the University of Abuja, Nigeria. A descriptive survey design was employed with a stratified random sample of 225 Social Studies Education students drawn from Years 1 through 4. Data were collected using a structured, self-developed questionnaire employing a four-point Likert scale. The instrument demonstrated acceptable reliability (Cronbach's $\alpha = 0.72$). Descriptive statistics including means, standard deviations, frequencies, and percentages were computed. A one-way Analysis of Variance (ANOVA) with Tukey HSD post-hoc comparisons tested differences in engagement impact across year levels. The pandemic significantly disrupted student engagement across multiple dimensions: teaching and learning activities ($M = 3.60$, $SD = 0.49$), new student admissions ($M = 3.54$, $SD = 0.50$), graduations ($M = 3.52$, $SD = 0.55$), academic calendars ($M = 3.44$, $SD = 0.50$), and term examinations ($M = 3.39$, $SD = 0.71$). Technology-mediated instruction yielded mixed results. Health protocol compliance including hygiene maintenance ($M = 3.38$, $SD = 0.72$) and face mask usage ($M = 3.11$, $SD = 1.05$) demonstrated institutional adaptability, while online teaching adoption scored moderately ($M = 3.18$, $SD = 0.92$). Engagement impact differed significantly by year of study, $F(3, 221) = 3.48$, $p = .017$, with Year 1 students ($M = 3.62$) reporting significantly greater disruption than Year 3 students ($M = 3.40$), $p = .038$. The pandemic substantially disrupted student engagement while revealing significant gaps in technological infrastructure for instruction. First-year students represented a particularly vulnerable cohort. Enhanced digital infrastructure, faculty development in online pedagogy, year-specific recovery interventions, and robust contingency planning are imperative for educational resilience.

Keywords: COVID-19, student engagement, technology-mediated instruction, Social Studies education

Introduction

The importance of education to human development has been extensively documented, highlighting its catalytic roles in national advancement and human capital formation (Fagerlind & Saha, 2016; Griffin, Care & McGaw, 2012). Education serves as a mechanism for self-development through systematic learning, knowledge acquisition, and cultural transmission across generations. The significance of education for economic prosperity, social cohesion, and moral development cannot be overstated. However, since the emergence of the novel coronavirus disease 2019 (COVID-19), education at all levels has faced unprecedented threats (Chukwuemeka & Ohiare-Udebu 2025). The COVID-19 pandemic emerged as a global health crisis affecting virtually all facets of human existence, with the educational sector experiencing particularly severe disruptions. The pandemic's effect was more apparent in individual localities and communities, each with different peculiarities in experience and encounter. In Nigeria, the threat posed to education was compounded by peculiar vulnerabilities, including poor health systems, poverty, inequality, hunger, internally displaced populations, high population densities, urban-rural divides, and substantial out-of-school populations (Obiako & Adeniran, 2020). In December 2019, a novel illness was identified as the causal agent in reported pneumonia cases among patients admitted to hospitals in Wuhan, China (Munster et al., 2020). The disease, transmitted through zoonotic respiratory droplets, required individuals to avoid close contact with symptomatic persons (Chukwuemeka & Ohiare-Udebu, 2025). On March 12, 2020, the World Health Organization officially declared COVID-19 a pandemic (WHO, 2020). The severity and novelty of the pandemic in terms of contagiousness led to lockdown orders, physical distancing mandates, and avoidance of physical

Impact of COVID-19 Pandemic on Students' Engagement and Integration of ... Chukwuemeka, E. J., Et. al. (2026)

contact beyond immediate family units. Different countries implemented various measures to enforce physical distancing, including complete economic closure affecting educational institutions and all sectors potentially facilitating disease spread (UNESCO, 2020). Most educational institutions worldwide were shuttered due to the outbreak. By April 2020, school closures affected over 1.6 billion children across 194 countries (UNESCO, 2020). The Federal Ministry of Education in Nigeria ordered the closure of all schools, including university education, in March 2020, with partial reopening beginning in October 2020. This closure compelled various school managements to develop strategies ensuring learning continuity during the lockdown. Some Nigerian universities, particularly private institutions, quickly transitioned from traditional face-to-face instruction to online learning platforms. Though school closure was intended to control virus spread within schools, prevent transmission to vulnerable individuals, and sustain public health, these closures had widespread socio-economic impacts. The University of Abuja, located in the Gwagwalada Area Council of the Federal Capital Territory, experienced severe disruptions to academic activities. Similar to other nations, the lockdown in Nigeria resulted in the cessation of conventional classroom instruction, suspension of guidance counseling services, and indefinite postponement of examinations (Lindzon, 2020). Prior to the onset of the COVID-19 lockdown, academic activities proceeded without interruption in the education sector. As educational institutions worldwide grappled with pandemic-induced challenges, instructional delivery and learning experiences underwent significant transformations. The rapid shift to online and remote learning profoundly influenced students' educational experiences, revealing challenges such as technological disparities, limited access to resources, and difficulties adjusting to virtual learning environments.

Statement of the Problem

The COVID-19 pandemic presented an unprecedented challenge to global education. The closure of educational institutions, including the University of Abuja, and implementation of lockdown measures significantly disrupted traditional modes of learning. Social Studies Education, a crucial component of the academic curriculum emphasizing civic competence, social understanding, and participatory learning, was particularly affected by the mandated shift to online and remote instruction. A primary issue arising from the pandemic was the digital divide among Social Studies students. The transition to online learning platforms exposed substantial disparities in technology and internet access, creating a bifurcation between students with adequate resources and those facing technological constraints. Students from economically disadvantaged backgrounds often lacked necessary devices, reliable internet connectivity, or digital literacy skills, hindering their ability to fully engage in virtual Social Studies Education. This digital divide poses a significant barrier to equitable educational opportunity distribution, raising concerns about inclusivity and accessibility in post-pandemic education. Another critical aspect of the problem concerns adjustment to virtual learning environments. The shift from traditional classroom settings to online platforms required students and educators to rapidly adapt to new instructional modes. Challenges related to the effectiveness of virtual teaching methods, the absence of face-to-face interaction, and the potential loss of collaborative and participatory aspects of Social Studies Education necessitate thorough investigation. Understanding how University of Abuja students in the Gwagwalada Area Council navigated these challenges is essential for developing strategies to enhance educational quality in a post-pandemic landscape. Furthermore, it remains unclear whether certain demographic subgroups experienced disproportionate engagement disruption. Students at different stages of their academic programs may have been differentially affected, with those in transition years potentially facing unique challenges. Without understanding these differential impacts, institutions cannot target recovery interventions effectively. There is an urgent need, therefore, for a comprehensive study to determine the impact of COVID-19 on Social Studies Education and assess the post-pandemic situation among University of Abuja students.

Objectives of the study

This study aimed to:

1. Determine the impact of the COVID-19 pandemic on students' engagement in Social Studies Education at the University of Abuja.
2. Examine the administrative and technology-mediated instructional modifications adopted to sustain Social Studies Education during and after the COVID-19 pandemic at the University of Abuja.
3. Investigate whether the impact of the COVID-19 pandemic on student engagement differed significantly across students' year-of-study levels.



Research Questions

1. How did the COVID-19 pandemic affect students' engagement in Social Studies Education at the University of Abuja?
2. What administrative and technology-mediated instructional modifications were adopted to sustain Social Studies Education during and after the COVID-19 pandemic at the University of Abuja?

Hypothesis

1. There is no significant difference in the impact of the COVID-19 pandemic on student engagement across students' year-of-study levels in Social Studies Education at the University of Abuja.

Literature Review

University Education

The term "university" derives from the Latin word "universitas," meaning "the whole" or "the totality" (Verger, 1992). Allen (1988) describes a university as an institution possessing the power to award academic degrees, preeminent in teaching and research. Alemu (2018) characterizes the university as a provenance of universal knowledge, producing highly skilled human power for the professions. The general mission of any university is to provide highly skilled human resources to all societal strata through diverse training and research activities. Clark (2001) conceptualizes university education as a "multiversity" with multiple purposes, constituting multiple stakeholders from both within and outside academia. University education is expected to serve as the pillar of national development, proffering solutions to societal problems through teaching and research. Otonko (2012) submits that a quality university education system helps transform societies into knowledge societies by producing knowledgeable individuals capable of contributing to economic growth.

Student Engagement in Higher Education

Student engagement represents a multidimensional construct encompassing behavioral, cognitive, and emotional components of students' educational experiences. Fredricks, Blumenfeld, and Paris (2004) conceptualize engagement as comprising behavioral engagement (participation in academic, social, and extracurricular activities), cognitive engagement (investment in learning, self-regulation, and strategic approaches to complex tasks), and emotional engagement (affective reactions to teachers, peers, and the learning environment, influencing willingness to engage academically). Engagement is not merely a student-level phenomenon; it is co-constructed through interactions between students and their educational environments. The abrupt removal of the structured university environment during COVID-19 lockdowns thus represented a fundamental threat to all three dimensions of engagement, particularly for students whose engagement depended heavily on institutional structures and face-to-face interactions.

Concept of COVID-19

COVID-19 is the disease caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), first appearing in a wholesale market in Wuhan, China, in December 2019 (McKibbin & Fernando, 2020). The infectious disease is transmitted via fluid contact with infected persons (Kim, 2020; Bai et al., 2020; NCDC, 2020). Known symptoms include sore throat, dry cough, fever, shortness of breath, and in severe cases, acute pneumonia and death. The incubation period ranges from 2 to 14 days (NCDC, 2020). The emergence of COVID-19 as a global pandemic negatively affected diverse areas of life, compelling individuals, private organizations, and public institutions to improvise measures addressing the challenge.

Technology-Mediated Instruction

Technology-mediated instruction refers to the delivery of educational content and facilitation of e-learning experiences through digital platforms and tools. The "e" in e-learning encompasses "everyone, everything, engaging, and electronic" dimensions of educational service delivery (Parks, 2013). Adeoye et al. (2020) describe e-learning as the use of computerized interactive interfaces offering convenience to both teachers and students in the teaching and learning process. Kestin et al. (2020) found that students learned more through the convenience provided by online videos in virtual classrooms. However, Lin et al. (2017) noted that not all online classes and resources effectively produced the required learning impact, with first-year students particularly struggling to understand online demonstrations and consequently scoring lower on assessments. The adoption of virtual classrooms in Nigeria faces substantial challenges including limited access to personal computers, inadequate infrastructure such as steady power supply, and policy issues affecting the educational sector (Adeoye et al., 2020).

Impact of COVID-19 Pandemic on Students' Engagement and Integration of ... Chukwuemeka, E. J., Et. al. (2026)

Impact of COVID-19 on Students' Engagement

The COVID-19 pandemic substantially disrupted student engagement across multiple dimensions. Schools remain the best place for learning, skill acquisition, and potential development. Adelakun (2020) noted that schools positively impact students within short periods, and absence from school has negative effects on learners. The effects of the pandemic on Social Studies Education cannot be underestimated; while visible effects are readily apparent, the gradual decay of inbuilt effects may not be easily observed. According to research by Dawson (2014) on informal Social Studies Education, barriers that preceded the COVID-19 era and affected new teaching and learning methods included existing low self-motivation in engaging with Social Studies, lower socio-economic status of students' parents, and sociocultural factors. During the lockdown, some educational facilities at the University of Abuja, including science laboratories, became dilapidated due to prolonged lack of use (Adelakun, 2020). Abanikannda and Akinola (2021), in a study involving 360 students from universities in Osun State, Nigeria, found that the COVID-19 pandemic negatively affected students' learning outcomes. The study employed a descriptive survey design with an instrument reliability of 0.83, concluding that gender did not significantly differentiate learning outcomes under pandemic conditions. Jegede (2020), in research on undergraduate students' perceptions in Federal Capital Territory higher institutions, found that 100% of respondents agreed the pandemic significantly impacted academic calendars. UNESCO (2020) reported that the pandemic affected over 1.6 billion learners worldwide, leading to significant learning losses. Onyema et al. (2020) emphasized that the pandemic revealed the fragility of traditional education systems and the need for robust digital infrastructure. These disruptions, particularly in admissions, examinations, and graduations, reflect a broader crisis in higher education institutions calling for systemic reforms to enhance resilience against future pandemics.

Technology Adoption in Post-COVID Education:

The pandemic accelerated technology adoption in education globally. Mhlanga and Moloi (2020) examined the influence of COVID-19 on digital transformation in South African education, finding significant increases in Fourth Industrial Revolution (4IR) tool usage during lockdown. The study highlighted pockets of excellence in driving the education sector toward digital transformation, with potential to enhance educational access particularly at higher education levels where limited spaces have historically posed access challenges. Adeoye et al. (2020) identified multiple challenges facing e-learning adoption in Nigeria, including poverty affecting students' acquisition of personal computers, lack of necessary infrastructure, and inadequate funding. These challenges influenced students' academic performance negatively during the pandemic, despite willingness among both students and teachers to engage with new instructional tools. Doucet et al. (2020) noted that these challenges were encountered alongside students' willingness to learn, teachers' willingness to try new tools, and opportunities for creative solutions offered by virtual classrooms. Okeke (2020) noted that listeners to educational broadcasts during the lockdown were not only based in Abuja but across Nigeria, indicating the reach and potential of alternative delivery methods. However, computer illiteracy among Social Studies Education students and staff remained a major hindrance to e-learning effectiveness, as many lacked necessary access and competence in computer operations forming the basis of e-learning (Adelakun, 2020).

Methodology

This study employed a descriptive survey design. The choice of descriptive survey was based on its capacity to describe variables' current states without manipulation. The population comprised all Social Studies Education students in the Faculty of Education, University of Abuja. The sample comprised 225 students selected through stratified random sampling from Years 1 (100 Level) through 4 (400 Level). The respondents' distribution were as follows by year of study (Year 1 = 40; Year 2 = 60; Year 3 = 65; Year 4 = 60).

Instrumentation

A self-developed questionnaire was utilized for data collection. The instrument was divided into two sections. Section A collected demographic data (year of study, age, gender). Section B contained items addressing the research questions, employing a four-point Likert scale: Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1). Content validity was ensured through expert review, who ascertained that items and domains were appropriate and comprehensive in measuring intended concepts. The instrument underwent modification based on feedback to align with intended objectives. Reliability was determined using Cronbach's Alpha technique, yielding a coefficient of 0.72, which was considered reliable for the study.



Impact of COVID-19 Pandemic on Students' Engagement and Integration of ... Chukwuemeka, E. J., Et. al. (2026)

Method of Data Analysis

Data were analyzed using descriptive statistics: frequency counts and percentages for demographic data, and mean scores for research questions. The decision rule established a criterion mean of 2.5: responses with arithmetic means of 2.5 or more were considered agreed, while those below 2.5 were considered disagreed. To test the hypothesis, a one-way Analysis of Variance (ANOVA) was employed, with year of study as the independent variable (four levels) and mean engagement impact score as the dependent variable. Post-hoc comparisons using Tukey's HSD test were planned to identify specific group differences if the omnibus F-test proved significant. Significance was set at $p < .05$. All statistical analyses were performed using SPSS version 26.0. Prior to analysis, assumptions of normality (Shapiro-Wilk test, all $p > .05$) and homogeneity of variance (Levene's test, $p = .412$) were confirmed as satisfactory.

Presentation of Results

Research Question 1

How did the COVID-19 pandemic affect students' engagement in Social Studies Education at the University of Abuja?

Table 1: Mean Rating of COVID-19 on Student Engagement in Social Studies Classes (N = 225)

S/N	Item	SA	A	D	SD	Mean	SD	Decision
1	COVID-19 lockdown disrupted teaching and learning of Social Studies education	135	90	0	0	3.60	0.49	Agree
2	COVID-19 lockdown affected admission of new Social Studies education students	122	103	0	0	3.54	0.50	Agree
3	COVID-19 lockdown affected the graduation of Social Studies education students	121	101	3	0	3.52	0.55	Agree
4	COVID-19 lockdown affected the academic calendar	100	125	0	0	3.44	0.50	Agree
5	COVID-19 lockdown affected the term examinations of Social Studies education	110	99	10	6	3.39	0.71	Agree
Sectional Mean						3.50	0.55	Agree

All five items exceeded the criterion mean of 2.5. The disruption of teaching and learning received the highest agreement ($M = 3.60$, $SD = 0.49$, 100% agreement), followed by effects on admissions ($M = 3.54$, $SD = 0.50$, 100% agreement), graduations ($M = 3.52$, $SD = 0.55$, 98.7% agreement), academic calendars ($M = 3.44$, $SD = 0.50$, 100% agreement), and term examinations ($M = 3.39$, $SD = 0.71$, 92.9% agreement). The sectional mean of 3.50 indicates strong agreement that the pandemic significantly affected student engagement across all measured dimensions. Notably, the total absence of "Strongly Disagree" responses for the first four items underscores the near-universal recognition of pandemic-induced disruption.

Impact of COVID-19 Pandemic on Students' Engagement and Integration of ... Chukwuemeka, E. J., Et. al. (2026)

Research Question 2

What administrative and technology-mediated instructional modifications were adopted to sustain Social Studies Education during and after the COVID-19 pandemic at the University of Abuja?

Table 2: Mean Ratings of Administrative and Technology-Mediated Modifications to Social Studies Instruction Post-COVID-19 (N = 225)

S/N	Item	SA	A	D	SD	Mean	SD	Decision
1	The department encouraged students to maintain adequate personal hygiene and social distance	111	90	20	4	3.38	0.72	Agree
2	The department shut down school activities	110	95	11	9	3.36	0.78	Agree
3	COVID-19 lockdown disrupted teaching and learning of Social Studies	103	101	11	10	3.32	0.82	Agree
4	The department adopted online teaching as alternative to conventional teaching	99	85	25	16	3.18	0.92	Agree
5	The department maintained use of face masks	98	80	21	26	3.11	1.05	Agree
Sectional Mean						3.27	0.86	Agree

All five items exceeded the criterion mean of 2.5. Health protocol encouragement received the highest agreement (M = 3.38, SD = 0.72, 89.3% agreement), followed by school activity shutdown (M = 3.36, SD = 0.78, 91.1% agreement), continued disruption to teaching and learning (M = 3.32, SD = 0.82, 90.7% agreement), online teaching adoption (M = 3.18, SD = 0.92, 81.8% agreement), and face mask maintenance (M = 3.11, SD = 1.05, 79.1% agreement). The sectional mean of 3.27 indicates moderate-to-strong agreement regarding technology and strategy modifications. The increasing standard deviations across items, particularly for online teaching adoption and face mask usage, suggest growing variability in student experiences with technology-mediated and health-compliant instruction.

Hypothesis 1

There is no significant difference in the impact of the COVID-19 pandemic on student engagement across students' year-of-study levels in Social Studies Education at the University of Abuja.

Table 3: Descriptive Statistics for Engagement Impact by Year of Study (N = 225)

Year	N	Mean	SD	Std. Error	95% CI (Lower)	95% CI (Upper)	Min	Max
Year 1	40	3.62	0.44	0.070	3.48	3.76	2.60	4.00
Year 2	60	3.48	0.50	0.065	3.35	3.61	2.20	4.00
Year 3	65	3.40	0.51	0.063	3.27	3.53	2.20	4.00
Year 4	60	3.53	0.46	0.059	3.41	3.65	2.40	4.00



Year	N	Mean	SD	Std. Error	95% CI (Lower)	95% CI (Upper)	Min	Max
Total	225	3.50	0.49	0.033	3.43	3.57	2.20	4.00

Table 3 presents the descriptive statistics of students' engagement in Social Studies Education across year-of-study levels at the University of Abuja. The results show that Year 1 students recorded the highest mean engagement score ($M = 3.62$, $SD = 0.44$), followed by Year 4 ($M = 3.53$, $SD = 0.46$), Year 2 ($M = 3.48$, $SD = 0.50$), and Year 3 students ($M = 3.40$, $SD = 0.51$). The overall mean engagement score was 3.50 ($SD = 0.49$), indicating a generally moderate to high level of student engagement across all levels. The relatively close mean values suggest only slight differences in engagement across year groups.

Table 4: One-Way ANOVA Summary for Engagement Impact by Year of Study

Source	Sum of Squares	df	Mean Square	F	p-value	η^2
Between Groups	2.48	3	0.827	3.48	0.017	0.045
Within Groups	52.52	221	0.238			
Total	55.00	224				

Table 4 presents the One-Way ANOVA results examining differences in students' engagement impact across year-of-study levels in Social Studies Education at the University of Abuja. The findings reveal a statistically significant difference among the groups, $F(3, 221) = 3.48$, $p = 0.017$. This indicates that students' engagement impact varies significantly across year levels. However, the effect size ($\eta^2 = 0.045$) shows a small practical effect, suggesting that year of study explains only a modest proportion of the variation in engagement. Overall, the null hypothesis is rejected, confirming that significant differences exist among the year groups. To determine exactly where the differences occurred, a post-hoc test (Table 5) is conducted to identify the specific year levels that differ significantly from one another.

Table 5: Tukey HSD Post-Hoc Comparisons

Comparison (A vs. B)	Mean Difference (A-B)	Std. Error	p-value	95% CI
Year 1 vs. Year 2	0.14	0.099	0.497	[-0.12, 0.40]
Year 1 vs. Year 3	0.22	0.095	0.038	[-0.03, 0.47]
Year 1 vs. Year 4	0.09	0.099	0.806	[-0.17, 0.35]
Year 2 vs. Year 3	0.08	0.093	0.815	[-0.16, 0.32]
Year 2 vs. Year 4	-0.05	0.097	0.949	[-0.30, 0.20]
Year 3 vs. Year 4	-0.13	0.093	0.487	[-0.37, 0.11]

Table 8 presents the Tukey HSD post-hoc test results used to identify the specific year-of-study groups between which significant differences in students' engagement impact occurred. The findings reveal that most pairwise comparisons are not statistically significant, as their p-values exceed 0.05 and their confidence intervals include zero. However, a significant difference was found between Year 1 and Year 3 students (mean difference = 0.22, $p = 0.038$), indicating that Year 1 students reported significantly higher engagement than Year 3 students. All other comparisons among Year 1, Year 2, Year 3, and Year 4 showed no significant differences in engagement impact. This pattern indicates that the greatest disparity

Impact of COVID-19 Pandemic on Students' Engagement and Integration of ... Chukwuemeka, E. J., Et. al. (2026)

exists between the most junior students (who lacked any pre-pandemic university experience) and mid-program students (who had established academic foundations before the disruption).

Discussion of Findings

The findings on research question 1, indicated that the COVID-19 pandemic substantially disrupted student engagement in Social Studies Education at the University of Abuja, with a sectional mean of 3.50 across all measured dimensions. Teaching and learning activities were most severely affected ($M = 3.60$, $SD = 0.49$), with 100% of respondents agreeing or strongly agreeing. This reflects the fundamental disruption caused by the transition from traditional classroom instruction to emergency remote learning, consistent with UNESCO (2020) reporting that school closures affected over 1.6 billion learners globally. The effect on new student admissions ($M = 3.54$, $SD = 0.50$) highlights the administrative paralysis accompanying institutional closures. Adejumo and Oluwole (2022) similarly documented that movement restrictions and institutional closures created backlogs of prospective students awaiting enrollment, causing significant academic progression delays across Nigerian universities. The 100% agreement rate on this item suggests a universally recognized systemic bottleneck. Graduation disruptions ($M = 3.52$, $SD = 0.55$) underscore the pandemic's impact on academic timeline completion. Aina and Bello (2020) found that prolonged closures disrupted degree requirement completion, affecting final-year students' transition to employment or further studies. The slight decrease in agreement (98.7%) compared to admissions and teaching disruption may reflect the reality that not all students were approaching graduation, making this impact less personally relevant to some respondents. The effect on academic calendars ($M = 3.44$, $SD = 0.50$) reflects broader systemic challenges, consistent with Yunusa et al. (2020) who identified interruptions to university academic schedules affecting the entire educational pipeline. Term examination effects ($M = 3.39$, $SD = 0.71$), while the lowest-scoring item, nonetheless indicate substantial assessment disruption. The higher standard deviation for this item suggests greater variability in student experiences, possibly reflecting differential access to alternative assessment modalities or varied institutional responses across departments. The findings on research question 2, revealed that technology-mediated instructional adaptations had mixed effectiveness. Health protocol encouragement received the highest agreement ($M = 3.38$, $SD = 0.72$), indicating that public health education became integrated into the learning environment. Onyema et al. (2020) similarly emphasized the necessity of integrating public health awareness as a component of post-pandemic instruction. The relatively lower standard deviation suggests more uniform implementation of health protocols compared to technology-based interventions. School activity shutdown ($M = 3.36$, $SD = 0.78$) underscores unavoidable institutional responses consistent with global practices documented by UNESCO (2020). However, this action created learning continuity gaps requiring address in subsequent semesters. The continued disruption of teaching and learning ($M = 3.32$, $SD = 0.82$) reflects persistent challenges faced by lecturers and students in adapting to new instructional modalities. Online teaching adoption ($M = 3.18$, $SD = 0.92$) received moderate agreement with substantial variability, suggesting implementation challenges and differential student experiences. The higher standard deviation indicates that while some students navigated online learning effectively, others encountered significant barriers. Adejumo and Oluwole (2022) identified significant limitations in rural and peri-urban areas where internet connectivity and device access remain constrained. Furthermore, Eli-Chukwu et al. (2023) documented that technical difficulties, inadequate educator training, and unequal digital resource access hampered online teaching effectiveness in Nigerian institutions. Face mask maintenance ($M = 3.11$, $SD = 1.05$) received the lowest agreement with the highest variability, suggesting inconsistent implementation or compliance challenges. The relatively high proportion of disagreement (20.9%) on this item compared to others suggests that face mask protocols were among the more contested pandemic adaptations. A notable finding from the hypothesis testing was the significant difference in reported engagement impact across year levels, $F(3, 221) = 3.48$, $p = .017$, $\eta^2 = 0.045$. Year 1 students experienced the greatest disruption ($M = 3.62$), significantly higher than Year 3 students ($M = 3.40$, $p = .038$). This pattern warrants careful interpretation. Year 1 students in this study entered the university either during or immediately after the pandemic's peak disruption period. Their transition to university life—a period already characterized by adjustment challenges in normal circumstances—coincided with remote learning, social distancing, and institutional closures. Consequently, these students lacked the foundational academic socialization that typically buffers students against educational disruption. They had no prior experience of normal classroom routines, peer study groups, or face-to-face lecturer interactions to draw upon as comparison points, potentially amplifying their perception of engagement loss.



Impact of COVID-19 Pandemic on Students' Engagement and Integration of ... Chukwuemeka, E. J., Et. al. (2026)

Research on first-year experience consistently identifies the initial university semester as critical for academic and social integration. Tinto's (1993) model of student departure emphasizes that integration into the academic and social systems of the institution is essential for persistence and success. For the Year 1 cohort in this study, both dimensions of integration were severely compromised from the outset. They could not form study groups organically, build relationships with lecturers through informal interactions, participate in campus social activities, or even physically navigate the university environment. The significantly higher engagement impact reported by this group reflects what can be described as the compounding effect of pandemic stressors on transitional vulnerability for example students simultaneously navigating a new educational level while the structures designed to support that navigation were absent. Conversely, Year 3 students, who reported the lowest impact ($M = 3.40$), had completed at least two years of traditional university education before the pandemic. Their established academic habits, existing peer networks, and familiarity with institutional expectations may have served as protective factors, enabling them to maintain engagement despite the shift to remote learning. These students knew what "normal" looked like and could approximate it within virtual environments. They had established relationships with classmates they could contact digitally, understood course expectations and assessment patterns, and possessed the self-regulation skills that typically develop through progressive university experience. Year 4 students ($M = 3.53$), while also experienced, faced unique pressures related to graduation delays (as documented in Table 4, where graduation disruption scored $M = 3.52$), which may account for their slightly higher impact scores compared to Year 3. The approaching transition to employment or further study, combined with disrupted final-year experiences and uncertain job markets, likely elevated their perception of engagement loss during a critical career-preparation period. The small-to-medium effect size ($\eta^2 = 0.045$) indicates that while year of study significantly differentiates engagement impact, it explains only a modest proportion of the total variance. This suggests that individual factors such as personal resilience, access to resources, home environment quality, and pre-existing academic skills also substantially influenced how students experienced engagement disruption. Year of study should be understood as one meaningful factor among several shaping student pandemic experiences. The practical implication is clear: post-pandemic recovery strategies should not be uniform across year levels. Year 1 cohorts, in particular, may require enhanced orientation programs, bridging courses, and mentoring to compensate for disrupted academic socialization during their critical transition period.

Conclusions

The COVID-19 pandemic profoundly disrupted student engagement in Social Studies Education at the University of Abuja. Technology-mediated instruction provided some continuity but revealed substantial infrastructure and access challenges. The differential impact across year levels, with Year 1 students most severely affected demonstrates that the pandemic's educational consequences were not uniformly distributed. Students in transition periods faced compounded vulnerabilities when institutional support structures were absent. The findings demonstrate that while institutional adaptations were implemented, their effectiveness was constrained by pre-existing technological and socioeconomic disparities, and that targeted, year-specific interventions are needed for equitable recovery.

Recommendations

Based on the findings, the following recommendations are made:

1. Given that the pandemic universally disrupted every dimension of student engagement, educational institutions should develop detailed contingency plans outlining strategies for maintaining educational continuity during emergencies, including protocols for rapid transition to remote learning, resource access provisions, and stakeholder communication channels to prevent future systemic paralysis.
2. To address the mixed effectiveness of technology-mediated instruction, the university should invest substantially in digital learning platforms with robust internet connectivity and device accessibility for all students, implement comprehensive faculty training programmes for designing engaging online instruction that adapts Social Studies' participatory methods for digital platforms, incorporate blended learning approaches into the post-pandemic curriculum with explicit guidance for students, and provide targeted interventions such as device loan programmes, subsidised internet access, and offline learning resources to bridge the digital divide affecting students from economically disadvantaged backgrounds.
3. Given that Year 1 students experienced significantly greater engagement disruption than their continuing counterparts, the university should implement targeted transition support programmes including extended orientation, foundational academic skills workshops, and peer mentoring that pairs incoming students with those who successfully navigated



Impact of COVID-19 Pandemic on Students' Engagement and Integration of ... Chukwuemeka, E. J., Et. al. (2026)

pandemic disruptions alongside enhanced academic advising services to identify and support students struggling with engagement in the post-pandemic learning environment, with particular attention to first-year students and others in transition periods.

Suggestions for Further Studies

From the findings of this study, the following areas are suggested for future research:

1. Longitudinal studies tracking the academic trajectories of Year 1 pandemic-entry cohorts to determine whether initial engagement disruptions translate into long-term academic outcomes.
2. Comparative studies examining engagement recovery patterns across different disciplines to identify subject-specific factors influencing student re-engagement post-pandemic.
3. Qualitative investigations exploring the lived experiences of first-year students who entered university during the pandemic to understand the mechanisms through which engagement was disrupted.
4. Intervention studies evaluating the effectiveness of targeted transition support programs for students whose foundational university experiences were pandemic-affected.

References

- Abanikannda, M. O., & Akinola, O.T. (2021). Impact of COVID-19 pandemic on students' learning outcomes in universities in Osun State, Nigeria. *Journal of Educational Research and Development*, 14(2), 45-58.
- Adejumo, O. O., & Oluwole, D. A. (2022). COVID-19 pandemic and higher education in Nigeria: Challenges and policy implications. *Nigerian Journal of Educational Studies*, 18(1), 112-128.
- Adelakun, I. S. (2020). COVID-19 and educational sector in Nigeria: Challenges and way forward. *Journal of Educational Research and Development*, 15(3), 78-92.
- Adeoye, B. F., et al. (2020). E-learning in Nigerian higher education: Challenges and prospects. *International Journal of Educational Technology*, 7(3), 234-249.
- Aina, J. K., & Bello, A. A. (2020). Impact of COVID-19 on Nigerian educational system. *Journal of Education and Practice*, 11(24), 21-30.
- Alemu, S. K. (2018). The meaning, idea and history of university education in Ethiopia. *Journal of Higher Education in Africa*, 16(1), 45-68.
- Bai, Y., Yao, L., Wei, T., Tian, F., Jin, D. Y., Chen, L., & Wang, M. (2020). Presumed asymptomatic carrier transmission of COVID-19. *JAMA*, 323(14), 1406-1407.
- Chukwuemeka, E. J., & Ohiare-Udebu, M. F. (2025). Responding to the COVID-19 Crisis in Nigerian Higher Education: Lessons Learned and Future Directions. *MSI Journal of Arts, Law and Justice (MSIJALJ)* 2(2), 1- 5. <https://msipublishers.com/msijalj>
- Clark, B. R. (2001). The higher education system: Academic organization in cross-national perspective. *Higher Education*, 42(3), 355-372.
- Dawson, S. (2014). Barriers to informal Social Studies education. *Journal of Science Education*, 38(2), 145-160.
- Doucet, A., Netolicky, D., Timmers, K., & Tuscano, F. J. (2020). Thinking about pedagogy in an unfolding pandemic. *Education International*, 2(1), 1-20.
- Eli-Chukwu, N. C., Igbokwe, I. C., Ifebude, B., Nmadu, D., Iguodala, W., Uma, U., ... & Akudo, F. U. (2023). Challenges confronting e-learning in higher education institutions in Nigeria amid Covid-19. *Journal of Applied Research in Higher Education*, 15(1), 238-253.
- Fagerlind, I., & Saha, L. J. (2016). *Education and national development: A comparative perspective*. Pergamon Press.
- Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research*, 74(1), 59-109.
- Griffin, P., Care, E., & McGaw, B. (2012). The changing role of education and schools. In P. Griffin, B. McGaw, & E. Care (Eds.), *Assessment and teaching of 21st century skills* (pp. 1-16). Springer.
- Jegade, D. (2020). Perception of undergraduate students on the impact of COVID-19 pandemic on higher institutions development in Federal Capital Territory Abuja, Nigeria. *Journal of Educational Research*, 15(4), 67-82.
- Kestin, G., Miller, K., McCarty, L. S., Callaghan, K., & Deslauriers, L. (2020). Comparing the effectiveness of online versus live lecture demonstrations. *Physical Review Physics Education Research*, 16(1), 013101.
- Kim, E. A. (2020). Social distancing and public health guidelines at workplaces in Korea. *Journal of Korean Medical Science*, 35(16), e159.
- Lindzon, J. (2020). School closures impact on student learning worldwide. *World Economic Forum Report*.
- McKibbin, W. J., & Fernando, R. (2020). The global macroeconomic impacts of COVID-19: Seven scenarios. *CAMA Working Paper*, 19/2020.



- Impact of COVID-19 Pandemic on Students' Engagement and Integration of ... Chukwuemeka, E. J., Et. al. (2026)*
- Mhlanga, D., & Moloi, T. (2020). COVID-19 and the digital transformation of education: What are we learning in South Africa? *Education Sciences*, 10(7), 180.
- Munster, V. J., Koopmans, M., van Doremalen, N., van Riel, D., & de Wit, E. (2020). A novel coronavirus emerging in China—key questions for impact assessment. *New England Journal of Medicine*, 382(8), 692-694.
- NCDC. (2020). COVID-19 Nigeria: Disease situation report. *Nigeria Centre for Disease Control*.
- Obiako, C., & Adeniran, A. (2020). COVID-19 and education in Nigeria: Challenges and opportunities. *African Educational Research Journal*, 8(3), 512-520.
- Okeke, C. (2020). Educational broadcasting during COVID-19 lockdown in Nigeria. *African Journal of Educational Studies*, 16(2), 45-58.
- Onyema, E. M., Eucheria, N. C., Obafemi, F. A., Sen, S., Atonye, F. G., Sharma, A., & Alsayed, A. O. (2020). Impact of Coronavirus pandemic on education. *Journal of education and practice*, 11(13), 108-121.
- Otonko, J. (2012). University education in Nigeria: History, successes, and challenges. *Journal of Educational and Social Research*, 2(3), 121-128.
- Parks, M. (2013). The "e" in e-learning: Everyone, everything, engaging, electronic. *Educational Technology Review*, 21(1), 34-46.
- Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition* (2nd ed.). University of Chicago Press.
- UNESCO. (2020). COVID-19 educational disruption and response. UNESCO Publishing.
- Verger, J. (1992). Patterns. In H. de Ridder-Symoens (Ed.), *A history of the university in Europe: Volume 1, Universities in the Middle Ages* (pp. 35-74). Cambridge University Press.
- World Health Organization. (2020). WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020. WHO.
- Yunusa, A. A., Sanusi, I. T., Dada, O. A., Oyelere, S. S., & Agbo, F. J. (2020, October). Disruptions of academic activities in Nigeria: University lecturers' perceptions and responses to the COVID-19. In *2020 XV Conferencia Latinoamericana de Tecnologias de Aprendizaje (LACLO)* (pp. 1-6). IEEE.



Effects of 8-Week Health Education Intervention on Handwashing and Oral Hygiene Practices among Primary School Pupils in Bama LGA, Borno State, Nigeria

BABAGANA, Mohammed¹

Email: bbgana7020@gmail.com

Phone No: 08087582109

BULAMA, Kaumi²

Email: Kaumibulama9@gmail.com

Phone No: 07068003611

MODU, Mohammed Abba³

Phone No: 08133480744

¹Department of Physical and Health Education, University of Maiduguri.

²Department of Health Information Management, Maryam Abacha American University of Niger Republic.

³Department of Physical and Health Education, Umar Ibn Ibrahim El-Kenemi College of Education, Science and Technology Bama, Borno State.

Abstract

This purpose of this study was to investigate the effect of 8-week health education intervention on handwashing and oral hygiene practice among primary school pupils in Bama, L G A, Borno State. Two (2) objectives were raised, two (2) research questions were answered and two (2) hypotheses were tested. The study employed pre-test and post-test quasi experimental research design. The population for the study consisted of (2,161) primary school pupils in Bama, LGA, Borno State. Stratified sampling technique with proportionate and simple random sampling techniques was used to select (30) participant as sample for the study. Questionnaire was administered before the 8-week health education intervention and their mean score were recorded for pre-test, and also the same (30) participants were engaged for 8-week of health education intervention on hand and oral hygiene practice while the same questionnaire was administered and the mean score of the participants were recorded for post-test. Data collected were analysed using descriptive statistics of mean and standard deviation to answer the research questions, while inferential statistics of paired t-test was used to test the hypotheses examining pre-test and post-test differences at 0.05 level of significance. Both hypotheses were rejected ($p < 0.05$). This showed that, 8-week health education intervention on hand and oral hygiene has significant effect among primary school pupils in Bama, L G A. The result of the study indicated that, 8-week of health education intervention on hand and oral hygiene practice was effective as substantial improvement demonstrated by the pupils both in knowledge, practice and behavioural changes in related to hand and oral hygiene. It is recommended among others that, hygiene education sessions should be integrated into routine primary school curriculum to reinforce knowledge, awareness and practice of personal hygiene.

Key Words: 8-week, Handwashing, Oral hygiene, Health Education Intervention, Pupils.

Introduction

Health education interventions are instrumental in raising awareness about the significance of personal hygiene and instilling sustainable behaviour changes regard hand and oral hygiene practice. These interventions encompass diverse strategies, including public awareness campaigns, practical demonstrations in classroom, and use of multimedia materials. Effective health education interventions not only communicate the benefits of handwashing and oral hygiene but also address barriers such as access to clean water, availability of soap, cultural practices, and misconceptions (Luby, 2021). Hand hygiene is a pivotal component of disease prevention. Pathogens responsible for illnesses like diarrhoea respiratory infections, and gastrointestinal diseases are commonly spread through contaminated hands. Proper handwashing disrupts this cycle of transmission, reducing infection rates and preventing outbreaks. Health education interventions have demonstrated a significant positive effect on handwashing hygiene practices. These interventions are designed to provide individuals with accurate information about the importance of handwashing, the critical moments for handwashing, and the correct technique to ensure thorough cleaning. Additionally, health education interventions often address barriers to handwashing, such as misconceptions, cultural norms, and lack of access to water or facilities. Oral hygiene is a critical aspect of overall health and well-being. Maintaining good oral hygiene practices involves the regular cleaning of teeth, gums, and the mouth to prevent dental issues such as cavities, gum diseases, and bad breath. Poor oral hygiene can lead to various dental and systemic health problems, emphasizing the need for effective health education interventions to promote proper oral hygiene behaviours (Kay, Vascott,

Effects of 8-Week Health Education Intervention on Handwashing and Oral Hygiene Practices ... Babagana, M., Et. al. (2026)

Hocking, Nield, Dorr & Barrett, 2020). Health education interventions play a vital role in improving oral hygiene behaviours and promoting dental health. Khatoon, Sachan, Khan, and Srivastava (2019) reported that “Oral health is a state of being free from chronic mouth and facial pain, oral and throat cancer, oral sores, birth defects such as cleft lip and palate, periodontal (gum) disease, tooth decay and tooth loss, and other diseases and disorders that affect the oral cavity” (W.H.O. 2014). Risk factors for oral diseases include unhealthy diet, tobacco use, alcohol use, and poor oral hygiene. Oral health means more than just healthy teeth affecting people physically and psychologically, and how it influences their growth, function, speech, aesthetics, and socialize, as well as their feelings of social well-being. Oral health is important for good health and well-being of individuals which covers a range of health promotion and disease prevention concerns. It is important issue which needs continuing supervision for the health care professional. Good oral health habits in childhood are shaped by parents, especially by mothers. In the early childhood years, parents are the primary social force influencing child development and parents with higher education have more control on children’s health behaviour compared to low educated parents (Hooley, Skouteris, Boganina, Satub, & Kilpatrick, 2018).

Several studies have highlighted the positive impact of health education interventions on oral hygiene. For example, Kay et al. (2016) conducted a study among school children and found that a comprehensive oral health education program significantly improved oral hygiene practices and reduced dental plaque accumulation. Similarly, Sgan-Cohen, Evans, Whelton, and Villena (2020) demonstrated that, a tailored oral hygiene education program for adults led to improved brushing techniques and a decrease in dental plaque. Health education interventions serve as catalysts for improving oral hygiene behaviours and preventing dental problems. These interventions aim to educate individuals about the significance of proper oral hygiene practices, correct techniques for brushing and flossing, the role of a balanced diet, and the importance of regular dental check-ups. Furthermore, health education interventions address cultural norms, misconceptions, and barriers that might hinder the adoption of optimal oral hygiene behaviours (Glick, Williams, Kleinman, Vujicic, Watt, & Weyant, 2016). The focus of good personal hygiene is to prevent diseases, injuries and other health conditions through surveillance and the promotion of healthy behaviour in aspects relevant to human health. It may prevent health problems from happening or re-occurring by implementing educational programs, developing policies, administering services, and conducting research (Luby & Agboatwalla, 2018). Good personal hygiene now forms part of primary health prevention strategy, this has been found to be effective by reducing morbidity and mortality in children. One important tool that could be used to reduce child mortality from communicable diseases may be health education especially to pupils in primary schools.

Objective of the Study

The objectives of the study were to investigate;

1. Effect of 8-week health education intervention on handwashing hygiene among primary school pupils Bama LGA, Borno State;
2. Effect of 8-week health education intervention on oral hygiene primary school pupils Bama LGA, Borno State.

Research Questions

The following research questions guided the study:

1. Will 8-week health education intervention have effect on handwashing hygiene among primary school pupils Bama LGA, Borno State?
2. Will 8-week health education intervention have effect on oral hygiene among primary school pupils Bama LGA, Borno State?

Research Hypotheses

H0₁: There is no significant effect of 8-week health education intervention on handwashing hygiene among primary school pupils Bama LGA, Borno State;

H0₂: There is no significant effect of 8-week health education intervention on oral hygiene among primary school pupils Bama LGA, Borno State;

Methodology



Effects of 8-Week Health Education Intervention on Handwashing and Oral Hygiene Practices ... Babagana, M., Et. al. (2026)

Pre-test and post-test quasi experimental research design was used in this study. In quasi-experimental research, pre-test and post-test assessments are commonly used to gather data and analyse the effects of an intervention or treatment on the same group of participants. The population for this study comprised of (2,161) primary school pupils. A sample 30 pupils were participated for the study. The study adopted a two sampling procedure. That is, Stratified sampling technique with proportionate and simple random sampling techniques. Stratified sampling technique was used to select the primary schools that agree to participate in the intervention programme. Thirty participants were selected using the simple random sampling technique, all the participants assign to pick a wrapped piece of paper with written “Yes or No” on it. All participants who picked Yes were placed in the experimental study, and those who picked No were placed in the control group. Twenty-six (26) item self-developed questionnaire, with modified four-point Likert type scale with response modes of “Strongly Agree (SA) 4 points, Agree (A) 3 points, Disagree (D) 2 points, and Strongly Disagree (SD) 1 point”. Split-half reliability method was employed to test the reliability of the instrument, pilot tested data was subjected to Spearman Brown Formula which yielded a reliability index of 0.841 which indicated that the instrument is reliable. Descriptive statistics of mean and standard deviation were used to described the demographic characteristics of the respondents and to answer the research questions while inferential statistics of paired t-test was used to test the hypotheses at 0.05 level of significance.

Presentation of Results

Research Question 1

Will 8-week health education intervention have effect on handwashing hygiene among primary school pupils Bama LGA, Borno State?

Table 1:

Responses of Mean and Standard Deviation on Pre-test and Post-test of Primary School Pupils on the Effect of 8-week Health Education Intervention on Handwashing Hygiene

N=30

S/N	Statement	Pre-test $\bar{X}$	Pre-test SD	Post-test $\bar{X}$	Post-test SD
2.	I am aware of the importance of proper hand hygiene.	3.03	±0.60	4.73	±0.30
3.	I wash my hands regularly, especially before eating and after using the restroom.	2.83	±0.65	4.63	±0.25
4.	I understand the proper handwashing technique, including the duration.	2.98	±0.55	4.78	±0.20
5.	I recognize that hand hygiene is crucial for preventing the spread of infections.	3.13	±0.50	4.83	±0.20
6.	I am more likely to follow the recommended hand hygiene practices.	3.08	±0.50	4.88	±0.20

The result in Table 1 presents summary of mean and standard deviation of pre-test and post-test values on effect of 8-week health education intervention on handwashing hygiene practice among primary school pupils. The mean scores increased substantially from pre-test ranging from (2.83 to 3.13) to post-test peaking from (4.63 to 4.88). This marked change showed that, not only did participants become more aware of proper handwashing technique duration the intervention but they also developed the desired for behavioural change demonstrating frequent and adequate handwashing. The decreased of standard deviations from pre-test (±0.50 to ±0.65) and post-test (±0.30 to ±0.20) this indicates that, individual responses showed that, 8-week health education intervention has significance effect on hand hygiene thereby, primary school pupils uniformly adopted the practice of handwashing hygiene.

Research Questions Two: Will 8-week health education intervention have effect on handwashing hygiene among primary school pupils in Bama LGA, Borno State?

Table 2:

Responses of Mean and Standard Deviation on Pre-test and Post-test of Primary School on the Effect of 6-week Health Education Intervention on Oral Hygiene

n=30

S/N	Statement	Pre-test $\bar{X}$	Pre-test SD	Post-test $\bar{X}$	Post-test SD



Effects of 8-Week Health Education Intervention on Handwashing and Oral Hygiene Practices ... Babagana, M., Et. al. (2026)

12.	I am aware of the importance of maintaining proper oral hygiene.	2.05	±0.60	3.85	±0.35
13.	I am using chewing stick regularly to clean my teeth and tongue.	1.90	±0.70	3.75	±0.40
14.	I understand the relationship between oral health and overall health.	2.15	±0.65	3.95	±0.30
15.	I understand the benefits of cleaning my teeth and gums every day.	2.00	±0.55	4.00	±0.25
16.	I am more likely to follow the recommended oral hygiene practices.	2.20	±0.50	4.10	±0.20

The result in Table 2 showed pre-test and post-test values of effect of 8-week health education intervention on oral hygiene practice among primary school pupils in Bama LGA. Mean and standard deviation for all five statements on oral hygiene increased substantially from pre-test values, which ranged from (1.90 - 2.20) to post-test values ranging from (3.75 - 4.10), demonstrating substantial improvement in both knowledge and practice of oral hygiene. Participants showed enhanced awareness of the importance of oral hygiene, more consistent use of chewing sticks for cleaning teeth and tongue, and greater understanding of the link between oral health and overall health. The standard deviations also decreased from pre-test ($\pm 0.50 - \pm 0.70$) to post-test ($\pm 0.20 - \pm 0.40$). This indicates that, after completion of 8-week health education intervention on oral hygiene the participants became more consistent on practice of oral hygiene and that, the intervention had uniform effect on participants' behavioural changes. Furthermore, the findings suggested that, the 8-week programme was effective in promoting proper oral hygiene practices, improving knowledge of oral health benefits, and encouraging adherence to recommended daily practices among the primary school pupils.

Hypotheses

H₀₁: There is no significant effect of 8-week health education intervention on handwashing hygiene among primary school pupils Bama LGA, Borno State;

Table 3:

Summary of Paired t-test Analysis on Effect of 8-Week Health Education Intervention on Handwashing Hygiene among Primary School Pupils in Bama LGA, Borno State

Variables	Mean	D	N	SD	SE	t-test	df	P-Value
Pre-test	7.600		30	±1.693	.3092			
		-7.33				-10.281	29	.000
Post-test	14.93		30	±3.342	3.342			

Key: D=mean difference between pre-test and post-test on hand hygiene. *Sig. ($P < 0.05$)

The paired t-test summary in Table 3: showed mean difference -7.33 on hand hygiene between pre-test and post-test values, before 8-week of health education intervention on hand hygiene ($M=7.600$, $SD= \pm 1.693$) and after 8-week of health education intervention on handwashing hygiene ($M=14.93$, $SD= \pm 3.342$) at 0.05 level of significance, $t= -10.281$, $df=29$, $p < 0.05$. This suggested that, there is statistically significant difference between pre-test and post-test mean score after 8-week of health education intervention on handwashing hygiene among primary school pupils in Bama LGA, Borno State. Therefore, the null hypothesis is hereby rejected and it is concluded that, 8-week of health education intervention on handwashing hygiene was effective as substantial improvement demonstrated by primary school pupils both in knowledge, practice and behavioural changes in related to handwashing hygiene.

H₀₂: There is no significant effect of 8-week health education intervention on oral hygiene among primary school pupils Bama LGA, Borno State

Table 4

Summary of Paired t-test Analysis on effect of 6-week Health Education Intervention on Oral Hygiene among Primary School Pupils in Bama LGA, Borno State

Variables	Mean	D	N	SD	SE	t-test	df	P-Value
Pre-test	8.47		30	±1.570	.287			
		-5.733				-9.733	29	.000
Post-test	14.20		30	±2.917	.533			

Effects of 8-Week Health Education Intervention on Handwashing and Oral Hygiene Practices ... Babagana, M., Et. al. (2026)

Key: D =mean difference between pre-test and post-test on oral hygiene. *Sig. ($P<0.05$)

The paired t-test summary in Table 4 showed mean difference -5.733 on oral hygiene between pre-test and post-test values, before 8-week of health education intervention on oral hygiene ($M=8.47$, $SD=\pm 1.570$) and after 8-week of health education intervention on oral hygiene ($M=14.20$, $SD=\pm 2.917$) at 0.05 level of significance, $t=-9.733$, $df=29$, $p<0.05$. This showed that, there is statistically significant difference between pre-test and post-test mean score after 8-week of health education intervention on oral hygiene practice among primary school pupils in Bama LGA, Borno State. Therefore, the null hypothesis is hereby rejected and it is concluded that, 8-week of health education intervention was effect in promoting proper oral hygiene practice and encouraging adherence to recommended daily practice of oral hygiene.

Findings of the Study

1. There was statistically significant difference between pre-test and post-test mean score after 8-week of health education intervention on handwashing hygiene among primary school pupils in Bama LGA, Borno State. Thereby this finding indicate that, 8-week of health education intervention on hand hygiene was effective as substantial improvement demonstrated by pupils both in knowledge, practice and behavioural changes in related to hand hygiene.
2. There was statistically significant difference between pre-test and post-test mean score after 8-week of health education intervention on oral hygiene practice among primary school pupils in Bama LGA, Borno State. Thereby this showed that, 8-week of health education intervention on oral hygiene was effective in promoting proper oral hygiene practice and encouraging adherence to recommended daily practice of oral hygiene.

Discussion of Findings

The aim of this study was to investigate the effect of 8-week health education intervention on handwashing and oral hygiene practice among primary school pupils in Bama, L G A, Borno State. The result of this study showed that, there was statistically significant difference between pre-test and post-test mean score after 8-week of health education intervention on handwashing hygiene among primary school pupils in Bama LGA, Borno State. Thereby the finding indicated that, 8-week of health education intervention on handwashing hygiene was effective as substantial improvement demonstrated by pupils both in knowledge, practice and behavioural changes in related to hand hygiene. This finding is supported by several studies. Kothari, (2023) studies on effect of health education classes on menstruation hygiene among female students in secondary school, his finding reflecting a uniform adoption of proper body and hand hygiene behaviour. Health education intervention programme has been widely recognized as a key strategy for improving hand hygiene and behavioural changes. According to Khan, Ashraf and Iftikhar, (2020), structured educational interventions that include practical demonstrations and active engagement significantly improve handwashing behaviour among school-aged children. Similarly, Gebreyessus and Adem, (2018) found that educational programs tailored to the specific needs of participants led to substantial increases in hand hygiene compliance among students and in general. The finding of the study on oral hygiene also showed that, there was statistically significant difference between pre-test and post-test mean score after 8-week of health education intervention on oral hygiene practice among primary school pupils in Bama LGA, Borno State. Thereby this showed that, 8-week of health education intervention on oral hygiene was effective in promoting proper oral hygiene practice and encouraging adherence to recommended daily practice of oral hygiene. This was in contrast to the study conducted by Kumar and Akoijam (2025) stated that, where a decrease in OHI-S in both groups at all-time intervals was seen at the end of 12 months. This difference in our study may be because the CI-S was not statistically significant in both the groups as oral prophylaxis was not done at the start of the study and the act of tooth brushing was not supervised. The role of other factors such as technique of tooth brushing, reduced motor, skills, and reduced concern about their appearance can also be considered. Furthermore, obtaining help from guardians was not considered, which might have an impact on oral hygiene status of both groups.

Recommendation

Based on the findings of the study, the following recommendations were made:

1. Hygiene education sessions should be integrated into routine primary school curriculum to reinforce knowledge, awareness and practice of personal hygiene.
2. Bama local education authority should collaborate with non-governmental organizations to provide additional support in the form of hygiene kits, training materials, and follow-up programmes. Continuous monitoring and research will help assess long-term impacts and identify areas needing improvement.

References

- Effects of 8-Week Health Education Intervention on Handwashing and Oral Hygiene Practices ... Babagana, M., Et. al. (2026)*
- Gebreeyessus, G. D. & Adem, D. B (2018). "Knowledge, Attitude, and Practice on Hygiene and Morbidity Status among Tertiary Students: The Case of Kotebe Metropolitan University. *International Journal of Food Science* 7(9) 12.
- Glick, M., Williams, D. M., Kleinman, D. V., Vujicic, M., Watt, R. G., & Weyant, R. J. (2016). A New Definition for Oral Health Developed by the FDI World Dental Federation Opens the Door to a Universal Definition of Oral Health. *Journal of Public Health Dentistry*, 76(1), 13.
- Hooleya, M., Skouterisa, H., Boganina, C., Saturb, J., & Kilpatrickc, N. (2018). Parental influence and the development of dental caries in children aged 0–6 years: a systematic review of the literature. *Journal of Dentistry*; 40(10): 787–872.
- Kay, E. J., Vascott, D., Hocking, A., Nield, H., Dorr, C., & Barrett, H. (2020). A Review of Approaches for Dental Practice Teams for Promoting Oral Health. *Journal of Community Dentistry and Oral Epidemiology*, 44(4), 313-330.
- Khan, S., Ashraf, H., & Iftikhar, S. (2020). Impact of hand hygiene intervention on hand washing ability of school-aged children. *PMC*. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8138401/>
- Khatoon, R., Sachan, B., Khan, M. A., & Srivastava, J. P. (2019). Impact of school health education program on personal hygiene among school children of Lucknow district. *Journal of Family Medicine and Primary Care*. 2019 Jan-Mar;6(1):97-100. DOI: 10.4103/2249-4863.214973.
- Kothari, A., (2023). Impact of health education on knowledge, attitude, and practices regarding hand hygiene among school children aged 10-12 years in Pune: An interventional study. *Journal of Marine Medical Society*, 25(Suppl 1), S36
- Kumar, K.S., Akoijam, B.S (2025). Knowledge of personal hygiene and water borne diseases and practice of personal hygiene among students of central Agriculture University, Manipur, India. *Int J Community Med Public Health*. 2(4): 592-595. Doi: 10. 18203/ 2394- 6040.ijcmph 2015 1053
- Luby A. F. (2021): Emphasize the need to tailor interventions to the specific cultural beliefs, practices, and perceptions of the target population to ensure their effectiveness and sustainability. This underscores the importance of understanding the cultural determinants of behavior and crafting interventions that respect and integrate local values.
- Luby, S. P., Agboatwalla, A. K., (2018). Promoting Handwashing Behavior: The Effects of Large-scale Community and School-level Interventions. *Journal of Health Education Research*, 26(4), 622-634.
- Sgan-Cohen, H. D., Evans, R. W., Whelton, H., & Villena, R. S. (2020). WHO Global Policy for Improvement of Oral Health: The Approach of the World Health Organization. *Oral Health & Preventive Dentistry*, 8(1), 1-6.
- World Health Organization (WHO). (2020). Water, Sanitation, Hygiene, and Health: A Primer for Health Professionals. Geneva, Switzerland.



Perceptions of Using Mother-Tongue on Mathematics Teaching among Primary School Teachers in Ilorin, Kwara State, Nigeria

LUWOYE, Akindeyi¹

drluwoye@hotmail.com

<https://orcid.org/0009-0003-3203-8003>

+2348167564774

SALMAN, Medinat Folorunso²

+2348026788932

ABDULGANIYU, Abdulmujeeb Ololade¹

+2347064451964

¹Department of Science Education, University of Ilorin, Ilorin, Kwara State, Nigeria

²Kwara State University of Education, Ilorin, Nigeria, Kwara State, Nigeria

Abstract

Language serves as the vehicle through which mathematical ideas, symbols, and operations are communicated. This study investigated the prospects and problems of the use of mother-tongue in teaching mathematics as perceived by primary school teachers in Ilorin, Nigeria. Three research questions were raised according to the purpose of the study. This research was descriptive of the survey type. The population for the study was all primary school teachers in Ilorin city. Simple random sampling technique was used to select 59 mathematics teachers across the primary schools in Ilorin. The research instrument used for data collection in this study was a questionnaire (PPUMIQ). The PPUMIQ was given to three experienced lecturers for face and content validity. The reliability of the instrument was ascertained using Cronbach Alpha statistical analysis and reliability value of 0.79 was obtained. Descriptive statistics of mean and standard deviations were used to answer the research questions raised for the study. Findings showed that use of mother-tongue for teaching primary school mathematics enhanced pupils' active participation, eagerness to learn, easy grasp of the idea, encourages smooth interactions with their teachers, students' value for their language and improved academic performance. In addition, problems associated with the use of mother-tongue for mathematics instruction were; unavailability of materials and resources, discouragement from educated parents, lack training for teachers and inadequate technology. It was therefore recommended that Teacher Professional development training programmes should be organized for teachers, encourage collaborative research with parents and community members, and develop inclusive curriculum for pupils in Ilorin.

Keywords: Mother-tongue, Mathematics Teaching, Primary School Teachers

Introduction

Mathematics is universally recognized as one of the most important school subjects because of its indispensable role in scientific advancement, technological innovation, economic development, and everyday problem-solving. It serves as the foundation upon which many disciplines such as engineering, medicine, architecture, economics, and information technology are built. In most educational systems across the world, including Nigeria, Mathematics is regarded as a compulsory subject and a prerequisite for admission into several tertiary institution programmes. Beyond its academic importance, Mathematics is often described as a universal language because of its symbolic and logical nature, which transcends geographical and linguistic boundaries. According to Sunday et al. (2021), Mathematics functions as a universal means of communication that enables individuals to interpret quantitative relationships and solve real-life problems regardless of cultural or linguistic background. The effective teaching and learning of Mathematics at the primary school level is particularly significant because primary education constitutes the foundation upon which subsequent learning experiences are built. At this formative stage, pupils are introduced to basic numeracy skills, logical reasoning, critical thinking, and problem-solving abilities that shape their future academic development. Consequently, the language through which mathematical concepts are communicated becomes highly important. Language plays a central role in the teaching and learning process because learners can only understand mathematical ideas when instruction is delivered in a language that is meaningful and comprehensible to them. Anne (2019) observed that successful learning of Mathematics requires a strong vocabulary base, comprehension skills, fluency in symbols and diagrams, and the ability to communicate mathematical ideas effectively. In multilingual societies such as Nigeria, the issue of language of instruction has remained a major concern in educational discourse. Nigeria is characterized by linguistic diversity with hundreds of indigenous languages spoken across different ethnic groups. Despite this diversity, English language remains the official language and the dominant medium of instruction in schools. However, the use of English language in teaching young learners, especially



Perceptions of Using Mother-Tongue on Mathematics Teaching among ... Luwoye, A., Et. al. (2026)

at the primary school level, has generated debates among scholars and educationists. Many researchers argue that pupils often struggle to understand mathematical concepts when instruction is delivered in a foreign language that they are not fully proficient in. Okudo (2013) noted that English language, being a colonial legacy, poses communication barriers to many Nigerian learners, thereby affecting their understanding of classroom instruction, particularly in Mathematics. The concept of mother tongue refers to the first language acquired naturally by a child from birth. It is the language predominantly spoken in the child's home and immediate environment and often serves as the child's primary means of communication and cognitive development. Richard (2019) described mother tongue as an individual's native language learned during early childhood and used naturally for communication and expression. The mother tongue occupies a central position in the intellectual, emotional, and social development of learners because it shapes their thought processes, cultural identity, and interaction with their environment. Educational psychologists and linguists have emphasized that children learn more effectively when instruction is delivered in a familiar language. The use of mother tongue in education promotes meaningful learning, active classroom participation, confidence, creativity, and better comprehension of abstract concepts. The National Policy on Education in Nigeria advocates the use of the child's immediate environment language or mother tongue as the medium of instruction at the lower primary school level. This policy is based on the understanding that children grasp concepts more effectively when taught in a language they understand well. Ojetunde (2012) asserted that mother tongue instruction during the formative years enables children to explore their environment naturally, develop reasoning abilities, communicate freely, and build self-confidence. Similarly, Kioko (2015) emphasized that learners benefit significantly from the use of home language during early grade instruction because it facilitates comprehension and cognitive development. In Mathematics education specifically, language serves as the vehicle through which mathematical ideas, symbols, and operations are communicated. Abubakar et al. (2015) argued that learners understand and express mathematical concepts more effectively through a familiar language, thereby making mother tongue an important instructional tool in Mathematics classrooms.

Despite the numerous advantages associated with the use of mother tongue in education, several challenges hinder its effective implementation in Nigerian schools. One major challenge is the lack of adequate instructional materials written in indigenous languages. Effective teaching requires the availability of textbooks, charts, and other learning resources in the language of instruction. However, many Nigerian languages lack sufficient educational materials for teaching Mathematics. Obioma (2011) also identified poor awareness and inadequate teacher preparedness as significant barriers to the implementation of mother tongue instruction. In addition, linguistically heterogeneous classrooms present another major challenge. Aguiyi (2012) observed that many classrooms in urban areas consist of pupils from different ethnic and linguistic backgrounds, making it difficult for teachers to adopt a single indigenous language as the medium of instruction. Another issue relates to teachers' perceptions and attitudes toward the use of mother tongue in teaching Mathematics. Teachers occupy a central position in curriculum implementation and classroom instruction; therefore, their perceptions significantly influence instructional practices and educational outcomes. Teachers' perceptions encompass their beliefs, attitudes, judgments, and interpretations regarding teaching methods, instructional policies, and classroom experiences. Studies by Eugene and David (2017), Mohammed, Faruk, Mustapha, and Muktar (2015), and Edu and Edu (2013) highlighted the critical role teachers' perceptions play in instructional decision-making and classroom effectiveness. Where teachers perceive mother tongue instruction positively, they are more likely to implement it effectively. Conversely, negative perceptions may hinder its adoption and effectiveness. The prospects associated with the use of mother tongue in teaching Mathematics are numerous. Mother tongue instruction has the potential to improve pupils' comprehension, classroom interaction, participation, retention, and academic performance. It also promotes inclusiveness and reduces the anxiety often associated with learning Mathematics through a foreign language. Furthermore, pupils taught in their native language are more likely to develop positive attitudes toward Mathematics and exhibit greater confidence in solving mathematical problems. However, the extent to which these prospects can be realized depends largely on factors such as teachers' competence, availability of instructional resources, government support, and societal attitudes toward indigenous languages. Several empirical studies have examined the influence of mother tongue on Mathematics instruction at different educational levels. Aliñab et al. (2018) investigated the impact of mother tongue as the medium of instruction in teaching Mathematics among primary school pupils in the Philippines. Using a descriptive research design involving Mathematics achievement tests, interviews, and document analysis, the study found that pupils performed better in Mathematics when



Perceptions of Using Mother-Tongue on Mathematics Teaching among ... Luwoye, A., Et. al. (2026)

taught in their first language. Similarly, Abubakari (2015) examined the effect of Hausa language on junior secondary school students' performance in Mathematics in Katsina State, Nigeria. The study revealed a significant improvement in students' academic performance after instruction was delivered in Hausa language. The persistent poor academic performance of pupils in Mathematics has remained a major concern to educators, parents, curriculum planners, and government agencies in Nigeria. Mathematics occupies a central position in the educational system because it serves as the foundation for scientific, technological, and economic advancement. Despite its importance, pupils at the primary school level continue to demonstrate low achievement and poor understanding of mathematical concepts. Reports from the West African Examinations Council (WAEC) Chief Examiners' Report (2022) revealed consistent poor performance of students in Mathematics, indicating serious deficiencies in learners' comprehension, problem-solving ability, and application of mathematical concepts. Although these reports are mostly based on secondary school examinations, the roots of such poor performance can often be traced to weak mathematical foundations developed during the primary school years. Several factors have been identified as contributing to pupils' poor performance in Mathematics. These include poor mastery of the language of instruction, low interest in the subject, inability to retain learned concepts, ineffective teaching methods, and inadequate learning support at the foundational level. Among these factors, the issue of language of instruction appears to be particularly critical because language serves as the medium through which mathematical ideas, concepts, and procedures are communicated in the classroom. Abubakar et al. (2015) observed that many pupils experience difficulty understanding mathematical concepts due to inadequate comprehension of the language used for instruction. Similarly, Kioko (2015) noted that the use of unfamiliar languages in classroom instruction negatively affects learners' understanding and academic achievement, particularly at the early stages of education.

In Nigeria, English language remains the dominant medium of instruction despite the multilingual nature of the country and the existence of numerous indigenous languages spoken by learners. Although the National Policy on Education recommends the use of mother tongue or the language of the immediate environment at the lower primary level, the implementation of this policy has remained inadequate in many schools. The researcher observed that the use of mother tongue in teaching Mathematics is not adequately encouraged in most Nigerian primary schools, especially in urban centres such as Ilorin where classrooms are often linguistically diverse. Consequently, many pupils are compelled to learn abstract mathematical concepts through a language they do not fully understand, thereby limiting effective comprehension and participation in classroom activities. Furthermore, indigenous Nigerian languages have gradually been marginalized within the formal educational system due to the dominance of English language inherited from colonial administration. As a result, many pupils struggle with the interpretation of mathematical vocabulary, symbols, and word problems, leading to misconceptions, poor retention, and negative attitudes toward Mathematics. Research evidence has shown that pupils at the primary school level often encounter difficulties in translating mathematical problems into meaningful understanding because of language barriers. This situation has continued to hinder the achievement of educational goals in Mathematics instruction. Despite the recognized importance of mother tongue instruction in enhancing comprehension and learning outcomes, its implementation faces several challenges such as inadequate instructional materials, lack of teacher preparedness, limited policy enforcement, and mixed-language classrooms. At the same time, the use of mother tongue presents significant prospects for improving pupils' understanding, participation, confidence, and achievement in Mathematics. However, the extent to which these problems and prospects are perceived by primary school teachers, who are the major implementers of instructional policies, remains unclear in the context of Ilorin, Nigeria. Although previous studies have established the effectiveness of mother tongue instruction in improving learners' achievement in Mathematics, many of these studies focused primarily on students' academic performance with limited attention to teachers' perceptions regarding the problems and prospects associated with its implementation. In addition, most previous studies were conducted outside Ilorin or in different educational contexts. Therefore, there is a need to investigate the problems and prospects of using mother tongue for teaching Mathematics as perceived by primary school teachers in Ilorin, Nigeria. This study is therefore designed in order to provide empirical evidence on teachers' perceptions regarding the effectiveness, challenges, and possibilities associated with the use of mother tongue in Mathematics instruction at the primary school level.



Perceptions of Using Mother-Tongue on Mathematics Teaching among ... Luwoye, A., Et. al. (2026)

Objectives of the Study

The main purpose of this study was to find out the prospects and problems associated with the use of mother-tongue in teaching mathematics as perceived by primary school teachers in Ilorin, Nigeria. Specifically, the study;

1. Investigated the prospects of using mother-tongue in teaching primary school mathematics as perceived by teachers in Ilorin.
2. Examined the problems facing the use of mother-tongue in teaching primary school mathematics as perceived by teachers in Ilorin.
3. Find out the areas of improvement (way forward) on the use of mother tongue in teaching primary school Mathematics in Ilorin.

Research Questions

1. What are the primary school teachers' perceptions on the prospects of using mother-tongue in teaching Mathematics in primary schools in ilorin?
2. What are the primary school teachers' perceptions of the problems facing the use of mother-tongue in teaching primary school Mathematics in Ilorin, Nigeria?
3. What are the areas of improvement (way forward) on the use of mother tongue in teaching primary school Mathematics in Ilorin?

Methodology

This study was descriptive of the survey type. Descriptive research involves systematic attempt to describe the characteristics or perception of a given population, area of interest factually to ensure meaningful description of a situation. The adoption of this research type was because the study described the perceptions of a given population. The population of the study comprised all primary school teachers in Ilorin, Kwara State, Nigeria. The target population consists of all Mathematics teachers in basic 3-6 in primary schools in Ilorin, Kwara State. Simple random sampling technique was used to select 59 mathematics teachers across the primary schools in Ilorin, Kwara State. The research instrument used for data collection in this study was a researcher developed questionnaire entitled: Prospects and Problems of Using Mother-Tongue in Instruction Questionnaire (PPUMIQ). The PPUMIQ was used to find out the prospect and problems of using mother-tongue in teaching primary school mathematics as perceived by teachers in Ilorin, Kwara State, Nigeria. The responses are rated on a four-point likert scale; strongly agree = 4, agree = 3, disagree = 2, strongly disagree = 1. The PPUMIQ was given to three experienced lecturers, one from the field of mathematics education and two from test and measurement, from Faculty of Education, University of Ilorin and two primary school mathematics teachers for face and content validity. These experts look at the contents, scope of coverage, ambiguity and vagueness of expression. They also checked among other things, the suitability and language clarity of the items measuring the specific tasks that was designed to measure. All the validators thoroughly scrutinized each item in relation to the objectives of the study. In other to ascertain the reliability of the instrument, the questionnaire was administered to ten primary school teachers outside Ilorin and the gathered data was statistically analysed using Cronbach Alpha which indicated a reliability score of 0.79. The PPUMIQ was administered to the 59 teachers according to the points assigned to each item respectively (that is 4, 3, 2 and 1). The researchers personally retrieved the entire questionnaire from the teacher respondents. The three research questions raised by the study were answered by descriptive statistics of mean and standard deviations.

Presentation of Results

Research Question 1: What are the prospects of using mother-tongue in teaching primary school Mathematics as perceived by teachers?

Table 1:

Mean Ratings on Prospects of Using Mother Tongue in Teaching Mathematics

Statements on Prospects of Using Mother Tongue	M	SD	Decision
1. Pupils easily understand mathematical concepts when mother-tongue is use for teaching.	3.17	0.79	Agreed
2. Use of Mother-tongue for teaching improves the overall performance of pupils in mathematics.	2.85	0.63	Agreed



Perceptions of Using Mother-Tongue on Mathematics Teaching among ... Luwoye, A., Et. al. (2026)

3. Pupils' engagement and interest in mathematics increase when mother-tongue is used for instruction.	3.24	0.81	Agreed
4. Pupils appreciate their native language and culture when Mother-tongue is used for teaching mathematics	3.06	0.82	Agreed
5. Mother-tongue allows effective communication of instruction based on individual pupils' needs.	2.95	0.71	Agreed
6. Use of mother-tongue helps bridge the gap between abstract mathematical concepts and real-life applications	2.81	0.69	Agreed
7. Pupils showed increased enthusiasm for exploring advanced topics in mathematics when learned in their mother tongues.	3.23	0.75	Agreed
8. The use of the mother tongue in teaching mathematics helps pupils to have a strong foundation in their mother tongue.	2.81	0.67	Agreed
Grand mean	3.01	0.73	Agreed

The results presented in Table 1 show the mean ratings and standard deviation scores of primary school teachers on the prospects of using mother tongue in teaching Mathematics. The findings revealed that all the items recorded mean scores above the benchmark value, indicating that the respondents generally agreed that the use of mother tongue has positive prospects for teaching Mathematics at the primary school level. Specifically, the respondents agreed that pupils easily understand mathematical concepts when mother tongue is used for teaching ($M = 3.17$, $SD = 0.79$). This suggests that the use of a familiar language enhances pupils' comprehension and understanding of mathematical ideas. The teachers also agreed that pupils' engagement and interest in Mathematics increase when mother tongue is used for instruction ($M = 3.24$, $SD = 0.81$), indicating that pupils participate more actively and develop positive attitudes toward the subject when taught in a language they understand well. Furthermore, the respondents agreed that the use of mother tongue improves pupils' overall performance in Mathematics ($M = 2.85$, $SD = 0.63$), allows effective communication based on pupils' individual needs ($M = 2.95$, $SD = 0.71$), and helps bridge the gap between abstract mathematical concepts and real-life applications ($M = 2.81$, $SD = 0.69$). These findings imply that mother tongue instruction promotes meaningful learning and facilitates better interaction between teachers and pupils in the classroom. The teachers also agreed that pupils appreciate their native language and culture when mother tongue is used for teaching Mathematics ($M = 3.06$, $SD = 0.82$), suggesting that the use of indigenous languages in instruction contributes to cultural preservation and identity development among learners. Similarly, respondents agreed that pupils show increased enthusiasm for exploring advanced mathematical topics when lessons are delivered in their mother tongue ($M = 3.23$, $SD = 0.75$). This indicates that mother tongue instruction can boost learners' confidence and motivation in Mathematics learning and also strengthens pupils' language development and literacy skills. The overall mean score of 3.01 with a standard deviation of 0.73 indicates that teachers generally perceived the use of mother tongue in teaching primary school Mathematics as highly beneficial. The relatively low standard deviation further suggests consistency in the opinions of the respondents. Therefore, the findings imply that primary school teachers in Ilorin, Nigeria perceive the use of mother tongue as a valuable instructional approach capable of enhancing pupils' comprehension, participation, academic performance, and cultural appreciation in Mathematics learning.

Research Question 2: What are the problems facing the use of mother-tongue in teaching Mathematics as perceived by primary school teachers in Ilorin.

Table 2:

Mean Ratings on Problems encountered when Using Mother-Tongue in Teaching Mathematics

Problems Encountered when Using Mother-Tongue	M	SD	Rank
1. Inadequate standardized terminology in the mother tongue for mathematical concepts.	2.94	0.80	Agreed



Perceptions of Using Mother-Tongue on Mathematics Teaching among ... Luwoye, A., Et. al. (2026)

2. Difficulty in finding appropriate teaching resources and materials in the mother tongue.	3.31	0.81	Agreed
3. Potential disconnects between mother tongue instruction and standardized assessments.	2.91	0.94	Agreed
4. Lack of training or professional development opportunities for effectively using the mother tongue in mathematics instruction	3.06	0.82	Agreed
5. Resistance from parents or stakeholders who perceived mother-tongue instruction as hindering English language proficiency	3.17	0.79	Agreed
6. Limited availability of educational technology and digital resources that support mother-tongue instruction	3.25	0.90	Agreed
7. I am balancing the use of my mother tongue with the need to teach mathematics skills simultaneously.	2.41	0.66	Disagreed
8. Difficulty in creating assessments and tests that effectively evaluate students' understanding when taught in the mother tongue.	2.91	0.78	Agreed
Grand mean	3.00	0.81	Agreed

The results presented in Table 2 show the mean ratings and standard deviation scores of primary school teachers on the problems associated with the use of mother tongue in teaching Mathematics. The findings revealed that the respondents agreed that several challenges hinder the effective use of mother tongue in Mathematics instruction at the primary school level. Specifically, the respondents agreed that difficulty in finding appropriate teaching resources and instructional materials in the mother tongue constitutes a major problem ($M = 3.31$, $SD = 0.81$). This suggests that the lack of textbooks, charts, and other learning materials written in indigenous languages poses a serious challenge to teachers during classroom instruction. The respondents also agreed that the limited availability of educational technology and digital resources that support mother-tongue instruction is another significant problem ($M = 3.25$, $SD = 0.90$). This implies that the absence of technological support limits the effective implementation of mother tongue instruction in Mathematics classrooms.

Furthermore, the teachers agreed that resistance from parents and stakeholders who perceive mother-tongue instruction as a barrier to English language proficiency is a major challenge ($M = 3.17$, $SD = 0.79$). This finding indicates that societal preference for English language education negatively affects the acceptance and implementation of indigenous language instruction in schools. Similarly, respondents agreed that lack of training and professional development opportunities for teachers on how to effectively use mother tongue in Mathematics instruction is a significant problem ($M = 3.06$, $SD = 0.82$). This suggests that many teachers may not possess adequate pedagogical skills and strategies for teaching Mathematics using indigenous languages. The respondents also agreed that inadequate standardized terminology in the mother tongue for mathematical concepts poses a challenge ($M = 2.94$, $SD = 0.80$). This indicates that some indigenous languages may lack appropriate equivalents for certain mathematical terms and symbols, thereby making effective communication of mathematical ideas difficult. In addition, respondents agreed that there are potential disconnects between mother-tongue instruction and standardized assessments ($M = 2.91$, $SD = 0.94$), as well as difficulties in creating assessment tools that effectively evaluate pupils' understanding when taught in the mother tongue ($M = 2.91$, $SD = 0.78$). These findings suggest that assessment practices may not adequately align with indigenous language instruction. The grand mean score of 3.00 with a standard deviation of 0.81 indicates that teachers generally agreed that there are considerable problems facing the use of mother tongue in teaching Mathematics in primary schools in Ilorin, Nigeria. The relatively low standard deviation further suggests consistency in the respondents' opinions. Therefore, the findings imply that although mother tongue instruction has notable educational benefits, its effective implementation is constrained by inadequate



Perceptions of Using Mother-Tongue on Mathematics Teaching among ... Luwoye, A., Et. al. (2026)

instructional resources, lack of teacher training, societal resistance, insufficient technological support, and challenges related to assessment and mathematical terminology.

Research Question 3: What are the areas of improvement (way forward) on the use of mother tongue in teaching primary school Mathematics in Ilorin?

Table 3:

Mean Ratings on Way Forward on the use of Mother-Tongue in Teaching Mathematics

Statements on Way Forward on the use of Mother-Tongue	M	SD	Decision
1. Provision of specialized professional development for teachers on use of mother-tongue in teaching.	3.36	0.88	Agreed
2. Developing a curriculum that seamlessly integrates the mother-tongue with English instruction in mathematics.	3.06	0.82	Agreed
3. Regular assessments in the mother tongue could be a practical way to measure students' mathematical understanding and language proficiency simultaneously.	2.56	0.73	Agreed
4. Establishing a support network among teachers, parents, and community members to promote the use of the mother tongue for teaching	3.10	0.95	Agreed
5. Encouraging the development of locally sourced teaching materials in the mother tongue would contribute to a more culturally inclusive mathematics classroom.	3.17	0.83	Agreed
6. Research and collaboration among educators on effective mother tongue integration is crucial for advancing this approach in teaching primary school pupils.	3.30	0.81	Agreed
7. Diverse linguistic and cultural backgrounds of pupils in Ilorin should be considered when making decisions about incorporating the mother tongue in teaching mathematics.	2.74	0.78	Agreed
8. Creating an inclusive learning environment that respects and values the cultural heritage of students using their mother tongue in mathematics instruction.	2.64	0.65	Agreed
9. Understanding local cultural norms and traditions can help tailor mathematics lessons that resonate with pupils.	2.64	0.61	Agreed
Overall mean and Standard Deviation	2.95	0.78	Agreed

The results presented in Table 3 show the mean ratings and standard deviation scores of primary school teachers on the possible ways of improving the use of mother tongue in teaching Mathematics. The findings revealed that all the items recorded mean scores above the criterion mean, indicating that the respondents agreed with the suggested measures for improving the implementation of mother-tongue instruction in primary school Mathematics classrooms. Specifically, the respondents strongly agreed that the provision of specialized professional development and training for teachers on the use of mother tongue in teaching is an important way forward ($M = 3.36$, $SD = 0.88$). This suggests that equipping teachers with appropriate instructional strategies and pedagogical skills would enhance the effective use of indigenous languages in Mathematics instruction. Similarly, the respondents agreed that research and collaboration among educators on effective mother tongue integration are crucial for advancing this instructional approach ($M = 3.30$, $SD = 0.81$). This implies that continuous research and professional collaboration would help improve instructional practices and provide practical solutions to challenges associated with mother-tongue instruction. The teachers also agreed that encouraging the development of locally sourced teaching materials in the mother tongue would contribute to a more culturally inclusive Mathematics classroom ($M = 3.17$, $SD = 0.83$). This finding indicates that the availability of instructional materials written in indigenous languages could enhance pupils' understanding and classroom participation. Furthermore, respondents agreed that establishing a support network among teachers, parents, and community members would promote the use of



Perceptions of Using Mother-Tongue on Mathematics Teaching among ... Luwoye, A., Et. al. (2026)

mother tongue for teaching Mathematics ($M = 3.10$, $SD = 0.95$). This suggests that community involvement and stakeholder support are essential for the successful implementation of mother-tongue instruction. The findings also revealed that respondents agreed that the diverse linguistic and cultural backgrounds of pupils in Ilorin should be considered when making decisions about incorporating mother tongue into Mathematics instruction ($M = 2.74$, $SD = 0.78$). This suggests that educational policies and classroom practices should accommodate the multilingual nature of the learning environment. Similarly, the respondents agreed that creating an inclusive learning environment that respects and values pupils' cultural heritage through the use of mother tongue is important ($M = 2.64$, $SD = 0.65$). Teachers also agreed that understanding local cultural norms and traditions can help in designing Mathematics lessons that are meaningful and relatable to pupils ($M = 2.64$, $SD = 0.61$). The overall mean score of 2.95 with a standard deviation of 0.78 indicates that teachers generally agreed on the various strategies that could improve the use of mother tongue in teaching primary school Mathematics in Ilorin, Nigeria. The relatively low standard deviation further suggests consistency in the respondents' opinions. Therefore, the findings imply that improving mother-tongue instruction in Mathematics requires adequate teacher training, curriculum development, provision of instructional materials, stakeholder collaboration, cultural inclusiveness, and continuous research efforts to enhance effective implementation in primary schools.

Discussion of Findings

The findings of this study revealed that primary school teachers in Ilorin, Nigeria generally perceived the use of mother tongue in teaching Mathematics as highly beneficial. The overall mean score of 3.01 indicates that teachers strongly believe that mother-tongue instruction enhances pupils' comprehension, participation, academic performance, and cultural appreciation in Mathematics learning. This finding implies that teachers recognize the important role of indigenous languages in facilitating effective teaching and learning of Mathematics at the primary school level. The finding agrees with the study of Aliñab et al. (2018), who reported that pupils performed significantly better in Mathematics when taught using their first language. Their study showed that mother-tongue instruction improved learners' understanding and participation because pupils could easily relate mathematical concepts to familiar linguistic expressions. Similarly, the finding supports Abubakari (2015), who found that students taught Mathematics in Hausa language demonstrated better academic performance than those taught using English language. The author concluded that indigenous language instruction promotes meaningful learning and better retention of mathematical concepts.

The result is also consistent with Kioko (2015), who emphasized that children learn more effectively in their home language, especially during the formative years of education. According to the author, mother-tongue instruction promotes classroom interaction, cognitive development, and learners' confidence. Likewise, Ojetunde (2012) maintained that the use of mother tongue in early education enhances learners' reasoning ability, communication skills, and self-confidence, all of which contribute positively to academic achievement. The finding further aligns with UNESCO (2016), which advocated the use of indigenous languages in primary education on the grounds that children understand concepts better when taught in a familiar language. However, the finding disagrees with the position of Bamgbose (2014), who argued that excessive dependence on mother tongue instruction may hinder pupils' proficiency in English language, which remains the official language of instruction and assessment in Nigeria. Similarly, Adegbija (2011) expressed concerns that the use of indigenous languages in multilingual societies may create communication barriers and instructional difficulties in linguistically mixed classrooms. Okebukola (2015) also observed that some parents and teachers prefer English language because of its perceived economic and social advantages, thereby showing resistance toward the implementation of mother-tongue instruction in schools. Another finding of this study revealed that teachers generally agreed that there are considerable problems facing the use of mother tongue in teaching Mathematics in primary schools in Ilorin, Nigeria, as indicated by the grand mean score of 3.00. The finding suggests that despite the educational benefits associated with mother-tongue instruction, its effective implementation is hindered by several challenges such as inadequate instructional materials, lack of teacher training, societal resistance, insufficient technological support, and difficulties associated with assessment and mathematical terminology. This finding agrees with Obioma (2011), who identified inadequate instructional resources and poor implementation strategies as major obstacles to the use of mother tongue in Nigerian schools. Similarly, Aguiyi (2012) reported that linguistically heterogeneous classrooms make it difficult for teachers to effectively implement indigenous language instruction, especially in urban areas where pupils come from diverse ethnic backgrounds. The finding also corroborates the work of Benson (2017), who observed that many indigenous languages



Perceptions of Using Mother-Tongue on Mathematics Teaching among ... Luwoye, A., Et. al. (2026)

lack standardized terminologies for scientific and mathematical concepts, thereby posing difficulties for effective classroom communication. The finding is further supported by Mohammed et al. (2015), who noted that many teachers lack adequate professional training on how to effectively integrate mother tongue into classroom instruction. In the same vein, UNESCO (2016) highlighted that inadequate government support, poor policy implementation, and insufficient technological resources continue to hinder effective mother-tongue education in many developing countries. In contrast, the finding disagrees with the submission of Cummins (2000), who argued that the major challenge facing mother-tongue instruction is not the language itself but poor educational planning and lack of political commitment. The author maintained that where adequate support structures are provided, mother-tongue instruction can be effectively implemented without significant difficulties. Similarly, Heugh (2011) contended that many of the perceived challenges associated with mother-tongue instruction are often exaggerated due to negative societal attitudes toward indigenous languages rather than actual pedagogical limitations.

In addition, the result of the study revealed that teachers generally agreed on various strategies that could improve the use of mother tongue in teaching primary school Mathematics in Ilorin, Nigeria, as indicated by the overall mean score of 2.95. The teachers agreed that adequate teacher training, curriculum development, provision of instructional materials, stakeholder collaboration, cultural inclusiveness, and continuous research efforts are necessary for improving the implementation of mother-tongue instruction. The finding agrees with Eugene and David (2017), who emphasized that continuous professional development is essential for equipping teachers with the skills needed to effectively implement innovative instructional approaches such as mother-tongue instruction. Similarly, Edu and Edu (2013) noted that curriculum integration and teacher support mechanisms are critical for successful language policy implementation in schools. The finding also supports Benson (2017), who advocated for the development of locally relevant teaching materials and collaborative partnerships among schools, communities, and policymakers to strengthen indigenous language education. The result also aligns with the recommendations of UNESCO (2016), which emphasized the need for culturally inclusive educational practices, community participation, and government investment in indigenous language instructional resources. Likewise, Kioko (2015) stressed that effective implementation of mother-tongue instruction requires supportive educational policies, regular teacher training, and the development of appropriate learning materials in local languages. However, the finding contrasts with the opinion of some scholars who believe that improving English language instruction should take priority over investment in indigenous language education. For instance, Adegbiya (2011) argued that greater emphasis on English language proficiency may better prepare pupils for global competitiveness and higher educational opportunities. Similarly, Bamgbose (2014) questioned the practicality of fully implementing mother-tongue instruction in multilingual societies due to issues of language diversity and limited educational resources. Despite these opposing views, the present study demonstrates that primary school teachers in Ilorin perceive mother-tongue instruction as beneficial and capable of improving Mathematics learning when adequate support systems are provided. The findings therefore suggest that effective implementation of mother-tongue instruction requires collaborative efforts from teachers, policymakers, parents, and educational stakeholders to address existing challenges and maximize its educational benefits

Conclusion

This study investigated the problems and prospects of using mother tongue for teaching Mathematics as perceived by primary school teachers in Ilorin, Nigeria. The findings of the study revealed that teachers generally perceived the use of mother tongue in teaching Mathematics as highly beneficial to pupils' learning outcomes. The study established that mother-tongue instruction enhances pupils' comprehension of mathematical concepts, increases classroom participation and interest, improves academic performance, and promotes appreciation of indigenous language and culture. The findings therefore suggest that the use of mother tongue provides a meaningful and learner-friendly approach to the teaching of Mathematics at the primary school level. Despite these notable prospects, the study also revealed that several challenges hinder the effective implementation of mother-tongue instruction in Mathematics classrooms. These challenges include inadequate instructional materials in indigenous languages, lack of standardized mathematical terminology, insufficient teacher training, limited technological support, societal preference for English language, and difficulties associated with assessment practices. These constraints indicate that although teachers recognize the value of mother-tongue instruction, effective implementation requires adequate institutional, material, and policy support.



Perceptions of Using Mother-Tongue on Mathematics Teaching among ... Luwoye, A., Et. al. (2026)

Furthermore, the study identified several strategies that could improve the use of mother tongue in teaching primary school Mathematics. These include regular professional development for teachers, curriculum integration of indigenous languages and English language, development of locally relevant instructional materials, stakeholder collaboration, cultural inclusiveness, and continuous research on effective implementation practices. The findings suggest that successful implementation of mother-tongue instruction depends largely on collaborative efforts among teachers, parents, policymakers, and educational authorities. The study concluded that the use of mother tongue in teaching primary school Mathematics has significant educational benefits and the potential to improve pupils' understanding and achievement in Mathematics. However, for these benefits to be fully realized, the identified challenges must be adequately addressed through effective educational policies, teacher capacity building, provision of instructional resources, and sustained support from relevant stakeholders.

Recommendations

Based on these findings, the following recommendations are made:

1. Government and educational stakeholders should develop and distribute adequate Mathematics teaching materials such as textbooks, charts, and digital resources written in indigenous languages to support effective classroom instruction at the primary school level.
2. Regular workshops, seminars, and in-service training should be organized for primary school Mathematics teachers to equip them with the necessary pedagogical skills and strategies for effectively integrating mother tongue into Mathematics instruction.
3. The curriculum should be reviewed to encourage a balanced integration of mother tongue and English language in Mathematics teaching, while education policymakers should ensure proper implementation of language-in-education policies and provide support for bilingual instructional practices in primary schools.

References

- Abubakar H., Umar, S, A and Musawa B.I. (2015). The Impact of language in the teaching and learning of Mathematics at junior secondary school in Katsina. *IJRDO-Journal of Mathematics*: 1 (12), 2455-9210
- Abubakar, A., Mohammed, S., & Yusuf, M. (2015). Language of instruction and pupils' achievement in Mathematics in primary schools. *Journal of Educational Research and Development*, 8(2), 45–57.
- Abubakari, H. (2015). The Impact of language in the teaching and learning of Mathematics at junior secondary school in Katsina. *IJRO Journal of Mathematics*, 1(12), 7-17
- Adegbiya, E. (2011). Language planning in Nigeria: The neglected role of indigenous languages. *International Journal of Linguistics*, 3(1), 1–12.
- Aguiyi, A. I. (2012). Challenges of multilingual classrooms and instructional effectiveness in Nigerian primary schools. *African Journal of Teacher Education*, 1(2), 33–41.
- Aguiyi, A. I. (2012). The challenges of Igbo language and programme in revamping education in Nigeria. *Journal of Research in Education*. 1(1), 68-77.
- Aliñab, J., Aguja, S., Prudente, M. (2018). Improving pupils' Mathematics achievement through mother tongue based-multilingual education. *American Scientific Publishers*. 24(7).
- Aliñab, R., Cruz, J., & Santos, M. (2018). Mother tongue-based instruction and pupils' Mathematics achievement in primary schools. *Asian Journal of Education and Learning*, 6(3), 101–112.
- Anne, M.H. (2019). Why Mathematics is a Language. Adapted from
- Bamgbose, A. (2014). *Language and the nation: The language question in sub-Saharan Africa*. Edinburgh University Press.
- Benson, C. (2017). Mother tongue-based education in Africa: Policy, practice and implications. *International Review of Education*, 63(5), 645–666.
- Cummins, J. (2000). *Language, power and pedagogy: Bilingual children in the crossfire*. Multilingual Matters.
- Edu, D. O., & Edu, G. O. (2013). Attitude and experience as influencing variables of teachers' perception of difficult concepts in primary science in Ikom educational zone Cross River state, Nigeria. *International Education Research*, 1(1), 60-68.
- Edu, S. O., & Edu, G. A. (2013). Teachers' perception and instructional effectiveness in Nigerian schools. *Nigerian Journal of Educational Studies*, 10(1), 22–30.
- Etor, C. R., Mbon. U. F. & Ekanem, E. (2013). Primary education as a foundation for qualitative higher education in Nigeria. *Journal of Education and Learning*; 2(2), 15-28
- Eugene, A., & David, B. (2017). Teachers' perception and classroom decision-making in basic education. *Journal of Educational Practice*, 8(14), 90–98.



Perceptions of Using Mother-Tongue on Mathematics Teaching among ... Luwoye, A., Et. al. (2026)

- Eugene, M., & David, N. (2017). Teachers' perceptions on the causes of poor academic performance of grade 12 learners in four selected schools in the Zambezi Region of Namibia. *Journal of Educational Research (IJRDO)*, 2(4), 93-110.
- F.R.N (2013). *National Policy on Education in Nigeria* (6th edition). Lagos, Nigeria Educational Research and Development Council
- Falade, A. A. (2013). *Stakeholders' perception of the integration of information and communication technology into distance learning in Nigeria*. (Unpublished Ph.D. thesis). Department of Educational Technology, University of Ilorin, Nigeria.
- Heugh, K. (2011). Theory and practice: Language education models in Africa. *Language Policy*, 10(3), 263–279.
<https://www.thoughtco.com/why-mathematics-is-a-language>
- Kioko, A. (2015) Why schools should teach young learners in home language. <https://www.britishcouncil.org/voices-magazine/why-schools-should-teach-young-learners-home-language>.
- Kioko, A. (2015). The role of mother tongue in early childhood education in Africa. *Journal of Multilingual Education*, 5(2), 55–68.
- Mohammed, A., Faruk, I., Mustapha, S., & Muktar, H. (2015). Teachers' perception and challenges of instructional practices in Nigerian schools. *African Journal of Education and Practice*, 2(1), 15–27.
- Mohammed, S. A., Faruk, A., Mustapha, I., & Muktar, M. S. (2015). Teachers' perception of on the causes of students' poor mathematics performance in secondary schools of Kebbi state, Nigeria. *Asian Journal of Science and Technology*, 6(2), 1065-1069.
- Obioma, G. (2011). Issues in the implementation of language policy in Nigerian education system. *Journal of Educational Policy and Leadership*, 5(1), 12–20.
- Ojetunde, F. (2012). Mother tongue instruction and cognitive development in early childhood education. *Journal of Early Childhood Studies*, 6(1), 40–52.
- Okebukola, P. (2015). Language of instruction and science education in Nigeria. *Journal of Science Education in Africa*, 3(2), 1–10.
- Okudo, A. R. (2013). National policy on education: Problems and prospects for teaching and learning of Igbo as a second language in Nigerian secondary schools. *Journal of Educational and Social Research*. 3(2), 371-376.
- Okudo, S. (2013). English language and instructional challenges in Nigerian schools. *Journal of Language and Education Development*, 4(1), 23–31.
- Oluwole, D.A. (2008). The Impact of mother tongue on students' achievement in English language in junior secondary certificate examination in Western Nigeria, *Journal of Social Sciences*, 17(1), 41-49
- Omoniyi, M. B. I. (2013). The role of education in poverty alleviation and economic development: A theoretical perspective and counselling implications. *British Journal of Arts and Social Sciences*, 15(2), 176-185.
- Omoogun, T. (2015) Factor responsible for poor academic performance of pupils in public primary school in Ikere local government <https://projectmaterials2015.blogspot.com.ng/2015/08/factor-responsible-for-poor-academic.html>
- Onyeka, E. C., Nwamaradi, A. T., & Chimuanya, O. U. (2023). Effect of mother tongue on primary school pupils' academic achievement and interest in mathematics in Abia state. *Unizik Journal of Educational Research and Policy Studies*. 15 (2)
- Richard, N. (2019). Get the Definition of Mother Tongue Plus a Look at Top Languages.
- Richard, T. (2019). Mother tongue and language acquisition in early childhood. *International Journal of Linguistics and Communication*, 7(4), 112–120.
- Sumbalan, E., Caterial M., Jimeno, R., and Balane C. (2017). The utilization of mother tongue in teaching young learners: Its implications to pre- service teachers. *Journal of Educational and Human Resource Development* (5), 15-22.
- Sunday, A. O., Oduwale, O. S., Olaoye, A.E. (2021). Effect of mother's tongue on secondary school students' achievement in Mathematics in Federal Capital Territory (FCT) Abuja. *Continental Journal of Education Research*. 13(2), 23-34
- Sunday, O., Akinyemi, T., & Bello, R. (2021). Mathematics as a universal language and its educational implications. *Journal of Science and Mathematics Education*, 9(2), 78–88.
- UNESCO. (2016). *If you don't understand, how can you learn? Global education monitoring report*. UNESCO Publishing
- West African Examination Council WAEC, (2022). *Chief Examiner's Report*.
- Williams, Y. (2014). *What is perception in psychology? Definition & theory*. Retrieved from <https://study.com/academy/lesson/what-is-perception-in-psychology-definition-theory-quiz.html>.



Influence of Emotional Intelligence on Academic Achievement among ... Gurjiya, A. U. & Danladi, I. I. (2026)

Influence of Emotional Intelligence on Academic Achievement among Geography Pre-Service Teachers in Colleges of Education, North-West, Nigeria

GURJIYA, Abubakar Uba¹

abubakarnee@gmail.com

+234 (0)8039645642

DANLADI, Idris Isa²

iidanladi.ste@buk.edu.ng

+234 (0)7030607966

¹Geography Department, Sa'adatu Rimi College of Education, Kano State, Nigeria

²Department of Science and Technology Education, Bayero University Kano State, Nigeria

Abstract

This study investigated the predictive influence of emotional intelligence on the academic achievement of Geography pre-service teachers in Colleges of Education in Northwestern Nigeria. The study was motivated by concerns over the low academic achievement of Geography pre-service teachers and the need to identify factors that could enhance their academic achievement. Guided by one research objective, one research question, and one null hypothesis, the study adopted a correlational research design. A sample of 285 Geography pre-service teachers was selected from a population of 1,089 using a multistage sampling technique. Data were collected using the Geography Pre-service Teacher Emotional Intelligence Questionnaire (GPTEI-Q) and the NCE II Geography Academic Proforma (NCE-GAP). The GPTEI-Q demonstrated satisfactory validity and reliability, with a Cronbach's Alpha coefficient of 0.85, a face validity index of 91%, a content validity index of 89%, and construct validity was confirmed through Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) for the questionnaire. While the NCE-GAP was reviewed by five validators, with face validity indices of 100%. Data were analyzed using mean, standard deviation, Pearson correlation, scatterplot, and linear regression. The findings revealed that emotional intelligence had a positive relationship with academic achievement ($r = 0.27$) and significantly predicted academic achievement ($p = 0.001 < 0.05$). The study recommends integrating emotional intelligence training into Geography teacher education programmes to enhance academic achievement and professional development.

Key words: Emotional intelligence, academic achievement and geography pre-service teachers

Introduction

Geography is a uniquely integrative discipline that bridges the natural sciences, social sciences, and technical applications. As Dempsey (2023) explains, physical geography represents science, GIS is a technological application, land surveying belongs to civil engineering, human geography encompasses arts and social sciences, and geodesy is a branch of mathematics. Geography systematically studies humanity, human activities, places, and the physical environment. Pallathadka & Pallathadka (2021) emphasize that geography complements science by examining broader relationships and combining scientific knowledge with social science contributions. The discipline's five themes; location, place, region, movement, and human-environment interaction, operationalize this integration in geography education. The importance of geography education is multifaceted. Olaniyi & Oladokun (2021) affirm its role in security, economic, political, social, environmental, and human capital development. Hagge (2023) adds that geography enables students to understand policy connections, make educated resource decisions, comprehend environmental problems, and appreciate places and natural phenomena. With good academic achievement in Geography, career opportunities are available in defense, foreign-service, urban planning, tourism, environmental management, spatial technology, teaching, geology, conservation, demography, remote sensing, cartography, surveying, and meteorology. Academic achievement, defined by Davis (2019) as demonstrated mastery of content and competencies, is typically measured through grades and test scores. Mahajan & Sarjit Singh (2017) describe it as claims about student abilities following learning. Ghosh (2022) cautions that standard measures cannot fully represent dynamic student learning. Nevertheless, Baber (2020) affirms that academic achievement assesses both teaching and learning. Jang (2018) advocates discipline-based research to study variables affecting academic achievement, including emotional intelligence. Emotional Intelligence (EI) is defined by Gonzalez, Peña & Arboleda (2019) as understanding, managing, and utilizing one's own and others' emotions. Carthy & Jameson (2016) describe it as the capacity to determine and understand emotions to control behavior and relationships. Serrat (2017) notes that high-EI individuals are friendly, strong, and optimistic. Tripathy (2018) concludes that managing emotions is key to performance and life satisfaction, essential for building relationships and attaining goals.

Influence of Emotional Intelligence on Academic Achievement among ... Gurjiya, A. U. & Danladi, I. I. (2026)

The study is constructed around and hosted under the shades of Emotional Intelligence Theory of Goleman (1995). The theory has a lot of support in the literature and has been applied successfully in education (Rahman et al., 2024; Shengyao et al., 2024; Gosim, Abebe, & Negasi, 2025). Emotional intelligence (EI), the ability to recognize, evaluate, and control one's own and others' emotions, significantly influences academic success. The five EI domains include self-awareness, self-regulation, self-motivation, social awareness, and social skills. Self-awareness enables effective study strategies; self-regulation supports focus and stress management; self-motivation drives goal achievement; empathy enhances collaborative learning; and social skills promote classroom participation. Additionally, EI aids test anxiety management, positive teacher-student relationships, and conflict resolution in group work. Collectively, these mechanisms demonstrate that emotional intelligence is a foundational competency that directly facilitates improved academic achievement across educational contexts. This theory of EI is relevant to this study because it explains how emotion recognition, stress management, motivation, positive relationships, and adaptability influence learning approaches and academic achievement. Higher emotional intelligence enables persistence through challenges, resource limitations, and setbacks, ultimately supporting consistent academic success. Therefore, this theory was found as the bedrock of this study.

Statement of the Problem

Ideal geography education requires emotionally and physically prepared pre-service teachers. However, CGPA data collected by the researcher from three Northwest Nigerian Colleges of Education across five sessions revealed very low achievement: only 0.4% earned distinction and 7.3% credit, while the majority attained merit, pass, low pass, or fail. This deficit threatens secondary geography education and reduces candidates for university degrees and higher programmes. Although academic achievement is influenced by learning styles, teaching strategies, cognitive abilities, and environments, emotional intelligence remains underexplored in geography education. Emotional intelligence significantly affects stress management, peer interaction, and motivation. Limited studies have investigated this variable, yet addressing it is essential for improving geography teacher education and its multiplier effect across Nigeria.

Objective of the Study

To find out whether emotional intelligence has predictive influence on academic achievement of geography pre-service teachers in Northwest colleges of education.

Research Question

What is the relationship between emotional intelligence and academic achievement of geography pre-service teachers in Northwest Colleges of Education?

Research Hypothesis

Emotional intelligence is not a significant predictor of academic achievement of geography pre-service teachers in Northwest colleges of education.

Methodology

This study adopted a correlational research design to examine the predictive relationship between emotional intelligence and academic achievement among geography pre-service teachers. A multistage sampling technique selected 285 participants from a population of 1,089. Two instruments were used: the Geography Pre-service Teacher Emotional Intelligence Questionnaire (GPTEI-Q) and the NCE II Geography Academic Proforma (NCE-GAP). The GPTEI-Q was validated by nine experts, achieving a face validity index of 91% and a content validity index of 89%. Construct validity was confirmed through Exploratory Factor Analysis (EFA), where all factor loadings exceeded 0.50 with no cross-loadings, indicating convergent and discriminant validity. Confirmatory Factor Analysis (CFA) supported these findings, with composite reliability (CR) exceeding 0.70 and average variance extracted (AVE) surpassing 0.50. Inter-factor correlations were smaller than the square root of AVE, confirming construct validity. Reliability, measured by Cronbach's Alpha for GPTEI-Q, was 0.85. The NCE-GAP was reviewed by five validators, achieving a perfect face validity index of 100%. These rigorous psychometric properties establish both instruments as valid and reliable for the study. The researcher obtained institutional permission, then administered questionnaires and academic proformas to 285 pre-service teachers confidentially. Data were analyzed using mean, SD, correlation, scatterplot, simple and multiple regression at 0.05 significance via SPSS.

Influence of Emotional Intelligence on Academic Achievement among ... Gurjiya, A. U. & Danladi, I. I. (2026)

Presentation of Results

Data were analyzed using mean, SD, correlation, scatterplot and simple regression at 0.05 significance. The decision rules include; mean is considered positive if ≥ 2.5 and negative if < 2.5 . Standard deviation (SD) shows low variability (0.00–0.49), moderate (0.50–0.99), and high (≥ 1.00).

Research Question

What is the relationship between emotional intelligence and academic achievement of geography pre-service teachers in Northwest Colleges of Education?

The statistical tools used: Mean, standard deviation, Pearson's correlation and scatterplot.

Table 1: Relationship between Emotional Intelligence and Academic achievement

Variables	n	Mean	SD	R
Emotional Intelligence	285	2.15	0.55	0.27
Academic Achievement	285	1.99	0.98	

Table 1 shows that the relationship between the emotional intelligence and academic achievement of the geography pre-service teachers $r = 0.27$, is weak but positive, although the pre-service teachers have negative mean with moderate standard deviation. Figure 1 showed the nature of the relationship.

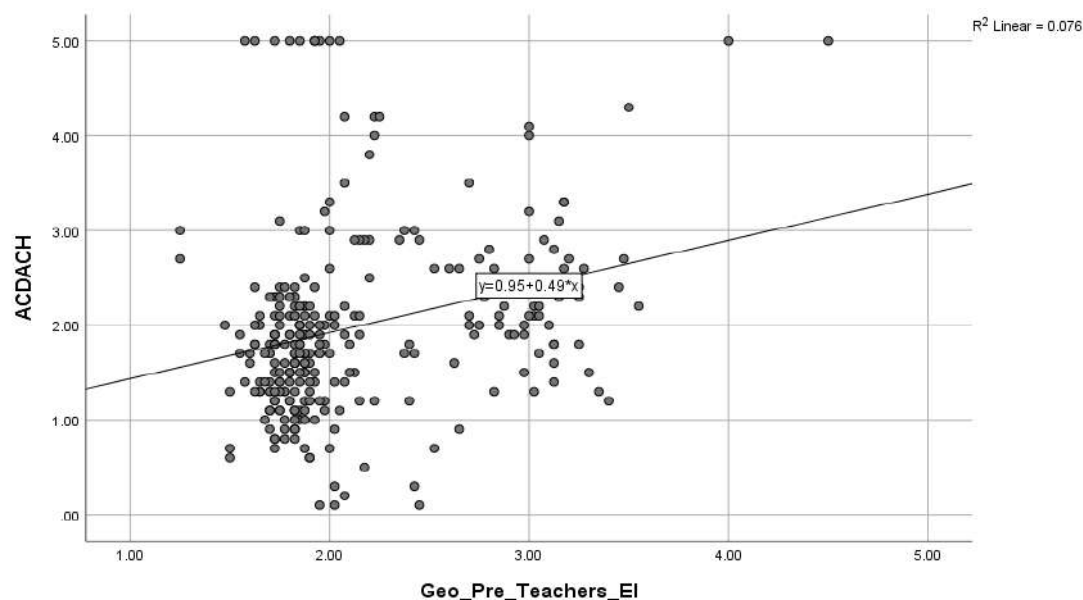


Figure 1: Scatterplot of Emotional Intelligence and Academic Achievement

Figure 1 shows the scatterplot of the relationship between geography pre-service teachers' emotional intelligence and academic achievement having gradient of 0.49 as the direction of the line indicated. This means that the emotional intelligence and academic achievement are in the same directions, meaning that the emotional intelligence increases with increases in the academic achievement (ACDACH). The gradient 0.49 shows how the academic achievement increase with unit increases in the emotional intelligence.

Null Hypothesis One

Emotional intelligence is not a significant predictor of academic achievement of geography pre-service teachers in Northwest colleges of education.

The statistical tools used: Linear regression

Table 2: Regression Model Emotional Intelligence and Academic achievement

Model	r	r ²	Adjusted R Square	Std. Error of the Estimate
1	0.275 ^a	0.076	0.072	0.94464

a. Predictors: (Constant), Geo_Pre_Teachers_EI



Influence of Emotional Intelligence on Academic Achievement among ... Gurjiya, A. U. & Danladi, I. I. (2026)

Table 2 shows the regression model of emotional intelligence and academic achievement of Geography pre-service teachers. The table revealed that the relationship of emotional intelligence and academic achievement, $r = 0.275$ and $r^2 = 0.076$ indicated that 7.6% of the academic achievement of the geography pre-service teacher is explained by their emotional intelligence. By implication, the emotional intelligence of the geography pre-service teachers has little influence (7.6%) of their academic achievement.

Table 3: Regression Coefficient for Emotional Intelligence and Academic achievement

		Unstandardized Coefficients		Standardized Coefficients			
Model		B	Std. Error	Beta	T	Sig.	Remark
1	(Constant)	0.949	0.224		4.228	0.00	S
	El of Geo Pre Teachers	0.487	0.101	0.275	4.809	0.00	S

a. Dependent Variable: ACDACH Significant at $P \leq 0.05$

Table 3 shows the regression coefficient of emotional intelligence and academic achievement of Geography pre-service teachers. The regression equation $y = 0.949 + 0.487x$, this means that in every 1 unit increase in academic achievement (y) there is corresponding 0.487 increase in emotional intelligence (x) of the Geography pre-service teachers. The constant (0.949) indicate unit increase of other factors that may influence the academic achievement of the Geography pre-service teachers. The table revealed that the hypothesis is rejected having (Sig. 0.001). This means emotional intelligence significantly predicted the academic achievement of Geography pre-service teachers. In addition, the Beta sign (0.275) again indicated that the relationship between the emotional intelligence and academic achievement is positive.

Discussion of Findings

The study found a positive yet weak relationship between emotional intelligence and academic achievement among geography pre-service teachers in Northwest zone Nigeria. This finding partially supports Goleman's (1995) emotional intelligence theory, though the modest effect size indicates that emotional intelligence functions within a broader ecosystem of multiple factors rather than operating as a dominant predictor. Supporting evidence from the literature includes a comprehensive meta-analysis by MacCann et al. (2020), which examined 158 studies involving 42,529 students and reported an overall correlation of $\rho = .20$ between emotional intelligence and academic achievement. Within Nigeria, Oyewunmi et al. (2016) confirmed that emotional intelligence goes in the same direction with academic achievement among undergraduates. Similarly, El Seifi et al. (2023) documented a positive relationship and recommended interventions to enhance students' emotional intelligence for improved academic achievement. However, contradictory evidence exists. Miller (2024) found no significant relationship whatsoever, concluding that emotional intelligence has no influence on students' academic achievement. Regarding hypothesis testing, the null hypothesis was rejected, as emotional intelligence did demonstrate a statistically significant predictive influence on academic achievement. This aligns with Sánchez-Álvarez et al. (2020), who reported an influence of emotional intelligence on academic achievement. Synthesizing these findings, several conclusions emerge. First, while a positive relationship between emotional intelligence and academic achievement is frequently reported, the strength and significance of this relationship vary considerably across studies. Second, key moderating factors include the type of emotional intelligence assessment employed (ability-based measures versus self-report questionnaires), the academic discipline under investigation, the educational context (secondary, tertiary, or postgraduate), and cultural or geographical settings. Third, the weak-to-modest effect sizes suggest that emotional intelligence is neither necessary nor sufficient for academic success but rather operates as one contributing factor among many. Consequently, while emotional intelligence appears to play a meaningful role in academic achievement, its influence is modest and contingent upon various moderating factors. Geography educators should therefore foster emotional intelligence alongside cognitive abilities, effective study habits, high-quality teaching strategies, and adequate resource provision to optimize pre-service teachers' academic outcomes.

Conclusion

The study concluded that in Northwest Colleges of Education, emotional intelligence had a positive relationship with the academic achievement of geography pre-service teachers, and emotional intelligence is a significant predictor of academic achievement.



Influence of Emotional Intelligence on Academic Achievement among ... Gurjiya, A. U. & Danladi, I. I. (2026)

Recommendation

Teacher education programs should integrate emotional intelligence training into the curriculum to help pre-service teachers better manage stress, develop and maintain positive relationships, thereby enhancing their academic achievement.

References

- Baber, H. (2020). Determinants of students' perceived learning outcome and satisfaction in online learning during the pandemic of COVID19. *Journal of Education and e-Learning Research*, 7(3), 285-292. <https://doi.org/10.20448/journal.509.2020.73.285.292>
- Carthy, A. & Jameson, A. (2016). An Introduction to Emotional Intelligence. In Carthy, A. (Eds), *The Emotionally Intelligent College: Transforming Third level Education to help Students and Educators Reach their Maximum Potential* (pp.1-24). Cambridge Scholar Publishing. <https://arrow.tudublin.ie/cgi/viewcontent.cgi?article=1000&context=ncrpbk>.
- Davis, D. (2019). *Learning objectives and outcomes*. [Unpublished dissertation] University of Alberta. <https://www.ualberta.ca/graduate-studies/media-library/professional-development/gtl-programmeme/gtl-week-january-2019/20190103>
- Dempsey, C. (2023). *What is Geography?* <https://www.geographyrealm.com/definition-geography/>
- El Seifi, O. S., Albishi, N., Albalawi, G. A., Alzahrani, R. A., Albalawi, S. M., Albalawi, N. S., Alatawi, A. A., & Albalawi, N. M. (2023). Relationship between emotional intelligence and academic achievement among medical students at University of Tabuk. *Cureus*, 15(11), Article e49301. <https://doi.org/10.7759/cureus.49301>
- Ghosh, R. (2022). *Learning Outcomes of Classroom Research*. ResearchGate. <https://www.researchgate.net/publication/358050961>.
- Goleman D. (1995) *Emotional intelligence: why it can matter more than IQ*. Bantam Books.
- Gonzalez, M. A. Peña, P. L. & Arboleda, G. I. J. (2019). Emotional intelligence: origins and theories. *Publicaciones Didácticas (E-Journal)* 103(1), 34-39. <https://core.ac.uk/download/pdf/235850833.pdf>.
- Gosim, D., Abebe, A. S., & Negasi, R. D. (2025). Emotional intelligence and academic achievement among first-year undergraduate university students: The mediating role of academic engagement. *Frontiers in Education*, 10. <https://doi.org/10.3389/feduc.2025.1567418>
- Gurjiya, A. U. and Danladi, I. I. (2025). Assessment of Validity and Reliability of Geography Emotional Intelligence Questionnaire among Pre-service Teachers in Colleges of Education, North-West, Nigeria. *Studies in Science Technology, & Mathematics Education (SSTME)*, 1(2), 45-56. Abubakar Tabawa Balewa University, Bauchi
- Hagge, P. D. (2023). Find It on a Map: Country Location Identification in a University Geography Classroom, 2016–2022. *Journal of Geography*, 122(5), 105-114. <https://doi.org/10.1080/00221341.2023.2224374>
- Jang, S. T. (2018). The implications of intersectionality on Southeast Asian female Students' educational outcomes in the United States: A critical quantitative intersectionality analysis. *American Educational Research Journal*, 55(6) 1268–1306. <https://doi.org/10.3102/0002831218777225>
- Mahajan, M., & Sarjit Singh, M. K. S. (2017). Importance and benefits of learning outcomes. *Journal of Humanities and Social Science*, 22(3), 65-67. <https://doi.org/10.9790/0837-2203056567>
- MacCann, C., Jiang, Y., Brown, L. E. R., Double, K. S., Bucich, M., & Minbashian, A. (2020). Emotional intelligence predicts academic achievement: A meta-analysis. *Psychological Bulletin*, 146(2), 150–186. <https://doi.org/10.1037/bul0000219>.
- Miller, E. (2024). The relationship between noncognitive (emotional intelligence) variables on academic GPA among sonography or radiography students after 1-year course completion. *Journal of Diagnostic Medical Sonography*, 40(3), 265-271. <https://doi.org/10.1177/87564793231220618>
- Olaniyi, O. P. & Oladokun, T. A. (2021). Geography Education as a tool for National Integration in Nigeria. *International Journal of Intellectual Discourse (IJID)*, 4(2), 39-47. <https://ijidjournal.org/index.php/ijid/article/download/69/38>.
- Oluymo, A. A., Musbahu, A., Kukwil, I. J., Anikweze, C. M. & Shaluko Y. D. (2020). Gender Differences in Mathematics Interest and Achievement in Junior Secondary School Students, Niger State, Nigeria. *International Journal of Research and Innovation in Social Science (IJRISS)*, 4(10), 359-366. www.rsisinternational.org
- Pallathadka, A. & Pallathadka, H. (2021). Human and environment relationship in geographical research. *PalArch's Journal of Archaeology of Egypt/ Egyptology*, 18(4), 6666-6679. <https://www.researchgate.net/publication/351869623>.
- Rahman, M. H., Amin, M. B., Yusof, M. F., Islam, M. A., & Afrin, S. (2024). Influence of teachers' emotional intelligence on students' motivation for academic learning: An empirical study on university students of Bangladesh. *Cogent Education*, 11(1), Article 2327752. <https://doi.org/10.1080/2331186X.2024.2327752> Sánchez-Álvarez et al. (2020)



Influence of Emotional Intelligence on Academic Achievement among ... Gurjiya, A. U. & Danladi, I. I. (2026)

Serrat, O. (2017). Understanding and Developing Emotional Intelligence. In O. Serrat, (Ed.), *Knowledge Solutions* (pp.329-339). Springer, Singapore. https://doi.org/10.1007/978-981-10-0983-9_37.

Shengyao, Y., Xuefen, L., Jenatabadi, H. S., Samsudin, N., Ke, C., & Ishak, Z. (2024). Emotional intelligence impact on academic achievement and psychological well-being among university students: The mediating role of positive psychological characteristics. *BMC Psychology*, 12, 389. <https://doi.org/10.1186/s40359-024-01886-4>

Tripathy, M. (2018). *Emotional Intelligence: An overview*. Research gate. <https://www.researchgate.net/publication/335433492>



Perceived Influence of Artificial Intelligence Chatbots on Self-Efficacy and attitude in ... Ayua, G. A., Et. al. (2026)

Perceived Influence of Artificial Intelligence Chatbots on Self-Efficacy and Attitude in Science Education Research among Undergraduate Students in Makurdi, Benue State, Nigeria

AYUA, Geoffrey Aondolumun¹

ayuageofrey@gmail.com

+2348069337213,

KWAGH, Tertsea Caleb¹

kwaghcaleb@gmail.com

+2348161795694,

OKANCHE, Samuel¹

sokanche-pg26@bsum.edu.ng

+2349164825455,

OBONGA, Idoma Jairus¹

obongaidoma@gmail.com

+2348108896100,

OBU, Reuben Oibe¹

oibereuben59@gmail.com

+2347016691269,

TAVERSHIMA, Ushahemba Asher¹

tavertroy88@gmail.com

+2349034187874

¹⁻⁶Science Education Department, Rev. Fr. Moses Orshio Adasu University, Makurdi, Benue State, Nigeria

Abstract

Artificial Intelligence (AI) chatbots' perceived influence on science education undergraduates' research self-efficacy and attitude in Makurdi, Nigeria was investigated using a descriptive survey research design. The study was guided by two research questions. The study's sample of 100 was randomly drawn from a population of 259 400-level undergraduates in the Department of Science and Mathematics Education, Rev. Fr. Moses Orshio Adasu University Makurdi, Benue State, Nigeria. A validated and trial-tested Artificial Intelligence Chatbots and Research Questionnaire for Undergraduates (AICRQU) with a Cronbach Alpha reliability index of 0.85 was used for data collection. Data were analysed using mean and standard deviation to answer the research questions. Findings of the study revealed that AI Chatbots usage positively influence science education undergraduates' research self-efficacy by enhancing academic confidence, independent learning, and problem-solving abilities with a high cluster mean of 3.00. The study also found that AI chatbots usage promotes undergraduates' positive attitudes towards research by enhancing research curiosity in learning with a high cluster mean of 3.09. Based on the findings, the study recommended that universities integrate AI chatbot technologies into teaching and research practices, provide AI literacy training for university students, and establish policies to ensure ethical and effective use of AI tools in higher education.

Keywords: Artificial Intelligence Chatbots, Supervisee, Self-Efficacy, Attitude.

Introduction

Science is the factual knowledge about the natural and physical world obtained through methodical and experimental processes. Through the enterprise of science education, students acquire the relevant skills to verify and replicate scientific facts (Ayua et al., 2025). One of the ways through which science students acquire the relevant skills, problem-solving abilities and competencies is through research. With the advancement of modern technology, research in science education has undergone a significant paradigm shift in methodology from the traditional methods to technology driven methods. According to Ayua and Taangahar (2024) university research should be of global standard and keep pace with the paradigm shift. Artificial Intelligence (AI) is a cutting-edge technology that is reshaping the global landscape in all areas of human endeavour. According to Luckin et al. (2016) the most practical applications of AI is the Artificial Intelligence Chabot. These AI tools are designed to simulate human conversation using text or voice interactions, providing information in a conversational manner (Labadze et al., 2023). Adamopoulou and Moussiades (2020) see Chatbots as Artificial Intelligence that fosters communication between computers and humans. In educational environments, AI chatbots are used to: personalize learning experience through dialogue-based interactions, support self-regulated learning by providing



Perceived Influence of Artificial Intelligence Chatbots on Self-Efficacy and attitude in ... Ayua, G. A., Et. al. (2026)

immediate feedback, foster student autonomy and encourage self-correction (Guo et al., 2022; Molenaar, 2022). While AI Chatbots do not replace human insight, they enhance communication, provide consistency and could enhance research competency of undergraduate supervisees. Undergraduate research supervision is a structured process aimed at providing oversight, knowledge and competency to guide students through research task (Davys & Beddoe, 2020; Corey et al., 2020). Supervision of undergraduate research project requires project supervisor(s) to offer professional guidance, provide feedback, monitor research progress, and to be a source of encouragement aimed at fostering academic research independence in the learner (Ayua et al., 2022b). Thus, supervision is not just about oversight but a dynamic partnership designed to foster growth, independence and academic excellence. However, with evolving AI Chatbots capable of providing feedback, knowledge and intellectual stimulation, the traditional responsibilities of supervisors have been altered (Nkosi, 2026). Since these systems work round the clock, they could become a useful resource for undergraduate supervisees. A Supervisee is a student who is under the guidance of an academic supervisor during a research project. Ayua et al. (2022a) see research project as an honest academic activity that involves the collection of relevant data with the intention of becoming thoroughly informed about an engaging topic for the purpose of making valid contribution to knowledge and preferring solutions to the identified problem(s) in order to make this world a better place for a meaningful living. Undergraduate research is a creative endeavour that develop students' critical and creative thinking abilities though the application of science process skills thereby enhancing their self-dependence. Supervisees are responsible for carrying out the research process with increasing independence while also depending on their supervisors for mentorship, feedback and academic support. Recently, emerging technologies like Artificial Intelligence (AI) have started playing a role in supporting supervisees in tasks such as literature reviews, citations, writing structure and explaining complex research concepts (Parsakia, 2023). AI Chatbots could reduce dependency of supervisees on their supervisors by acting as a round the clock standby resource tool thereby improving undergraduates' self-efficacy in undertaking research tasks.

Self-efficacy is a persons' belief in their ability to achieve specific goals. Anierobi et al. (2025) sees self-efficacy as a students' belief in their ability to successfully perform and complete academic tasks such as studying for exams, solving problems or managing course work. Ayua et al. (2025) posits that the goal of science education is to develop science learners capable of independent living in the ever-dynamic globe. Research studies have shown a link between students' use of AI tools such as AI chatbots and Self-efficacy. According to Parsakia (2023), frequent and satisfying interactions with chatbots can enhance Self-efficacy. Similarly, Zhang et al. (2022) posited that AI-based educational chatbots paradigms could improve learners' emotional confidence and Self-efficacy through dialogue templates and improve their attitude. Attitude is a learned predisposition to evaluate things or react to some ideas, persons or situations in certain ways either consciously or unconsciously (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2022). According to Ayua et al. (2022a) students' negative or neutral attitude towards undergraduate project could threaten the quality of research. Studies have shown that students' attitudes toward subjects such as science are shaped by their experiences, social environment and the tools used for instruction including technological aids like Artificial Intelligence chatbots (Kim et al., 2021). In recent years, integrating technology particularly AI-based tools into the educational system has been shown to positively shift student attitudes by making learning more accessible, personalized and engaging (Nketsiah & Boateng, 2023). Therefore, understanding and addressing students' attitudes is critical for designing educational interventions that promote sustained interest and success. This study is anchored on Banduras' (1986) Social Cognitive Theory. This theory posits that learning and behaviour (Self-efficacy and attitude) are the result of continuous interaction between three key factors: personal factors (cognitive ability), behaviour (actions or decisions) and the environment (which includes technological learning tools like AI Chatbots). Bandura emphasized that Self-efficacy and positive attitude is influenced by experiences of success, verbal encouragement and modelling. In this study AI Chatbots form a supportive academic environment. When students get timely feedback and helpful guidance from Chatbots, it could build their confidence in handling research tasks which could influence their attitude towards such tasks. Empirical studies on Artificial Intelligence and Self-efficacy have revealed positive results in different areas of human endeavour. Tolorunleke (2025) examined the awareness and use of ChatGPT as a co-pilot for research purposes among students in Tertiary institutions in Kogi State and found that, although ChatGPT was widely recognized among undergraduates, its potential as an effective research tool was underutilized. Anierobi et al. (2025) examined Artificial intelligence utilization as a determinant of academic self-efficacy, engagement and satisfaction of university students at Nnamdi Azikiwe



Perceived Influence of Artificial Intelligence Chatbots on Self-Efficacy and attitude in ... Ayua, G. A., Et. al. (2026)

University, Awka, Anambra state Nigeria and found that the use of Artificial intelligence tools by undergraduates positively correlated with academic self-efficacy. Similarly, Tanveer et al. (2024) examined the impact of AI based chatbots on academic Self-efficacy and self-regulation among university students in Rawalpindi and Islamabad, Pakistan and also found that students who engaged more with AI chatbots exited greater confidence in their academic abilities. On Artificial intelligence and students' attitude, Morell-Mengual et al. (2025) examined characteristics, motivations and attitudes of students using ChatGPT and other language Model-Based chatbots in higher education and found that students had varying attitude to the use of AI chatbots based on personal and academic factors. Alan and Kirbag-Zengin (2025), investigated on the effect of Artificial Intelligence-Based E-learning environment on students' attitude towards science course. The study revealed Artificial Intelligence positively affected students' attitude towards science course. Similarly, Adeosun (2025) examined students' attitude on the use of Artificial Intelligence in learning in the faculty of education, University of Benin, Benin city, Nigeria and found that students exhibited a highly positive attitude to the application of AI in education. While these studies relate to Artificial intelligence, self-efficacy and attitude, they did not explore the use of Artificial Intelligence chatbots in science education undergraduate research in terms of self-efficacy and attitude of students.

The problem of this study is the inadequacy of empirical research on the influence on Artificial Intelligence chatbots on students' self-efficacy and attitude in research. The integration of Artificial Intelligence (AI) chatbots in science education has been praised for its potential to enhance learning, personalize educational experiences, and support supervisees in research-related tasks (Parsakia, 2023). However, despite these promising capabilities, the actual influence of AI chatbots on supervisees' self-efficacy and attitudes towards research tasks remains inconsistent and underexplored, especially among undergraduates in science education. Previous studies have attempted to investigate the role of AI-based tools in higher education learning contexts, yet they fell short in examining the interplay between AI chatbots and the self-efficacy and attitude of supervisees towards research tasks (Anierobi et al., 2025; Tanveer et al., 2024). Similarly, Zawacki-Richter et al. (2019) explored AI's general implications in education but did not address its specific role in shaping supervisees' confidence and disposition toward academic research. These gaps in literature highlight a persistent challenge. This study therefore seeks to bridge this knowledge gap by examining the perceived influence of AI chatbots on science education undergraduates' self-efficacy and attitudes in research within a structured supervisory context.

Purpose of the Study

The purpose of this study is to examine the extent to which the use of AI chatbots influences supervisees' self-efficacy and attitude in science education research. The specific objectives are to:

1. To find out the perceived influence of AI chatbots usage on 400-level science education undergraduates' self-efficacy in research project writing.
2. To establish the perceived influence of AI chatbots usage on 400-level science education undergraduates' attitude towards research project writing.

Research Questions

1. What is the perceived influence of AI chatbots usage on 400-level science education undergraduates' self-efficacy in research project writing?
2. What is the perceived influence of AI chatbots usage on 400-level science education undergraduates' attitude towards research project writing?

Methodology

This study employed a descriptive survey design. This design was considered appropriate as it allows for the collection of data on the current state of affairs without manipulating variables (Achor et al., 2018). The study was carried out at Rev. Fr. Moses Orshio Adasu University, Makurdi, Benue State, Nigeria (formerly Benue State University). The population of the study comprised 259 400-level undergraduates in the 2024/2025 academic year from the department of Science and Mathematics Education (Directorate of Information and Communication Technology [ICT], Rev. Fr. Moses Orshio Adasu University, Makurdi). A sample of 100 respondents was selected using simple random sampling. Instrument for data collection was a questionnaire titled: Artificial Intelligence Chatbots and Research Questionnaire for Undergraduates (AICRQU) developed by the researcher and validated by two experts in science education. The AICRQU was trial tested and test scores collected were computed using Cronbach's Alpha to obtain a reliability of 0.85. Items in all sections of the

Perceived Influence of Artificial Intelligence Chatbots on Self-Efficacy and attitude in ... Ayua, G. A., Et. al. (2026)

instrument were structured on a four-point Likert scale: Strongly Agree (SA) = 4, Agree (A) = 3, Disagree (D) = 2, and Strongly Disagree (SD) = 1. The data collected was analysed using descriptive statistical tools of Mean and standard deviation to answer the research questions. A mean score of 2.50 was set as the decision rule implying agreement with the items.

Presentation of Results

Results are presented in tables in order of research questions.

Research Question One: What is the perceived influence of AI chatbots usage on 400-level science education undergraduates' self-efficacy in research project writing?

Table 1: Perceived influence of AI chatbots usage on 400-level science education undergraduates' self-efficacy in research project writing

S/N	Items	SA	A	D	SD	mean	Std.	Remark
1	Using AI chatbots makes me more confident in completing my research tasks.	47	42	9	2	3.34	.728	Accepted
2	AI chatbots help me organize my research project effectively.	34	47	11	8	3.07	.879	Accepted
3	I rely less on my supervisor for routine guidance because of AI chatbots.	24	40	28	8	2.80	.899	Accepted
4	AI chatbots improve my ability to solve research-related problems.	29	42	14	15	2.85	1.009	Accepted
5	AI chatbots increase my overall confidence in conducting research independently.	26	45	15	14	2.83	.975	Accepted
6	AI chatbots help me understand difficult research concepts more clearly.	31	44	16	9	2.97	.915	Accepted
7	AI chatbots improve my ability to structure my research work.	25	50	21	4	2.96	.790	Accepted
8	AI chatbots enable me to generate relevant ideas for my research writing.	37	45	16	2	3.17	.766	Accepted
9	I feel more capable of carrying out literature review tasks with the help of AI chatbots.	22	50	18	10	2.84	.884	Accepted
10	AI chatbots help me identify mistakes for correction in my research work.	26	46	14	14	2.84	.972	Accepted
11	Using AI chatbots strengthen my confidence in analysing research data.	25	26	9	10	2.96	.864	Accepted
12	AI chatbots help me manage my research time more effectively.	51	36	7	6	3.32	.851	Accepted
13	I feel more independent in completing my research tasks when I use AI chatbots.	32	51	7	10	3.05	.892	Accepted
Cluster						3.00	0.88	Accepted

Table 1 presents the mean and standard deviation scores on supervisees' perceptions of how AI Chatbot usage influences their self-efficacy in research projects. Based on the decision rule of 2.50 and above as accepted, all items were accepted, indicating overall agreement among the students. The cluster mean of 3.00 with a standard deviation of 0.88 shows that supervisees strongly perceive AI Chatbots as having a positive influence on their self-efficacy in research projects. The cluster mean above 3.00 reflects a high level of positive perception, while the standard deviation shows a moderate level of consistency in responses.



Perceived Influence of Artificial Intelligence Chatbots on Self-Efficacy and attitude in ... Ayua, G. A., Et. al. (2026)

Research Questions Two: What is the perceived influence of AI chatbots usage on 400-level science education undergraduates' attitude towards research project writing?

Table 2: Perceived influence of AI chatbots usage on 400-level science education undergraduates' attitude towards research project writing

S/N	Items	SA	A	D	SD	Mean	Std.	Remark
1	AI chatbots make research tasks more enjoyable to me.	27	56	13	4	3.06	.750	Accepted
2	I feel more motivated to work on my research when using AI chatbots.	25	55	15	5	3.00	.778	Accepted
3	AI chatbots reduce my anxiety about completing research tasks.	35	39	23	3	3.06	.839	Accepted
4	I feel stress relieved using AI chatbots in searching for academic materials for research project writing.	26	46	21	7	2.91	.866	Accepted
5	I am more willing to engage actively in research because of AI Chatbots quick feedback.	31	39	26	4	2.97	.858	Accepted
6	AI chatbots make me learn new research skills, conveniently.	38	52	7	3	3.25	.716	Accepted
7	Using AI chatbots encourage me to explore research topics more deeply.	42	44	12	2	3.26	.747	Accepted
8	AI chatbots make the research process less frustrating for me.	43	41	12	4	3.23	.815	Accepted
9	I feel more enthusiastic about completing my research when I use AI chatbots.	36	36	20	8	3.00	.943	Accepted
10	AI chatbots encourage me to participate more actively in research discussions.	34	42	22	2	3.08	.800	Accepted
11	Using AI Chatbots makes me feel more positive about academic research.	39	39	16	6	3.11	.886	Accepted
12	AI chatbots help me develop a stronger commitment to finishing my research project.	31	42	19	8	2.96	.909	Accepted
13	I feel more comfortable asking research-related questions when using AI chatbots than my supervisor.	36	47	13	4	3.15	.796	Accepted
14	AI chatbots make me more curious about discovering new information for my research.	45	44	9	2	3.32	.723	Accepted
15	The use of AI chatbots makes research supervision more engaging for me.	27	52	16	5	3.01	.798	Accepted
Cluster						3.09	.814	Accepted

Table 2 presents the mean and standard deviation scores of supervisees' perceptions of the influence of AI chatbots on their attitudes toward research projects writing. Using the decision rule of 2.50 and above as accepted, all the items were accepted, indicating general agreement among the students. The cluster mean of 3.09 with a standard deviation of 0.814 indicates that supervisees strongly perceive AI chatbots as having a positive influence on their attitudes toward research projects. The cluster mean above 3.00 reflects a high level of positive perception, while the standard deviation shows a moderate level of consistency in responses.



Perceived Influence of Artificial Intelligence Chatbots on Self-Efficacy and attitude in ... Ayua, G. A., Et. al. (2026)

Discussion of Findings

The findings of this study revealed that AI chatbots significantly enhanced undergraduates' self-efficacy in research work. The study showed that interaction with AI chatbots enhances students' academic confidence, problem-solving ability and perceived competence in research tasks. This finding strongly corroborates Anierobi (2025) and Tanveer et al. (2024) who reported a positive relationship between AI utilization and academic self-efficacy among university students. The implication is that chatbots encourage autonomous learning enabling students to practice concepts repeatedly, receive feedback instantly and refine understanding without fear of evaluation pressure. The study also revealed that supervisees perceived AI chatbots as fostering positive learning attitudes including increased interest, motivation and openness toward technology-supported science education and research. Students reportedly develop favourable dispositions toward research tasks due to accessibility, responsiveness and personalized support provided by AI chatbots. This finding corroborates the findings of Kirban-Zengin (2025) and Morell-Mengual et al. (2025) who also found that use of AI positively influenced students' attitude towards science learning.

Conclusion

Based on the findings of the study, it was concluded that AI chatbots enhances 400-level science education undergraduates' self-efficacy in and positive attitude towards research project writing.

Recommendations

Based on the findings, the following were recommended:

1. Integration of AI chatbots into Teaching: Universities should formally integrate AI chatbots into science education teaching and research activities as supportive learning tools.
2. Guided usage policies: Educational authorities should develop policies that encourage responsible AI use while preventing academic dishonesty and overdependence.
3. Supervisor professional development: Supervisors should be trained on how to incorporate AI tools into research supervision to enhance students' academic development.

References

- Achor, E. E., Ejah, E. E. & Odaudu, R. E. (2018). Training needs for Basic Science teachers in Benue State, Nigeria. *Journal of Research in Curriculum and Teaching (Special Edition)*, 10(2), 109-116. <https://doi.org/10.2139/ssrn.3241821>
- Adamopoulou, E. & Moussaides, L. (2020). Chatbots: History, technology and application. *Journal of Machine Learning with Applications*, 2(15), 1-18. <https://doi.org/10.1016/j.mlwa.2020.100006>
- Adeosun, P. K. (2025). Students' attitude on the use of artificial intelligence (AI) in learning in the faculty of education, University of Benin, Benin, Nigeria. *Sokoto Education Review*, 24(2), 181-188. <https://doie.org/10.10318/SER.2025541920>
- Anierobi, E. I., Amjad, A. I., Agogbua, V. U., Aslam, S., Fakhrou, A., Alanazi, A. A., Nwogbo, V. N., Eleje, L. I., Alshamzi, H., Khan, S., & Javaid, S. (2025). Artificial intelligence utilization: A determinant of academic self-efficacy, engagement, and satisfaction of undergraduates. *Environment and Social Psychology*, 10(3), 1-12.
- Ayua, G. A., & Taangahar, B. A. (2024). Quality science education research among postgraduate scholars: Being updated with paradigm shift. *African Journal of Sustainable Professional Development*, 5(2), 171-177.
- Ayua, G. A., Samuel, K. & Agbidye, A. (2022a). Science education students' expectations on research project supervision and attitude to its writing in Nigerian universities. *African Journal of Science, Technology and Mathematics Education*, 8(7), 615-621. <https://www.ajstme.com.ng>
- Ayua, G. A., Samuel, K., & Agbidye, A. (2022b). Science education supervisors' expectation on research project writing and attitude to its supervision in Nigerian Universities. *Journal of Science, Technology, Mathematics and Entrepreneurial Education*, 2(1), 177-187.
- Ayua, G. A., Samuel, K., Tofi, M., Ikyernum, G. S., & Iorpenda, N. G. (2025). Science-Text-Cards' effect on interest in science among upper basic school students with varied conceptual abilities in Makurdi, Nigeria. *BSU Journal of Science, Mathematics and Computer Education*. 5(2), 65-75. <https://bsum.edu.ng/journals/jsmce/index.php>
- Ayua, G. A., Terhemba, W. K., Agbidye, A., Tofi, M., Akwaji, N. I., & Salemkaan, P. A. (2025). Enhancing creative minds development in Basic Science students with different intellectual abilities through creative exploration in Gboko. *GAS Journal of Education and Literature*. 1(11), 47-58. <https://doi.org/105281/zenodo.17719046>
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall.
- Corey, G., Haynes, R. H., Moulton, P., & Muratori, M. (2020). *Clinical Supervision in the helping profession: A practical guide*. John Wiley & Sons.



- Perceived Influence of Artificial Intelligence Chatbots on Self-Efficacy and attitude in ...* Ayua, G. A., Et. al. (2026)
- Davys, A., & Beddoe, I. (2020). *Best practice in professional supervision: A guild for the helping professions*. Jessica Kingsley Publishers.
- Guo, K., Wang, J. & Chu, S. K. W. (2022). Using Chatbots to scaffold EFL students' argumentative writing. *Assessing Writing*, 54. 1-12 <https://doi.org/10.1016/j.asw.2022.100666>
- Kim, J., Park, S. & Baek, Y. (2021). Not just fun, but serious strategies: Using AI-powered Chatbots to promote student engagement and learning in science. *Journal of Educational Technology Research and Development*, 69, 1315-1334.
- Kirbag-zengin, F., & Alan, B. (2025). The effect of artificial intelligence-based e-learning environment on students' attitude towards science course. *Journal of the Human and Social Science Researches*, 14(3), 1254-1274.
- Labadze, L., Grigolia, M., & Machaidze, L. (2023). Role of AI Chatbots in education: Systematic literature review. *International Journal of Educational Technology in Higher Education*, 20, 56 <https://doi.org/10.1186/s41239-023-00426-1>
- Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence unleashed: An argument for AI in education*. Pearson Education.
- Molenaar, I. (2022). The concept of hybrid human-AI regulation. Exemplifying how to support young learners' self-regulated learning. *Computer and Education: Artificial Intelligence*, 3(1), 1075-1090.
- Morell-Mengual, E., et al. (2025). Characteristics, motivations and attitudes of students using ChatGPT and other language model-based Chatbots in higher education. *Computers and Education Open*, 6, 100-115.
- Nketsiah, R., & Boateng, R. (2023). Artificial Intelligence in African higher education: Possibilities and ethical concerns. *International Journal of Educational Technology in Higher Education*, 20(1), 1-17.
- Nkosi, T. B. (2026). Supervision Skills of supervisors in AI-enhanced environments: Perspectives on Postgraduate supervision. In I. Kariyana & W. Sinkala (Eds.), *Artificial Intelligence and Postgraduate Supervision in Higher Education* (pp. 93-100). <https://doi.org/10.38140.obp4-2026-06>
- Parsakia, K. (2023). The effects of Chatbots and AI on the self-efficacy, self-esteem, problem-solving and critical thinking of students. *Health Nexus*, 1(1), 71-76.
- Tanveer, I., Igbal, S., & Hussain, A. (2024). Examining the impact of AI based Chatbots on academic self-efficacy and self-regulation among university students. *Journal of Development and Social Sciences*, 5(2), 468-477. [https://doi.org/10.47205/jdss.2024\(5-11-S\)45](https://doi.org/10.47205/jdss.2024(5-11-S)45)
- Tolorunleke, E. A. (2025). Awareness and use of ChatGPT as a co-pilot for research purposes among undergraduate students in tertiary institutions in Kogi State. *Journal of E-Learning and Educational Technologies*, 11(4), 14-27. <https://doi.org/10.5281/zenodo.17432019>
- United Nations Educational, Scientific and Cultural Organization (UNESCO). (2022). *Curriculum Terminology*. <https://www.ibe.unesco.org>
- Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education changes and opportunities. *International Journal of Educational Technology in Higher Education*, 16(1), 1-22.
- Zhang, C., Li, G., Hashimoto, H., & Zhang, Z. (2022). Digital transformation for skill learners: The design methodology and implementation of educational chatbot using knowledge connection and emotional expression. *Education Sciences*, 13(8), 803. <https://doi.org/10.3390/educsci13080803>



Assessment of High-Tech Skills Competency among Librarians in Some Selected Universities in South-South, Nigeria

Promise, Aworo Okorie¹

asiwajufupre2014@gmail.com
08038560334

OLOSASA, Taofeek Adebayo²

olosasataoofeek@gmail.com

OLAWEPO, Saheed Adesina³

olawepo7158@gmail.com

¹University of Delta Agbor, Delta State, Nigeria

²Department of Library and Information Science, Faculty of Information and Communication Technology, Kwara State University, Malete, Kwara State, Nigeria

³Gani Bello Library, Federal College of Education, Abeokuta, Ogun State, Nigeria

Abstract

This paper examines high-tech skills competency of librarians in selected university in South-South, Nigeria. The population of the study was 44 professional librarians in Selected universities, in South-South, Nigeria, during the 2005/2006 academic session. The manageable size of the population warrants the adoption of total enumeration technique, thus, questionnaire was used as a tool for data collection and distributed to respondents physically at their different libraries by the two research assistants, where at the end, a total of 44 questionnaires were recovered and made usable for analysis (100% response rate). The data were analyzed using descriptive statistics, the result indicate that respondents were not fully use of the following high-tech skills, network management, computer security knowledge, web design, graphic design, creative online instructional materials/products, instant messages and instant software. The findings revealed that in-house training, NLA training, LRCN training and self-sponsorship were the modality to acquired IT training. The challenges identified include technological inefficiency/ AI integration, high cost of digitisation equipment/software, poor ICT infrastructure, insufficient institutional support, inadequate funding/limited training and skill development, ethical and security issues. Based on the findings the study recommended that management should provide adequate training to librarians especially on the aspect of network management, computer security knowledge, blogging, graphic design, web design, instant messages and creative online instructional materials/products, most of the high tech skills claimed not been used among the librarians in the university understudy, among others.

Keywords: High-tech skills, ICTs, Librarians, University Library, South-South

Introduction

In the era of rapidly changing Information and Communication Technologies (ICTs) in the world, libraries and the roles of librarians are not left out. Modern day librarians are not expected to handle just the conventional resources but must have the mastery of hi-tech skills ranging from digital cataloguing, electronic databases, online reference services, and newer technological concepts such as artificial intelligence and cloud computing, just to mention a few. In Nigeria, university libraries are progressively embracing ICT to improve access to information and service delivery. Nevertheless, the level of acquisition and the effective utilisation of ICT skills among librarians in the Nigerian universities are often hampered by differential factors such as infrastructural development, availability of training, and level of commitment of their respective institutions, especially in the case of the South-South zone where universities struggle with technological challenges. Evaluation of the ICT skills of librarians in such an environment would serve to inform the library profession on the level of preparation of their professionals in the knowledge economy era.

Statement of the Problem

With the advent of the digital revolution, many Nigerian libraries have not fully embraced the use of modern technologies. There are several difficulties that Nigerian librarians encounter in their effort to adopt new technologies in library operations. These are lack of training, insufficient access to ICT resources, difficulty in using the AI systems, lack of access to resources that can facilitate computer use and technology, poor funding and inability to cope with new technology. All these, throw doubt on the presence of high-tech skills competencies among Nigerian librarians needed for the demands of this modern information age. Libraries can no longer operate without adequate high-tech skills in all librarians if they hope



Assessment of High-Tech Skills Competency among Librarians in ... Promise, A. O., Et. al. (2026)

to remain relevant. This study attempts to answer that critical research problem by addressing the state of high-tech skills competency of Nigerian librarian

Objectives of the Study

The main objective of the study is to assess high-tech skills competency of librarians in selected university in South-South, Nigeria. The specific objectives are to:

1. Evaluate high-tech skills used among the librarians in selected university in South-South, Nigeria;
2. Determine high-tech training attended among the librarians in selected university in South-South, Nigeria;
3. Examine modality of acquiring IT Training among the librarians in selected university in South-South, Nigeria;
4. Identify the obstacles faced by librarians in acquiring and utilising high-tech skills; and

Review of Related Literature

High-tech Skills Use in the University Libraries

To cope with the current changing information environment in academic libraries, librarians need new and high-tech competencies like database searching, digitization, cloud computing, and AI integration in libraries. From researches in Nigeria and around the world, there has been progress but challenges still exist concerning lack of adequate training and infrastructure in full adoption of high-tech competencies. ICT competencies is defined as skills the librarian should be capable of displaying in using the Information and Communication Technology facilities to execute the operations and functions in the 21st century university library environment. Basic operations of ICT hardware skills, email setup and management skills, safe usage of the Internet skills, on-line research skill, on-line communication and collaboration skills, management of social/academic network sites and document creation and retrieval skills. To determine the ICT skills and service delivery of librarians in private universities, Ilesanmi (2023) researched it using the survey method of research. In the survey research, the population consisted of 181 librarians in the 45 private universities in southern Nigeria. Questionnaire was the tool used for data collection and frequency, percentage, mean and chart were the data analyzed. The findings show that librarians offered several library services to users; acquire basic ICT skills and were also adaptable in using ICT to search the internet, access information and for communicating on social networks, to work with micro-office, except for computer programming skill.

The majority of the librarians acquire the ICT skill through self-learning, therefore possessing the skill of retrieving, evaluating, receiving, sending and transmitting information from digital format while considering the societal and legal factors is one among the many digital skills digital literates like library staff, researchers and scholar could display. These skills comprise of knowledge of computer devices' basic principals, skills to utilize computer network, skills to communicate with other through online communities, social networking and also observation of its rules of behavior (Gui & Argentin, 2011) supported Bitri and Akkaya's (2018) claim to Gui and Argentin's (2011) conclusion that scholars be experts in using search engines, web sites, Ms Office applications (word processor, power point, excel) as well as downloading and uploading files, desk top publishing, web based learning environment, web page design, data base management, computer programming and so on digital skills. In a similar research Eromosele et al (2021); Opele and Unegbu, (2012) concluded that ICT skills to power on and off a computer system, skills to browse the web, download files from the Internet, navigation and use of library automation software and its modules, for example, the OPAC (online public access catalog), skills to send and receive email, skills to copy to and from a CD-ROM and flash drive/hard disks as some other important ICT skills is needed to enhance proper exploitation of the 21st Century ICT facilities by the library. Being able to access high-tech skills and communication skills to perform work can be defined as having information communication and technology (ICT) skills. In this digital age, unless academia possesses ICT skills, academic libraries will not be able to provide information services effectively. In a researcher ability to search, analyse and present through the use of technology. Possessing knowledge of ethical and legal issues relating to accessing and use of information (Mommoh & Saka, 2016). It is required that academic librarians need to attend a variety of training courses to be skilled in using it. Training is a course of instruction in which an individual is given specific skills, to perform work correctly and proficiently. It is defined as the process whereby a worker is helped to acquire work-related skills which would enable him or her to perform certain job responsibilities in the organisation, Shidi and Nwachukwu (2015) argued that Libraries and mother institutions should also actively participate in training staff on issues such as MS word, MS excel, MS power point, skill to download and upload, searching library database, searching the web, integrated library software. Susan and Baby



Assessment of High-Tech Skills Competency among Librarians in ... Promise, A. O., Et. al. (2026)

(2012) affirmed that librarian must be proficient and knowledgeable in the use of these technologies within teaching, research and community development. Basically, librarians must be able to be in tune with the needs that will shape digital librarianship skills. Every so often the core competencies of information providers should be evaluated. Misco and Ocholla (2013) believe that library Association organizations, in a diverse set of bodies, should participate in helping to develop new skills for librarians. So skills needed by the staff at the academic institution include the ability to operate digital library software program and the ability to install and upgrade software applications such as windows, SPSS and anti-virus, among others. Also the staff at the academic institution would like training needs identified for service delivery at the university library include training on the use of software and hardware programs, digitization training and strategy on how to download database programs such as OPAC, HINARI, AGORA, and ABSOHOST, among others. Chiware (2007), suggest the two primary ways to provide training in the digital age, especially for librarians at the African university libraries, include training in the form of workshop or short course training or formal training in a library and information science program

The digital literacy skill of Nigerian librarian was assessed by Sambo et al. (2022). Based on the survey data, many certified librarians acquire the digital literacy skills through sponsorship by themselves as well as trial and error. Similar to this, Mulat and Natarajan (2020) research the digital literacy skills among the library staff at Jimma University libraries in Ethiopia. Data shows that librarian learn the digital skill through workshop, formal education, and youtube, while similar research was also conducted on university librarians on the issue of digital skill by Emiri (2017). From this result, library staff acquire digital skill through learning from peers, trial and error, information technology courses, formal education, respectively. From the different results, we realize there are diverse methods library staff learn the digital literacy skills. Similar to this, Sambo et al. (2022) pointed out training received by the certified librarian in Nigeria, of which include: 231(59%) offices organise computer training for staff over time, 201(51.4%) institutions provides adequate fund for staff training sponsorships, 198(50.6%) enrolled in private computer and internet training/ assistance from friends and course mates, 175(44.7%) I sponsor myself to acquire digital literacy training whereas 172(43.9%) had improved over time by virtue of their training and work, 81(20.7%) by trial and error, and 76(19.4%) not easy for me to learn and practice using ICT gadget. Hamad et al. (2020) examined some problems facing librarians in Jordan while gaining digital skills: low funding and lack of funds from library management to attend trainings; poor library infrastructure, etc. Similarly, Emiri (2015) found some problems affecting librarians of academic libraries in Nigeria: no ICT facilities; no sponsorship; unreliable power supply. Okeji et al. (2019) stated many barriers to digital literacy learning such as lack of funds for training for professional skill acquisition, no ICT facilities, shortage of ICT, etc. Absence of ICT facilities, lack of Internet speed and lack of a robust and well-defined digital literacy training programs and standard is a serious obstacle to learning digital literacy skills (Ukwoma et al., 2016). However, academic libraries, library associations and school management must support their librarians by providing in-house training and financial aid for attending training workshops in order for them to acquire digital skills needed in the 21st century academic library

Methodology

This study employed a descriptive research design survey, considering the nature of the research. The study population was 44 professional's librarians from two universities in the South-South, Nigeria, one state university and one federal university, both universities were in Delta State. University of Delta Agbor, 17 professional's librarians while Federal University of Petroleum Resources, Effurun has 27 professional's librarians. The study population consists of the entire 44 professional librarians working in the South-South University in Delta State, Nigeria. Total enumeration sampling was adopted for the study owing to the manageable size of the population for the study. Justification for using this sampling procedure is that all the librarians at various units engaged in some kind of job function/activities relevant to the technology skills competency needed to enhance effective service delivery. The questionnaire was the instrument used in the collection of data and were administered to the respondent personally by researchers along with two (2) research assistants in all the university understudy. Forty-four (44) questionnaires were distributed and 44 were retrieved as the entire questionnaire distributed were usable, thereby achieving a response rate of 100%. The descriptive statistics was used to analyse the data by adopting the tabular and frequency count presentation modes.



Assessment of High-Tech Skills Competency among Librarians in ... Promise, A. O., Et. al. (2026)

Data Presentation

Table 1: Respondents' Demographic Information

Variable	Frequency	Percentage (%)
Gender		
Male	23	52.2
Female	21	47.7
Total	44	100
Marital Status		
Single	11	25
Married	33	75
Total	44	100
Age		
26 – 30	4	9.0
11- 35	19	43.1
Greater than 36	21	47.7
Total	44	100
Year of Experience		
Less than 6 Years	3	6.8
6 – 10 Years	25	52.2
11 – 15 Years	15	34.0
Greater than 20 Years	8	18.1
Total	44	100
Highest Qualification		
Bsc/BLIS	3	6.8
Msc/MLS	32	72.7
Phd	9	20.4
Total	44	100
Designation		
Professor	1	2.2
Principal Librarian /Associate prof	3	6.8
Senior Librarian/Senior Lecturer	13	29.5
Librarian I/Lecturer I	12	27.2
Librarian II/Lecturer II	13	29.5
Assistant Librarian/Assistance Lecturer	2	4.5
Total	44	100
University		
University of Agbor, Delta	17	38.6
Federal University of Petroleum Resources	27	61.3
Total	44	100

Source: Authors' Fieldwork Survey (2026)

Table.1 shows that majority of the respondents 23(52.2%) were male and 21 (47.7%) were female while 33(75%) married. Also, the table shows that majority of the respondents 21 (47.7%) were within the age range of 36 and above. Indicating that majority are within the age range. More so, the table shows that majority of the respondents 25 (52.2%) has spent between 6 to 10 years in services, meaning that they have understanding on library activities. Furthermore, the Table shows that majority of the respondents 32(72.7%) has Msc/MLIS, 13 (28.5%) were senior lecturer/ senior librarian and Librarian II/ lecturer II respectively.

Objective 1: High-tech skills used among the librarians in selected university in South-South, Nigeria

Table 2: High-tech Skills Used (N=44)

High-tech Used	Federal University of Petroleum Resources	University of Delta Agbor	Total of Respondents	%
Using an Integrated Library System (Virtual/Alice for Windows etc)	21	12	33	(75%)
Microsoft word (Word Processing Skills)	24	14	37	(86..3%)
Web Searching Skills	19	11	30	(68.1%)



Assessment of High-Tech Skills Competency among Librarians in ... Promise, A. O., Et. al. (2026)

Use of Digitization Software	20	9	29(65.9%)
File management/operating system navigation skills	7	2	9(20.4%)
Citing and evaluating Internet resources	11	6	16(36.6%)
Creating & updating institutional OPAC	7	1	8(18.1%)
Use of Digital Camera for Digitization	13	6	19(43.1%)
Web navigation Skills	6	2	8(18.1%)
CD-ROM/DVD Search	5	1	6(13.6%)
Microsoft Access (Database management skills)	20	8	28(63.6%)
Scanners and similar devices	15	6	21(47.7%)
Troubleshooting technology	11	4	15(34.0%)
Microsoft Excel (Spreadsheet Skills)	22	12	34(77.2%)
Power point (presentation software)	24	14	38(86.3%)
Searching library databases	13	11	24(54.5%)
Installing Printer, scanner and computer	3	1	4(9.0%)
Installing software	4	1	5(11.3%)
Instant messaging	4	0	4(9.0%)
Graphic Design	0	1	1(2.7%)
Web design	1	0	1(2.7%)
Network management	2	0	2(4.5%)
Creating online instructional materials/products	5	1	6(13.6%)
Use of PDF Software	19	12	31(70.4%)
Blogging	1	0	1(2.7%)
Connecting patrons laptop to the library wireless	6	6	12(27.2%)
Computer security knowledge	2	1	3(6.8%)
Computer programming	2	2	4(9.0%)

Source: Authors' Fieldwork Survey (2026)

Table 2: Show high-tech used by the respondents. The study indicated that, 38(86.3%) of the respondents used Microsoft word and power point presentation while 34(77.2%) used Microsoft excess whereas, 33(75%) of the respondents used integrated library system, 31(70.4%) used PDF software, 30(68.1%) used web searching skills, 29(65.2%) used digitised software and 28(63.6%) used micro soft access databased. Meanwhile, network management, computer security knowledge, blogging, graphic design and creative online instructional materials/products, instants messages were the least high-tech skills used by the respondents.

Objectives 2: High-tech skills training attended

Table 3: High-tech Training Attended

(N=44)

S/N	High-tech Skills Training Attended	Federal University of Petroleum Resources	University of Delta, Agbor	Total (%) of respondents
1	Word processing skills	18	13	31(70.4%)
2	Data based management skills	21	9	30(68.1%)
3	Microsoft Excel	23	13	36(81.8%)
4	PowerPoint skills	22	10	32(72.7%)
5	E-mail management skills	7	4	11(25%)
6	Web Searching Skills	6	2	8(18.1%)
7	Use of Digitization Software	19	8	27(61.3%)
8	Using an Integrated Library System (Virtua/Alice for Windows)	21	5	26(59%)
9	Use of Digital Camera for Digitization	4	2	6(13.6%)
10	Searching library databased	9	5	14(31.8%)
11	Citing and evaluating Internet resources	7	3	10(22.7%)
12	Installing printing, scanner and computer system	5	2	7(15.9%)
13	Network management	0	0	0(0%)
14	Computer programming	0	0	0(0%)
15	Graphic design	0	0	0(0%)
16	Web navigation skills	1	0	1(2.7%)

Assessment of High-Tech Skills Competency among Librarians in ... Promise, A. O., Et. al. (2026)

17	Install software	3	1	4(9.0%)
18	Computer security management	0	0	0(0%)
19	CD-ROMs/DVD searching	4	1	5(11.3%)
20	Creating online instructional materials/products	0	0	0(0%)
21	Blogging	0	0	0(0%)
22	Wiki	0	0	0(0%)
23	Troubleshooting technology	3	0	3(6.8%)
24	Troubleshooting printing problem	2	0	2(4.5%)
25	Teaching others to use technology	1	0	1(2.2%)

Source: Field Work Survey, (2026)

Table 3: Show high-tech training attended among the librarians, which indicated that, 36(81.8%) of the respondents attended micro software excel training, while 32(72.7%) attended power point training, whereas 31(70.4%) indicated word processing skills, 30(68.1%) databased management, while 27(61.3%) digitised system and 26(59%) integrated library system. Therefore, respondents were not attended the following training, blogging, wiki, creative online constructional, computer security management, computer programming, web navigation, teaching other to used technology, network management, installation software and troubleshooting.

Objective 3: Modality of acquiring IT training among the librarians in selected university in South-South, Nigeria

Table 4: Mode of Acquiring IT Training (N=44)

Place of Training	Federal University of Petroleum Resources	University of Delta, Agbor	Total % of respondents
LRCN training workshop	19	4	23(52.2%)
NLA training workshop	20	9	29(65.9%)
In house training	23	11	34(77.2%)
Self-development	21	12	33(75%)
Professional courses programmes(within Nigeria)	7	2	9(20.4%)
Foreign workshop and training programmes	3	1	4(9.0%)
NGO programmes	1	0	1(2.2%)

Source: Field Work Survey, (2026)

Table 4: Shown modality of acquiring IT training. 34(77.2%) indicated that they benefited from in-house training organised by their libraries, while, 33(75%) indicated self-development, 29(65/9% indicated Nigerian Library Association and 23(52.2%) indicated LRCN.

Objective 4: Identify the obstacles faced by librarians in acquiring and utilising high-tech skills

Obstacles faced by librarians in acquiring and utilising high-tech skills

Table 5: Obstacles Encountered

Challenges	SA	A	D	SD	Weighed Means
Insufficient institutional support	21	22	0	1	3.43
High cost of digitization equipment/software	27	17	0	0	3.61
Poor ICT infrastructure	26	16	2	0	3.54
Technological inefficiency	30	14	0	0	3.68
Inadequate funding	23	12	9	0	3.31
AI integration	29	15	0	0	3.68
Ethical and security issues	18	16	4	6	3.04
Limited training and skill development	23	15	3	3	3.31

Source: Field Work Survey, (2026)

Aggregate Mean 3.45

Criterion Mean 2.50

As seen from the table 5, the grand mean score of 3.41, being greater than the criterion mean score of 2.50, proposes that the university libraries understudy was encountering huge challenges in the acquiring and utilising high tech skills which include technological inefficiency/ AI integration (X=3.68), high cost of digitisation equipment/software (X=3.61), poor



Assessment of High-Tech Skills Competency among Librarians in ... Promise, A. O., Et. al. (2026)

ICT infrastructure (X=3.54), insufficient institutional support (X=3.43), inadequate funding/limited training and skill development (X=3.31), ethical and security issues (X=3.04),

Discussion of the Findings

Results are organised according to the research objectives. Research objective one revealed the high tech skills used among the librarian in the South-South university libraries understudy which includes, Microsoft word, power point presentation, Microsoft excess, integrated library system, PDF software, web searching skills, digitised software, micro soft access databased. This conforms with Ilesanmi (2023) asserted that librarians conveyed various services to their users, acquired basic ICT skills and were versatile in its application for Internet searches, information retrieval, social communication and Microsoft-office related activities with the exception of programming skills. Supported by Bitri and Akkaya's (2018); Gui and Argentin's (2011) emphasized on the proficient in using search engines, websites, MS Office programs (word processing, presentation, and spreadsheet programs), uploading and downloading files, desktop publishing, web-based learning systems, web page design, database management, and programming, among other digital literacy skills. Research objectives two revealed the high tech training attended by the librarians in the South-South university libraries which include, micro software excel training, power point training, word processing skills, databased management, digitised system and integrated library system. This is in line with Shidi and Nwachukwu (2015) opined that libraries and the mother institutions to get more involved in staff training in various fora such as Microsoft word, excel, power point, skill to download and upload, searching library database, web searching, integrated library software, so that they can develop and enhance their abilities in service delivery.

Research objectives three revealed respondent's modality of acquiring IT training which include, in-house training, self-development, Nigerian Library Association and LRCN. This is in consonant with Chiware (2007), opined on the techniques for training in the digital age, particularly for African university librarians, are workshops or short courses and formal training in library and information science program. Supported by Emiri (2017) and Sambo et al., (2022) asserted that librarians learned digital skills via peer aid, trial and error, information technology courses, and formal schooling. offices organize computer training for staff over time, institutions provide adequate fund for staff training sponsorships, enrolled in private computer and Internet training/ assistance from friends and course mates, I sponsor myself to acquire digital literacy training. Research objective four revealed the challenges encountered by the librarians in acquiring and utilising high tech skills in the university libraries understudy, such as technological inefficiency, high cost of digitisation equipment/software, poor ICT infrastructure, insufficient institutional support, inadequate funding/limited training and skill development, ethical and security issues. This is in line with Ukwoma et al., (2016); and. Okeji et al. (2019) highlighted various obstacles to learning digital literacy, including insufficient funds for professional skill development, a lack of ICT facilities, and a shortage of ICT, absence of ICT facilities, inadequate Internet speed, and the absence of comprehensive digital literacy programs and standards.

Conclusion

It was revealed by the finding of this research that high tech skills such as knowledge of computer security and management of networks, blogging, graphic designing, web design, instant messages, creative online instructions/products are not being used by librarians. Modalities for the acquisition of the training received by the respondents are: in-house training, self-development, Nigerian Library Association, LRCN. As librarians do not only possess some high tech skills, the librarians do also have challenges, which need quick remedies. Contribution of this study is adding to literature and informing readers about the assessment of librarian's high tech skills for excellent service delivery.

Recommendations

Arising from the findings of the study and the conclusion drawn, the following recommendations are put forward:

1. Management should provide adequate training to librarians especially on the aspect of network management, computer security knowledge, blogging, graphic design, web design, instant messages and creative online instructional materials/products, most of the high tech skills claimed not been used among the librarians in the university understudy.
2. University should be committed, support and encourage them to attend professional courses, foreign workshops and non-governmental organization seminar so as to enhance their skills.



Assessment of High-Tech Skills Competency among Librarians in ... Promise, A. O., Et. al. (2026)

3. Lastly, ICT training and retraining must be mandatory and continuous policy, funding and institutional support be given to the libraries and librarians to enhance their passivity. Especially on AI integration.

References

- Bitri, C. E. & Akkaya, M. A. (2018). A comparative study of electronic information literacy levels of researchers: Instances from the Universities of Kastamonu and Çankırı Karatekin in Turkey. *International Conference on Social Sciences and Humanities, Changing the World: Challenges, Opportunities and Responsibilities (ICSSH2017)*, 1(2), 134-148. Retrieved from: <http://dergipark.gov.tr/by>
- Chinware, E.R.T. (2007). *Training librarians for the digital age in African University Libraries*. <http://www.ifla.org/rv/ifla73/satellite1programme.empdf>
- Echezona, R.I., & Ugwuanyi, C.F. (2012). African university libraries and Internet connectivity: challenges and the way forward. *Library Philosophy and Practice*, paper 1446. <https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1446&context=libphilprac>
- Emiri, O. T. (2015). Digital literacy skills among librarians in University Libraries In the 21st Century in Edo and Delta States, Nigeria. *International Journal of Scientific & Technology Research*, 4(8).
- Eromesele, O.C., Omosekejimi, A.F. & Ogo, E.P. (2021). Librarians' ICT competency in the 21st century: A study of federal university libraries in southern Nigeria. *Library Progress (International)*, 41(2), pp.215–226. doi:10.5958/2320-317x.2021.00024.6.
- Gui, M. & Argentin, G. (2011). Digital skills of internet natives: Different forms of digital literacy in a random sample of Northern Italian high school students. *New Media & Society*, 13(6). Retrieved from: <http://nms.sagepub.com/content/13/6/963>
- Hamad, F., Al-Fadel, M., & Fakhouri, H. (2020). "The effect of librarians' digital skills on technology acceptance in academic libraries in Jordan". *Journal of Librarianship and Information Science*, 1–12. <https://doi.org/10.1177/0961000620966644>
- Ilesanmi, T. C. (2023). Librarians' ICT skills and services delivery in private universities in Nigeria. *Information impact: Journal of Information and Knowledge Management*, 14 (1), 54-75. <https://dx.doi.org/10.431/ijikm.v14i1.4>
- Mornmoh & Saka (2016). ICT training skills and use by librarians in special libraries in Abuja, Federal Capital Territory, Nigeria. *International Journal of Applied Technologies in Library and Information Management*. 2 (21):7-16.
- Mulat, T., & Natarajan, M. (2020). "Digital literacy skills among library professionals at Jimma University Libraries". *Library Philosophy and Practice*, 4629. Available at <https://digitalcommons.unl.edu/libphilprac/4629>
- Okeji, C. C., Tralagba, E. C., & Obi, I. C. (2019). "An investigation of the digital literacy skills and knowledge-based competencies among librarians working in university libraries in Nigeria". *Global Knowledge, Memory and Communication*, 69, (4/5), 311-330. Available at <https://doi.org/10.1108/GKMC-05-2019-0054>
- Opele, J.K, & Unegbu, V.E (2012). Staff perception on the relevance of hardcopy materials and library use in this digital age: A study of the National Centre for Technology Management. 4(December), 131–136. <https://doi.org/10.5897/IJLIS11.092>
- Sambo, A. S., Imran., A. A & Akanbi., M. L (2022). Digital literacy skills among certified librarians in Nigerian libraries: Library Overview, *Journal of Digital Learning and Education*, 2(2), 70-79. Available at: <http://journal.moripublishing.com/index.hp/jdle>
- Shidi, H., & Nwachukwu, V (2015). Acquisition of digital library skills by library staff in Benue State, Nigeria. *Information and Knowledge Management*, 3(11), 5-10. Available at: www.iiste.org
- Susan, K.M. & Baby, M.P. (2012). *Developing technology skills for academic libraries: A study based on the universities in Kerala, India. Library Philosophy and Practices(e-journal)* 702 <http://digitalcommons.un.edu/libphi/prac/702>
- Ukwoma, S. C., Iwundu, N.E., & Iwundu, I. E. (2016). "Digital literacy skills possessed by students of UNN, implications for effective learning and performance: A study of the MTN Universities Connect Library". *New Library World*, 117(11/12), 702-720. Available at <https://doi.org/10.1108/NLW-08-2016-0061>



Qualitative Study in Mathematics Education Reforms and Pedagogical Innovations in Nigeria: Addressing Challenges in Secondary School Classrooms

AKISSANI, Ishaku¹

shakiss4real@gmail.com

<https://orcid.org/0009-0008-5844-5789>

+2348062840698

AMINU, Naziru²

aminunaziru@gmail.com

+2348061671347

RABE, Hanafi³

rabehanafi89@gmail.com

+2349132401050

¹Department of Mathematics, Isa Kaita College of Education, Dutsin-Ma, Katsina State, Nigeria

²Department of Mathematics and Computer Science Education, Umaru Musa Yar'adua University, Katsina, Katsina State, Nigeria

³Department of General Studies in Education, Isa Kaita College of Education, Dutsin-Ma, Katsina State, Nigeria

Abstract

Mathematics education remains a critical component of national development, yet persistent poor performance among secondary school students in Nigeria continues to raise concern among educators and policymakers. This paper examines mathematics education reform and pedagogical innovation in Nigeria with a focus on addressing challenges in secondary school classrooms. It reviews relevant literature on reform initiatives, instructional practices, and classroom-based constraints affecting effective mathematics teaching and learning. The paper identifies key challenges, including inadequate instructional resources, large class sizes, insufficient teacher preparation, ineffective curriculum implementation, negative student attitudes toward mathematics, limited instructional time, and teachers' continued reliance on conventional teaching methods. The study further highlights pedagogical innovations such as problem-solving, inquiry-based learning, activity-based instruction, and collaborative learning as effective approaches for improving students' engagement, conceptual understanding, and academic performance in mathematics. However, the successful implementation of these strategies is constrained by systemic and institutional factors, particularly inadequate teacher training and resource limitations. The paper argues that sustainable improvement in mathematics education in Nigeria requires a holistic reform approach that integrates curriculum enhancement, continuous teacher professional development, improved instructional resources, and supportive learning environments. It concludes that pedagogical innovation is essential for transforming mathematics classrooms into active learning spaces that foster critical thinking and problem-solving skills required in the 21st century.

Keywords: Mathematics education Reform; pedagogical innovation; mathematics; classrooms.

Introduction

Mathematics is a fundamental discipline that underpins scientific advancement, technological innovation, and economic development. Its relevance extends beyond the classroom, as it equips individuals with essential skills such as logical reasoning, critical thinking, and problem-solving required for everyday life and participation in a knowledge-driven society (Boaler, 2016). Despite its importance, students' performance in mathematics at the secondary school level in Nigeria has remained consistently low, as reflected in national examination results (Udonsa, 2015). This persistent poor performance has generated serious concerns about the quality of teaching and learning in schools. Several factors have been identified as contributing to this challenge, including ineffective instructional strategies, unfavorable learning conditions, and inadequate instructional resources (Eze & Ikpe, 2023). Among these, instructional strategies appear to play a particularly critical role in shaping students' learning outcomes (Kocak et al., 2021). Thus, the way mathematics is taught directly influences students' understanding, engagement, and overall performance in the subject. In many Nigerian classrooms, traditional or conventional teaching approaches remain dominant. These approaches are largely teacher-centered, focusing mainly on procedural instruction and passive knowledge transmission rather than fostering deep understanding and active learner participation. Consequently, students often struggle to develop conceptual understanding and meaningful



Qualitative Study on Mathematics Education Reforms and Pedagogical Innovations in ... Akissani, I., Et. al. (2026)

connections within mathematical content. Such instructional practices have been widely criticized for their inability to equip learners with the critical thinking and problem-solving skills required in the 21st century (Boaler, 2016). More specifically, the continued reliance on conventional teaching methods that promote memorization and passive learning has been identified as a major factor contributing to students' poor performance in mathematics (Omolafe & Okikiayo, 2023). These methods limit opportunities for students to actively construct knowledge, engage in reasoning, and apply mathematical concepts to real-life situations, thereby hindering meaningful learning. In response to these challenges, mathematics education reform has become imperative in Nigeria. Reform efforts are aimed at improving curriculum implementation, enhancing instructional practices, and promoting better learning outcomes among students. Central to these reforms is pedagogical innovation, which emphasizes learner-centered approaches that actively engage students in the learning process. Such approaches encourage exploration, collaboration, and critical thinking, thereby fostering deeper understanding and improved performance in mathematics (Hiebert & Grouws, 2007). Given the persistent challenges in mathematics education and the growing demand for relevant skills in the modern world, it is essential to examine how pedagogical innovation can be effectively utilized to address existing gaps in teaching and learning. This paper therefore explores mathematics education reform and pedagogical innovation in Nigeria, with particular focus on addressing challenges in secondary school classrooms.

Mathematics Education Reform in Nigeria

Mathematics education reform in Nigeria has evolved over time in response to changing societal needs, global educational trends, and persistent challenges in students' learning outcomes. Historically, the development of mathematics curricula has undergone several transformations aimed at improving both the content and delivery of instruction. One of the most notable reforms was the introduction of the 9-year Basic Education Curriculum, which restructured primary and junior secondary education into a unified system designed to provide a strong foundation in mathematics for all learners (Awofala, 2012). This reform was intended to align Nigeria's education system with international standards and to promote continuity in mathematics learning. The rationale for mathematics education reforms in Nigeria is grounded in the recognition of the subject's critical role in national development. Educational policies emphasize the need for mathematics to foster essential competencies such as problem-solving, analytical reasoning, and technological literacy, which are indispensable in a knowledge-driven economy (Aminu, 2024). Consequently, recent reforms have increasingly shifted focus from content-based instruction to competency-based learning, where students are expected not only to acquire knowledge but also to apply it in real-life situations (Adeoye et al., 2025).

In line with global developments, Nigeria has embraced competency-based curriculum reforms aimed at promoting learner-centered instruction and skills acquisition. These reforms emphasize active learning, collaboration, and critical thinking, as well as the practical application of mathematical concepts (Ibrahim & Adewale, 2024). Furthermore, there has been growing advocacy for integrating mathematics with other disciplines to enhance its relevance and applicability in solving real-world problems (Anyor, 2015). Such interdisciplinary approaches are considered essential for bridging the gap between theoretical knowledge and practical application. Despite these reform efforts, their effectiveness has been limited by several systemic challenges. Studies indicate that although curriculum reforms have introduced innovative content and pedagogical expectations, implementation has often been inconsistent due to inadequate teacher preparation, insufficient funding, and lack of instructional resources (Kunle, 2025). In many cases, reforms have focused more on curriculum design than on classroom realities, resulting in a disconnect between policy intentions and instructional practices. Moreover, research suggests that while some level of alignment exists between curriculum, instruction, and assessment in Nigeria, teaching practices often emphasize lower-order cognitive skills, thereby limiting the development of higher-order thinking abilities. This indicates that although reforms have introduced progressive ideas, their impact on deep learning and conceptual understanding remains limited (Ibrahim & Adewale, 2024). The need for continuous reform is further driven by the recognition that earlier curricula were insufficient to meet the demands of contemporary society. Reforms in secondary school mathematics curricula are therefore essential for promoting human capital development and enhancing global competitiveness (Chinweoke, 2015). This underscores the importance of not only revising curriculum content but also strengthening teaching methodologies and improving teacher capacity. Overall, mathematics education reform in Nigeria represents an ongoing effort to improve the quality and relevance of education. While progress has been made in curriculum restructuring and policy development, the success of these reforms largely depends on effective



Qualitative Study on Mathematics Education Reforms and Pedagogical Innovations in ... Akissani, I., Et. al. (2026)

implementation, teacher preparedness, and the integration of innovative pedagogical practices. Consequently, there is a need to complement curriculum reforms with sustained investment in teacher professional development, instructional resources, and supportive learning environments to achieve meaningful improvements in students' mathematics performance.

Pedagogical Innovation in Mathematics Education

Pedagogical innovation has emerged as a central pillar in contemporary mathematics education reform, particularly in contexts where traditional instructional approaches have proven inadequate for improving students' learning outcomes. In essence, pedagogical innovation refers to the adoption and implementation of teaching strategies that promote active learning, conceptual understanding, and meaningful student engagement. It represents a shift from teacher-centered methods to learner-centered approaches that position students as active participants in the construction of knowledge (Hiebert & Grouws, 2007). In mathematics education, pedagogical innovation is especially important because of the abstract nature of the subject and the widespread difficulties students experience in understanding mathematical concepts. Traditional instructional methods, which emphasize procedural knowledge and passive reception of information, often fail to foster deep understanding or the ability to apply knowledge in novel situations (Boaler, 2016). As a result, innovative pedagogies have been advocated as a means of enhancing both the quality of teaching and students' academic performance. In the Nigerian context, several innovative approaches have been identified to include:

Problem-Solving Instructional Strategy

The problem-solving instructional strategy is widely recognized as a fundamental approach in mathematics education that promotes active engagement and higher-order thinking. This strategy involves presenting learners with mathematical problems that require reasoning, analysis, and the application of prior knowledge to arrive at solutions. Rather than focusing on memorization of procedures, problem-solving emphasizes understanding the underlying concepts and developing flexible thinking skills (Polya, 1957). In the context of mathematics education reform, the problem-solving approach is particularly relevant as it aligns with the goal of developing students' critical thinking and analytical abilities. It encourages learners to explore multiple solution pathways, justify their reasoning, and apply mathematical concepts to real-life situations. Empirical studies in Nigeria have shown that students exposed to problem-solving strategies demonstrate significantly improved performance and deeper conceptual understanding compared to those taught using traditional lecture methods (Nwoke, 2015). Despite its effectiveness, the implementation of problem-solving strategies in Nigerian classrooms is often constrained by factors such as large class sizes, limited instructional time, and teachers' reliance on conventional teaching methods. Nonetheless, its integration into classroom practice remains essential for enhancing students' mathematical competence and preparing them for real-world problem-solving.

Inquiry-Based Learning

Inquiry-based learning is an innovative pedagogical approach that emphasizes exploration, questioning, and discovery in the learning process. In mathematics education, this strategy encourages students to investigate mathematical ideas, formulate hypotheses, and construct knowledge through guided inquiry rather than passive reception of information (Hmelo-Silver et al., 2007). This approach is grounded in constructivist learning theory, which posits that learners actively build knowledge through interaction with their environment. By engaging students in inquiry-based activities, teachers create opportunities for deeper understanding, critical thinking, and sustained engagement. Inquiry-based learning also fosters curiosity and independence, enabling students to take ownership of their learning. Researches by Hmelo-Silver et al. (2007), Simsek and Kabapinar (2010), Ahmad et al. (2023), Ugo and Oliweh (2024), and Oduwole et al. (2025) have shown that inquiry-based approaches significantly enhance students' conceptual understanding, problem-solving abilities, and mathematics performance. However, effective implementation requires careful scaffolding by teachers to ensure that students remain focused and achieve the intended learning outcomes. In the Nigerian context, challenges such as insufficient teacher training and limited instructional resources may hinder its widespread adoption. Nevertheless, inquiry-based learning remains a vital component of pedagogical innovation in mathematics education.

Activity-Based Learning Strategy

Activity-based learning is a learner-centered instructional strategy that involves engaging students in hands-on activities and practical tasks to facilitate understanding of mathematical concepts. This approach makes abstract ideas more concrete by linking them to real-life experiences, thereby enhancing students' comprehension and retention of knowledge. In

Qualitative Study on Mathematics Education Reforms and Pedagogical Innovations in ... Akissani, I., Et. al. (2026)

mathematics classrooms, activity-based learning may include the use of manipulatives, experiments, games, and real-world problem scenarios. These activities encourage active participation, collaboration, and experiential learning, which are essential for developing meaningful understanding. Studies have demonstrated that students taught using activity-based methods perform better academically and exhibit greater interest in mathematics compared to those taught using traditional methods (Bature et al., 2020). The effectiveness of activity-based learning lies in its ability to cater to diverse learning styles and promote engagement among students. However, its successful implementation depends on the availability of instructional materials and teachers' ability to design and manage interactive learning activities. In many Nigerian schools, resource constraints and large class sizes pose significant challenges to the adoption of this approach.

Collaborative Learning Strategy

Collaborative learning is an instructional approach that involves students working together in groups to achieve shared learning goals. In mathematics education, this strategy promotes interaction, communication, and collective problem-solving, allowing students to learn from one another and develop a deeper understanding of mathematical concepts (Johnson & Johnson, 2009). Through collaborative learning, students are encouraged to discuss ideas, explain their reasoning, and evaluate alternative solutions. This process not only enhances conceptual understanding but also develops essential social and communication skills. Collaborative learning environments foster positive interdependence, where students rely on one another to succeed, thereby promoting accountability and teamwork. Empirical evidence has consistently shown that collaborative learning significantly enhances students' performance and engagement in mathematics. This instructional approach promotes interaction among learners, enabling them to share ideas, explain reasoning, and jointly solve mathematical problems. Through such interaction, students develop deeper conceptual understanding while also improving their communication and reasoning skills (Johnson & Johnson, 2009). In addition, collaborative learning has been found to reduce mathematics anxiety and build learners' confidence, particularly among students who struggle with the subject, by creating a supportive peer-learning environment (Slavin, 2014). However, the effectiveness of collaborative learning depends largely on its proper implementation. Research indicates that successful use of this strategy requires careful planning, clearly defined group roles, structured tasks, and active facilitation by the teacher to ensure meaningful participation from all students (Gillies, 2016). Without these conditions, group work may become unproductive and fail to achieve its intended learning outcomes. In the Nigerian context, collaborative learning has been identified as a promising pedagogical approach for addressing persistent challenges associated with traditional teacher-centered instruction. Studies have shown that when students engage in structured group activities, their participation, motivation, and achievement in mathematics improve significantly. For example, Nigerian classroom-based research has demonstrated that cooperative and peer-assisted learning strategies lead to higher academic performance compared to conventional lecture methods (Bature et al., 2020). By fostering interaction and shared responsibility, collaborative learning creates an inclusive classroom environment that enhances students' engagement and improves learning outcomes in mathematics.

Reflective Instructional Strategies

Reflective instructional strategies constitute an important dimension of pedagogical innovation in mathematics education, as they promote critical thinking, self-awareness, and deeper conceptual understanding among learners. Reflective teaching involves encouraging students to think about their own learning processes, evaluate their understanding, and make connections between prior knowledge and new mathematical concepts. This approach shifts learning from mere acquisition of procedures to meaningful engagement with mathematical ideas (Schon, 1983). In mathematics classrooms, reflective strategies may include activities such as self-explanation, journaling, error analysis, and guided questioning. These practices enable students to articulate their reasoning, identify misconceptions, and refine their problem-solving approaches. By engaging in reflection, students develop metacognitive skills, which are essential for independent learning and long-term retention of knowledge (Hiebert & Grouws, 2007). Empirical evidence supports the effectiveness of reflective instructional strategies in improving students' performance in mathematics. For instance, Olamide (2024) found that students exposed to reflective teaching methods demonstrated significantly higher performance and deeper conceptual understanding compared to those taught using conventional methods. Similarly, reflective practices have been shown to enhance students' confidence and reduce mathematics anxiety by promoting a supportive and interactive learning environment. Despite these benefits, the implementation of reflective instructional strategies in Nigerian classrooms remains limited. This is largely due to factors such as time constraints, large class sizes, and teachers' limited familiarity



Qualitative Study on Mathematics Education Reforms and Pedagogical Innovations in ... Akissani, I., Et. al. (2026)

with reflective teaching techniques. Nevertheless, integrating reflective practices into mathematics instruction is essential for fostering higher-order thinking skills and improving students' overall learning outcomes.

Case-Based Instructional Strategies

Case-based instructional strategies represent another innovative approach that has gained attention in mathematics education due to their potential to connect abstract concepts with real-life situations. Case-based learning involves presenting students with real-world or simulated scenarios that require the application of mathematical concepts to solve practical problems. This approach enhances relevance and contextual understanding, making mathematics more meaningful to learners (Herreid, 2011). In mathematics classrooms, case-based instruction can take the form of problem scenarios, real-life applications, or situational analyses that require students to apply mathematical reasoning. By engaging with authentic problems, students develop critical thinking, analytical skills, and the ability to transfer knowledge across contexts. This aligns with contemporary educational goals that emphasize the application of knowledge rather than mere memorization. Empirical studies in Nigeria have demonstrated the effectiveness of case-based strategies in improving students' performance in mathematics. For example, Ogunsaju and Sam-Kayode (2024) reported that students taught using case-based approaches performed significantly better in algebraic problem-solving tasks than those taught using traditional lecture methods. Similarly, case-based learning has been found to enhance students' engagement, motivation, and collaborative learning experiences. However, the successful implementation of case-based instructional strategies requires careful planning, appropriate instructional materials, and teacher competence in facilitating discussion and guiding inquiry. Challenges such as limited resources, large class sizes, and rigid curriculum structures may hinder the adoption of this approach in Nigerian secondary schools. Despite these constraints, case-based instruction remains a valuable pedagogical tool for promoting meaningful learning and bridging the gap between theory and practice in mathematics education.

Technology-Enhanced Learning

In recent years, technology-enhanced learning has also become a key component of pedagogical innovation in mathematics education. The integration of digital tools such as computer simulations, virtual manipulatives, and online learning platforms enables teachers to present mathematical concepts in dynamic and interactive ways. These technologies support visualization, immediate feedback, and personalized learning experiences, which can enhance students' understanding and retention of mathematical knowledge (Clark-Wilson et al., 2014). However, the effective use of technology requires adequate infrastructure and teacher competence, which remain challenges in many developing countries, including Nigeria.

Formative Assessment Practices

Formative assessment practices represent an important innovative strategy for improving teaching and learning in mathematics. Unlike traditional summative assessments, formative assessment focuses on continuous monitoring of students' learning progress and providing timely feedback to guide instruction. This approach helps teachers identify learning gaps and adjust their teaching strategies accordingly, thereby improving student outcomes (Black & Wiliam, 2009). Empirical evidence from Nigeria provides strong support for the effectiveness of pedagogical innovation in improving students' performance in mathematics. For instance, Akinpelu et al. (2024) found that the application of mastery learning strategies significantly enhanced students' academic performance. Similarly, Olamide (2024) reported that the use of reflective instructional strategies improved students' conceptual understanding and overall performance in mathematics. In addition, studies have shown that activity-based and other learner-centered approaches lead to higher academic performance compared to conventional lecture methods, largely due to increased student engagement and active participation in the learning process (Bature et al., 2020). Despite these demonstrated benefits, the adoption and effective implementation of pedagogical innovation in Nigerian secondary school classrooms remain limited. Several constraints continue to hinder its widespread use, including inadequate teacher training, insufficient instructional resources, large class sizes, and resistance to change among educators. These challenges significantly limit teachers' capacity to adopt innovative instructional practices and highlight the need for sustained professional development programmes that equip teachers with the requisite pedagogical skills and competencies (Darling-Hammond et al., 2017). Furthermore, pedagogical innovation extends beyond the mere introduction of new teaching techniques; it involves a comprehensive transformation of the teaching and learning environment. This transformation requires a shift in teachers' beliefs, attitudes, and classroom practices, as well as the provision of supportive institutional frameworks and adequate resources. When effectively implemented, pedagogical innovation has the potential to bridge the gap between curriculum intentions and classroom



Qualitative Study on Mathematics Education Reforms and Pedagogical Innovations in ... Akissani, I., Et. al. (2026)

realities, thereby enhancing students' engagement, understanding, and academic performance in mathematics. Within the broader context of mathematics education reform in Nigeria, pedagogical innovation plays a pivotal role in addressing persistent challenges related to poor student performance and ineffective teaching practices. By promoting learner-centered instruction and fostering higher-order thinking skills, innovative pedagogies contribute significantly to improving the quality and relevance of mathematics education. Therefore, integrating pedagogical innovation into reform initiatives is essential for achieving sustainable improvements in teaching and learning outcomes. However, the persistent constraints affecting their implementation underscore the need to critically examine the challenges confronting mathematics classrooms in Nigerian secondary schools.

Challenges in Secondary School Mathematics Classrooms in Nigeria

Despite ongoing efforts toward mathematics education reform in Nigeria, several challenges continue to hinder effective teaching and learning at the secondary school level. These challenges are multifaceted and interconnected, affecting both instructional delivery and students' academic outcomes. Some of these challenges include:

1. Inadequate Instructional Resources

One of the most critical challenges facing mathematics education in Nigerian secondary schools is the inadequacy of instructional resources. Many schools lack essential teaching materials such as textbooks, mathematical tools, and technological facilities required to support effective instruction. This deficiency limits teachers' ability to employ interactive and innovative teaching methods, thereby reducing students' engagement and understanding of mathematical concepts (Ibe-Moses et al., 2024). Additionally, poor infrastructure, including poorly equipped classrooms and absence of laboratories, further constrains effective teaching and learning (Babajide & Smith, 2022).

2. Poor Teacher Preparation

Effective mathematics instruction requires well-prepared teachers with strong subject knowledge and pedagogical skills. However, evidence suggests that many teachers in Nigerian secondary schools are inadequately prepared to meet the demands of modern mathematics teaching. Teacher education programmes often suffer from outdated curricula and insufficient practical training, resulting in teachers who lack the competence to implement innovative instructional strategies (Disciplines.ng, 2024). This inadequacy negatively impacts the quality of instruction and students' learning outcomes.

3. Large Class Size

Large class size remains a major challenge in Nigerian secondary school classrooms. In many public schools, the number of students per class far exceeds the recommended teacher–student ratio, making effective classroom management and individualized instruction difficult. Studies have shown that overcrowded classrooms reduce students' participation, increase disruptive behaviour, and negatively affect academic performance in mathematics (Akanmu, 2025). Consequently, teachers are often unable to attend to the diverse learning needs of students.

4. Ineffective Curriculum Implementation

Although Nigeria has introduced several curriculum reforms aimed at improving mathematics education, implementation remains a significant challenge. Research indicates that factors such as inadequate funding, lack of instructional materials, and teachers' poor understanding of curriculum content hinder effective implementation (Ige & Arekemase, 2021). In many cases, there is a disconnect between curriculum objectives and classroom practices, resulting in limited achievement of intended learning outcomes.

5. Negative Attitudes towards Mathematics

Students' attitudes toward mathematics play a crucial role in their learning outcomes. In Nigeria, many students perceive mathematics as a difficult and abstract subject, leading to low motivation and poor engagement. Negative attitudes often stem from previous learning experiences, ineffective teaching methods, and lack of relevance of mathematical concepts to real-life situations (Aduwa, 2021). This psychological barrier significantly contributes to poor performance in the subject.

6. Limited Instructional Time

Another challenge affecting mathematics education is the limited time allocated for instruction. The broad nature of the mathematics curriculum, combined with insufficient teaching periods, often prevents teachers from adequately covering the syllabus. This results in superficial teaching of concepts and limited opportunities for practice, which are essential for mastering mathematical skills.



Qualitative Study on Mathematics Education Reforms and Pedagogical Innovations in ... Akissani, I., Et. al. (2026)

7. Teachers' Reliance on Conventional Teaching Methods

Despite the emphasis on learner-centered approaches in recent reforms, many teachers still rely heavily on traditional, lecture-based methods. These methods emphasize passive learning and procedural knowledge rather than conceptual understanding and active engagement. Research has shown that such approaches limit students' ability to develop critical thinking and problem-solving skills, which are essential for success in mathematics (Bature et al., 2020).

8. Insufficient Teacher Training and Professional Development

Continuous professional development is essential for equipping teachers with modern pedagogical skills. However, in Nigeria, opportunities for in-service training, workshops, and professional development are often limited. This lack of ongoing training prevents teachers from updating their knowledge and adopting innovative teaching strategies, thereby limiting the effectiveness of mathematics instruction (Disciplines.ng, 2024).

Implications for Teaching and Learning in Mathematics Education in Nigeria

The findings from literature on mathematics education reform, pedagogical innovation, and classroom challenges in Nigeria have important implications for both teachers and students. These implications are critical for improving instructional quality, enhancing learner engagement, and ultimately raising students' performance in mathematics.

1. Implications for Teachers

For teachers, the literature underscores the need for a fundamental shift from traditional teacher-centered instruction to more learner-centered and interactive pedagogies. Teachers are expected to move beyond procedural teaching approaches and adopt innovative strategies such as problem-solving, inquiry-based, collaborative, and activity-based learning that promote conceptual understanding and critical thinking (Boaler, 2016; Hiebert & Grouws, 2007). This shift implies that teachers must continually develop their professional competencies through sustained training and professional development programmes. Effective teaching of mathematics requires not only strong content knowledge but also pedagogical content knowledge that enables teachers to present abstract concepts in meaningful and relatable ways (Shulman, 1986). However, studies have shown that many Nigerian teachers lack adequate exposure to modern instructional strategies due to insufficient in-service training and limited professional development opportunities (Akanmu, 2025). Furthermore, teachers are expected to integrate formative assessment practices into their instruction to monitor students' understanding and provide timely feedback. This approach helps to identify learning gaps and adjust instructional strategies accordingly, thereby improving learning outcomes (Black & Wiliam, 2009). In addition, teachers must create inclusive classroom environments that encourage participation, reduce mathematics anxiety, and support diverse learners. Overall, the implication is that teachers are central agents of reform, and their readiness, beliefs, and instructional practices significantly determine the success of mathematics education reforms in Nigeria.

2. Implications for Students

For students, pedagogical innovation implies a shift from passive learning to active engagement in the learning process. Students are expected to take greater responsibility for their learning by participating in discussions, collaborative tasks, problem-solving activities, and inquiry-based investigations (Johnson & Johnson, 2009). This active engagement enhances students' conceptual understanding, critical thinking skills, and ability to apply mathematical knowledge to real-life situations. Studies have shown that when students are exposed to learner-centered instructional strategies, their academic performance and interest in mathematics improve significantly (Bature et al., 2020; Olamide, 2024). In addition, students benefit from reduced mathematics anxiety and increased confidence when learning is structured in supportive and interactive environments. Collaborative learning, in particular, fosters peer support and shared understanding, which helps weaker students improve their performance (Slavin, 2014). However, for these benefits to be fully realized, students must also develop positive attitudes toward mathematics and a willingness to engage actively in learning activities. Negative perceptions of mathematics as a difficult subject must be addressed through consistent exposure to meaningful and engaging instructional experiences (Akanbi et al., 2024). In summary, students are no longer passive recipients of knowledge but active participants in knowledge construction, and their engagement is essential for the success of mathematics education reform.

Recommendations

Based on the review of literature on mathematics education reform, pedagogical innovation, and classroom challenges in Nigerian secondary schools, the following recommendations are made to improve teaching and learning outcomes in mathematics:



Qualitative Study on Mathematics Education Reforms and Pedagogical Innovations in ... Akissani, I., Et. al. (2026)

1. Government and educational stakeholders should organize regular and sustained professional development programmes to equip mathematics teachers with modern pedagogical skills that focus on learner-centered strategies such as problem-solving, inquiry-based learning, collaborative learning, and reflective teaching practices.
2. Mathematics teachers should be encouraged and supported to move away from traditional lecture-based instruction toward more interactive and student-centered approaches.
3. Government and school administrators should ensure that schools are adequately equipped with instructional materials, including mathematical tools, textbooks, and digital resources. The integration of technology-enhanced learning tools should also be prioritized to support visualization and engagement in mathematics instruction.
4. Policy interventions should be implemented to reduce overcrowded classrooms, particularly in public secondary schools. Smaller class sizes will enable teachers to provide individualized attention and improve classroom interaction, thereby enhancing student learning outcomes.
5. Curriculum developers should ensure that mathematics curriculum reforms are effectively implemented at the classroom level. There should be strong monitoring and evaluation mechanisms to bridge the gap between curriculum objectives and instructional practices.
6. Teachers should adopt motivational and engaging instructional approaches that reduce mathematics anxiety and promote positive attitudes toward the subject.
7. Students should be encouraged to actively participate in classroom activities, group discussions, and problem-solving tasks. This will promote deeper engagement, collaboration, and improved understanding of mathematical concepts.

Conclusion

This paper has examined mathematics education reform and pedagogical innovation in Nigeria, with particular attention to the challenges affecting secondary school mathematics classrooms. The study revealed that despite various curriculum reforms and policy initiatives, students' performance in mathematics remains persistently low due to systemic and instructional challenges. Key issues identified include inadequate instructional resources, large class sizes, insufficient teacher preparation, ineffective curriculum implementation, and teachers' continued reliance on traditional teaching methods. These challenges collectively hinder effective teaching and limit students' ability to develop critical thinking and problem-solving skills necessary for success in mathematics and in the wider society. The paper further established that pedagogical innovation plays a crucial role in addressing these challenges. Strategies such as problem-solving, inquiry-based learning, collaborative learning, and activity-based instruction have been shown to significantly improve students' engagement, understanding, and academic performance. However, the successful implementation of these strategies depends on adequate teacher preparation, supportive learning environments, and effective educational policies. In conclusion, sustainable improvement in mathematics education in Nigeria requires a holistic approach that integrates curriculum reform with strong pedagogical innovation and systemic support. Teachers, students, policymakers, and other stakeholders must work collaboratively to transform mathematics classrooms into dynamic learning environments that promote active engagement, conceptual understanding, and lifelong learning skills. Only through such coordinated efforts can Nigeria achieve meaningful improvement in mathematics education outcomes and prepare learners for the demands of the 21st century.

References

- Adeoye, M. A., Obi, S. N., Oderinde, O. I., Alabi, O. A., & Sholihah, M. (2025). Tracking the Impact of Competency-Based Curriculum Reform in Nigerian Elementary School Practices (2015-2024). *Auladuna: Journal of Teacher Training for Madrasa Ibtidaiyah Department*, 7(1), 82–103. <https://doi.org/10.62097/ad.v7i01>
- Aduwa, J. (2021). Mathematics teaching and learning processes in secondary schools in Nigeria: Challenges and prospects. *International Journal of Research in Education and Sustainable Development*, 1(6), 20–28.
- Ahmad, M. U., Liman, M. A., & Shehu, L. A. (2023). Inquiry-based learning and senior secondary students' performance in the concept of mensuration in Minna Educational Zone, Niger State, Nigeria. *Faculty of Natural and Applied Sciences Journal of Mathematics and Science Education*, 5(1), 1–7.
- Akanbi, A. O., Adegoke, S. K., & Esho, S. O. (2024). Students' perception of mathematics and learning behaviour in secondary schools in Osun State, Nigeria. *Studies in Education*, 22(1), 115–126.
- Akanmu, M. A. (2025). Class size and mathematics achievement in Nigerian basic schools: A comparative study. *International Journal of Research and Innovation in Social Science*. <https://dx.doi.org/10.47772/IJRISS.2025.903SEDU0319>

Qualitative Study on Mathematics Education Reforms and Pedagogical Innovations in ... Akissani, I., Et. al. (2026)

- Akinpelu, G. A., Salman, M. F., Akinpelu, S. A., & Ameen, K. S. (2024). Effects of mastery learning strategy on senior school students' performance in mathematics in Osogbo, Nigeria. *Discover Education*. 3(197), <https://doi.org/10.1007/s44217-024-00285-6>
- Aminu, N. (2024). Research and Educational Policy in Nigeria: Role of Mathematics Education in Ensuring National Development. *ASUS Journal of Education*, 9(1), 45–56.
- Anyor, J. W. (2015). Integrating mathematics and other disciplines in Nigeria: A stand for curriculum reform. *Journal of Education and Policy Review*. 7(2), 63–70.
- Awofala, A. O. A. (2012). An analysis of the new 9-year basic education mathematics curriculum in Nigeria. *Acta Didactica Napocensia*, 5(1), 17–28.
- Babajide, O. P., & Smith, C. (2022). Teachers' challenges in the implementation of systemic change in Nigerian schools. *SAGE Open*. 12(2), <https://doi.org/10.1177/21582440221093033>
- Bature, I. J., Atweh, B., & Oreoluwa, F. (2020). Investigating the perception of senior secondary school students on the role of classroom engagement in mathematics problem solving. *Journal of Research in Science, Mathematics and Technology Education*, 3(2), 73–105. <https://doi.org/10.31756/jrsmte.323>
- Black, P., & Wiliam, D. (2009). Developing the theory of formative assessment. *Educational Assessment, Evaluation and Accountability*, 21(1), 5–31.
- Boaler, J. (2016). *Mathematical mindsets: Unleashing students' potential through creative math*. Jossey-Bass.
- Chinweoke, F. U. (2015). Reforms in secondary schools mathematics curricula in Nigeria: A need for human resource development for global competitiveness. *American Academic & Scholarly Research Journal*, 7(5), 121–128.
- Clark-Wilson, A., Robutti, O., & Thomas, M. (2014). Teaching with digital technology. In S. Lerman (Ed.), *Encyclopedia of mathematics education* (pp. 545–553). Springer.
- Darling-Hammond, L., Hylar, M. E., & Gardner, M. (2017). Effective Teacher Professional Development. Research Brief. Learning Policy Institute. <https://doi.org/10.54300/122.311>
- Disciplines.ng. (2024). Challenges in Nigerian teacher education. Retrieved from <https://disciplines.ng/teacher-education-challenges/?utm> on 11th April, 2026.
- Eze, B. N., & Ikpe, R. O. (2023). Factors Influencing Performance in Mathematics among Senior Secondary School Students: A Case Study of St. Theresa's College, Nsukka, Enugu State, Nigeria. *Sapientia Foundation Journal of Education, Sciences & Gender Studies*. 5(2), 137–156.
- Gillies, R. M. (2016). Cooperative Learning: Review of Research and Practice. *Australian Journal of Teacher Education*, 41(3). <https://doi.org/10.14221/ajte.2016v41n3.3>
- Herreid, C.F. (2011). Case study teaching. *New Directions for Teaching and Learning*, 2011(128): 31–40. <https://doi.org/10.1002/tl.466>
- Hiebert, J., & Grouws, D. A. (2007). The effects of classroom mathematics teaching on students' learning. In F. K. Lester Jr. (Ed.), *Second handbook of research on mathematics teaching and learning* (pp. 371–404). Information Age Publishing.
- Hmelo-Silver, C. E., Duncan, R. G., & Chinn, C. A. (2007). Scaffolding and Achievement in Problem-Based and Inquiry Learning: A Response to Kirschner, Sweller, and Clark (2006). *Educational Psychologist*, 42(2), 99–107.
- Ibe-Moses, K. C., James, N. C., Osaro, G., & Abiona, M. (2024). Investigating the Influence of Instructional Materials on the Academic Performance of Secondary School Students in Mathematics. *International Journal of Research and Innovation in Social Science*. <https://dx.doi.org/10.47772/IJRIS.2024.807038>
- Ibrahim, A. B., & Adewale, F. O. (2024). Revolutionizing mathematics education: Innovative methods for curriculum design and assessment in Nigeria. *International Journal of Intelligent Systems and Computing*. 11(1), 18–25.
- Ige, A. M., & Arekemase, T. A. (2021). Perception of Teachers on the Challenges Facing Implementation of the New Senior Secondary Education Curriculum in Ondo State, Nigeria. *International Academic Journal of Education and Literature*. 2(1), 1–9. <https://doi.org/10.47310/iajel.2021.v02i01.011>
- Johnson, D. W., & Johnson, R. T. (2009). An educational psychology success story: Social interdependence theory. *Educational Researcher*, 38(5), 365–379.
- Kunle, O. (2025). Rethinking education in Nigeria: Curriculum reform, teacher preparedness and student engagement in the digital age. *International Journal of Social Science and Human Research*, 8(9), 6973–6978.
- Kocak, O., Goksu, I., Goktas, Y. (2021). The factors affecting academic achievement: a systematic review of meta analyses. *International Online Journal of Education and Teaching (IOJET)*, 8(1). 454–484.
- Nwoke, B. I. (2015). Impact of problem-solving approach on senior secondary school students' achievement in mathematics. *Journal of Research in Education and Society*. 6(1), 27–33.
- Oduwale, O. S., Anaduaka, U. S., & Orji, N. O. (2025). Effects of Inquiry-Based Learning and Gardner's Learning Styles Classifications on Secondary School Students' Mathematics Achievement in Federal Capital Territory, Abuja,



Qualitative Study on Mathematics Education Reforms and Pedagogical Innovations in ... Akissani, I., Et. al. (2026)

Nigeria. *American Journal of Education and Evaluation Studies*, 2(8), 80–95. Retrieved from <https://semantjournals.org/index.php/AJEES/article/view/2308>

Ogunsaju, A. O., & Sam-Kayode, C. O. (2024). Effects of Case-based Strategy on Academic Achievement in Mathematics Algebraic Word Problems among Junior Secondary School Students in Ibadan Metropolis, Oyo State, Nigeria. *International Journal of Research and Innovation in Social Science*. <https://dx.doi.org/10.47772/IJRISS.2024.806202>

Olamide, J. A. (2024). Improving Secondary School Students' Mathematics Achievement through Reflective Instructional Strategies in Nnewi Education Zone. *Statistics and Mathematical Research Journal*. 12(2), 1–11. <https://doi.org/10.5281/zenodo.17368238>

Omolafe, B. E., & Okikiayo, A. E. (2023). Effect of Activity-Based Teaching strategy on Students' Academic Performance in Mathematics Concept. *Pedagogia Jurnal Ilmu Pendidikan*. 21(3), 261–274.

Polya, G. (1957) *How to Solve It. A New Aspect of Mathematical Method*. 2nd Edition, Princeton University Press, Princeton.

Schon, D.A. (1983) *The Reflective Practitioner: How Professionals Think in Action*. Basic Books, New York.

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 4–14.

Simsek, P., & Kabapınar, F. (2010). The effects of inquiry-based learning on elementary students' conceptual understanding of matter, scientific process skills and science attitudes. *Procedia - Social and Behavioral Sciences*, 2(2), 1190–1194.

Slavin, R. E. (2014). Cooperative learning and academic achievement. *Anales de Psicología*, 30(3), 785–791.

Udonsa, A. E. (2015). Trend on Students' Performance in Mathematics at the Senior Secondary Certificate Examination in Nigeria. *Journal of Research in Education and Society*. 6(2), 14–21.

Ugo, H. E., & Oliweh, S. I. (2024). Overview of the Impacts of Inquiry-Based and Peer Teaching Strategies on Mathematics Achievement. *Faculty of Natural and Applied Sciences Journal of Mathematical Modeling and Numerical Simulation*, 2(1), 64–71. Retrieved from <https://fnasjournals.com/index.php/FNAS-JMNS/article/view/539>



Correlation Between Learning Styles and Online Interaction among Postgraduate Students in Universiti Teknologi Malaysia, Malaysia

LAWAL, Yahaya¹

Email: yahayalawal24@gmail.com

Phone: +2348036589898

ROSLI, Mohammad Shafie²

Email: shafierosli@utm.my

¹Department of General Education, School of Sciences, Vocational & Technical Education (SSVTE), Nuhu Bamalli Polytechnic, Zaria, Kaduna State, Nigeria.

²Department of Advanced Learning Technology, Faculty of Educational Sciences and Technology, Universiti Teknologi Malaysia, Skudai, Johor, Malaysia.

Abstract

Learning styles in relation to online interaction is still a belligerent issue especially at postgraduate level, online teaching and learning are vital, their successes or failures depends so much on interaction. Although learning style is widely considered to be a determinant of online interactions among students, yet very few studies have established relationship between the two. This research aimed at finding out the relationship between learning style and online interaction of the postgraduate students of the University Technology Malaysia (UTM). The study used survey questionnaire as an instrument for data collection, convenience systematic sampling technique was used, a total of 210 questionnaires were distributed to the post-graduate students of the UTM, and 150 questionnaires were fully completed and returned. VARK inventory version 7.8 was integrated into a survey to identify the learning styles of the participants, The data obtained was analyzed statistically, eventually the responses were classified into four learning styles: visual, aural, read/write and kinesthetic; while the other aspect of the questionnaire captured data on online interaction of the respondents, correlations between participants' learning styles and online interaction was statistically computed using SPSS nonparametric tool- Chi Square. The results indicated that kinesthetic was the preferred learning style of the respondents and there was no relationship between learning style and online interaction. This research extends earlier studies by finding out if really students use VARK learning styles to learn, the study is of great importance to both instructors and students.

Keywords: Learning Style, VARK Model, VARK Inventory, Online Interaction, Post Graduate Students

Introduction

There are many definitions of learning styles yet there is no single definition that is universally accepted, however, various researchers made several attempts to define the concept. Learning styles was defined as individual's distinctive choice in terms of receiving, processing, remembering and relating with information during learning activities (Indriatik & Rahma, 2024). Learning style is also conceptualized as the way by which the learner manages, processes, represents, and combines data and preserves it in his mental reservoir, then recovers the information and experiences in the style that replicates his technique of communicating while learning (El-Sabagh, 2021). This is a very comprehensive and functional definition as it describes the two essential elements of learning style: how individual learner processes information and demonstrates learning. There are numerous ways of classifying learning styles and students are found in every one of them, some of the prominent learning style models include the following: VARK Model, the Four-Dimensional Model, the Kolb Experiential Learning Model, the Honey & Mumford Model (Practical Adaptation of Kolb) and the Grasha-Riechmann Model- this is very popular for social interaction. Most of the learning style models have their peculiar inventories for researchers to use them for data collection. Therefore, this study focuses on the VARK learning styles (Visual, Auditory, Read/Write and Kinesthetic). However, VARK is an inventory model for identifying individual's learning style, it is an acronym which refers to Visual Aural Read/Write and Kinesthetic. The model originated from VAK model; it was modified to VARK by Neil Fleming in the year 2006. VARK categorized learners into four different types based on the individual senses: Visual, Aural, Reading/Write and Kinesthetic. VARK is one of the most famous models used to categorise learners according to their styles (El-Sabagh, 2021). VARK has its peculiar questionnaire, VARK has been used for various educational purposes and it has been very operational in assisting students to enhance their academic skills as a result of identifying their learning styles (Rashid et al., 2023). One of the advantages of the VARK questionnaire is that the questions define real life situations that individuals can simply comprehend and relate to daily experience. It was established that VARK is the most widely used inventory among all the learning style inventories (Hattie & Yates, 2013). A learner's preference may not certainly

Correlation Between Learning Styles and Online Interaction among ... Lawal, Y. & Rosli, M. S. (2026)

signify their strong points; a person may be discovered to possess an aural preference that is best by listening that would not repudiate him from benefitting from reading information. A lot of literature discussed immensely on the factors affecting learning styles such as sex, age, teaching methods or even the learning style of the teacher himself. Some researchers have reiterated the importance of matching learning style and teaching style; they emphasized that teachers should amend their teaching styles to match their students' learning styles. Kuluşaklı suggested that learning styles be incorporated into the teacher education programs so that teachers would understand the various nature of learning styles and know what types of learning strategies should be used to develop students' learning. He further explained that if students understand their learning styles it can help them to increase their learning strategies to attain high academic goals (Kuluşaklı, 2026). If students identify their own learning style, they will be able to incorporate it into their learning process. Comprehending learning styles can assist in making more effective learning experience because there is a significant influence of learning style on student learning outcomes (Nurjannah et al., 2024). Students are made conscious of their own learning styles to enhance the quality of their learning process to become flexible learners, (Lau Kiat Hiong & Ying-Leh Ling, 2020). Furthermore, online interaction can be defined as any form of transfer of information, message, or societal intercourse between people otherwise between a person and a virtual platform such as collaborative instruments, social media, digital games, Learning Management System (LMS), blogs, and virtual forums in synchronous or asynchronous format. The famous literature on online interaction was published by Michael G. Moore, he classified interaction into three main categories: Learner-Content interaction, Learner-Instructor interaction and Learner-Learner interaction (Moore, 1989). Moreover, Hillman, Willis, and Gunawardena eventually advocated Learner-Interface Interaction. They argued that the types of interaction identified by Moore neglected the interaction that takes place when a learner uses prevailing technologies to relate with the content, the instructor and other students. They observed that the interaction between the learner and the technology is a crucial component that delivers instruction (Hillman et al., 1994). Moreover, social network sites are used for different purposes including education in order to improve learning; through these instruments like Facebook, X, WhatsApp, e-learning etc. discussions are held for online academic interaction which can be used to measure online interaction quantitatively or qualitatively (Wanpen, 2013). Over the years, learning style is drawing increased attention among the global scholars in the realm of teacher education, what seriously baffles them is learning style in relation to online interaction. There are a lot of topical researches carried out to investigate issues related to learning styles and /or online interaction but researches that focused solely on post-graduate are not very much available. In line with this, this research focusses on the learning style and online interaction of the postgraduate students of the University Technology Malaysia (UTM).

Statement of the Problem

Every individual is unique, but why is individual difference being neglected while planning lessons? The idea of individual differences is not new in the teaching and learning process, it has been professionally recognized and established that some problems associated with pedagogy can best be tackled if individual attention is offered. Individual differs in intelligence, temperament, learning style, physical appearance, etc. since students have different features, their learning styles need to be put into cognizance in teaching and learning situation especially at tertiary institutions (Kuluşaklı, 2026). Learning style is one the fundamental aspects of individual differences which manifests how people learn differently. Accordingly, additional research is needed to elucidate the extent to which learning styles contribute to technology-mediated situations (Tedi Gandara et al., 2025). El-Sabagh (2021) established that new studies are needed to design operational environments in which adaptive learning can be used to enhance academic performance and motivation; he also stressed the need for new quasi-experimental and descriptive studies to better comprehend the advantages and challenges of integrating adaptive e-learning in higher education institutions. Therefore, more researches are deemed necessary in order to elucidate the level at which learning styles meaningfully supports technology-facilitated settings and how they interrelate with other elements such as Learning Management System (LMS), artificial intelligence, and learner technological proficiencies (Tedi Gandara et al., 2025). Research has shown that several studies on learning styles failed to identify the preferred learning styles of online learners, as such, there is need for research in this area to fully study the variables (De Corte, 1990).

The Purpose of the Study

The purposes of this research are to identify the most preferred element among the VARK learning styles model of the UTM post-graduate students, to identify whether UTM postgraduate students use VARK learning styles to learn, to identify the rating of the UTM post-graduate students on their participation in online interaction and to discover the relationship



Correlation Between Learning Styles and Online Interaction among ... Lawal, Y. & Rosli, M. S. (2026)

between learning styles and online interaction of the postgraduate students of the University Technology Malaysia. It is envisioned that certain learning style makes a difference in online interaction and this difference plays a major role in academic interaction of the students which later makes a significant impact on their educational performance.

Objectives of the Study

The research has the following objectives:

1. To identify the preferred element of VARK learning styles of the UTM post-graduate students.
2. To identify whether UTM postgraduate students use VARK learning styles to learn.
3. To identify the rating of the UTM post-graduate students on their participation in online interaction.
4. To investigate the relationship between learning styles and online interactions among UTM post-graduate students.

Research Questions

This research has the following questions:

1. What is the preferred element of VARK learning styles of the UTM postgraduate students?
2. Do UTM postgraduate students use VARK learning styles to learn?
3. How would the UTM post-graduate students rate their participation in online interaction?
4. Is there any relationship between VARK learning styles and online interaction?

Null Hypothesis

The following null hypothesis was formulated and tested.

There is no relationship between learning style and online interaction among UTM post-graduate students

Methodology

The participants were the postgraduate students of the University Technology Malaysia from the following faculties: Engineering, Social Science and Humanities, Built Environment and Surveying and the Faculty of Science. The sample varied in relations to age, gender, and academic statuses. The researchers used convenience systematic sampling where every single third person who was going into the main library of the UTM during the sampling period was scientifically chosen. Gravetter and his associates stressed that this sampling method assists researchers to realize extensive representation (Gravetter, F. J et al., 2026). Two questionnaires were merged and used in the survey, the first was the adopted VARK questionnaire version 7.8 which contained 16 items that measured the learning styles of the samples. The second was the questionnaire developed by the researchers which contained 12 questions that measured online interaction of the participants. The researchers used self-reported survey where participants were asked to rate their online interaction according to their individual perception. Self-reported survey is one of the effective measurement approaches used for measuring online interaction (Christian & John, 2010). Questions were designed in a Likert Scale format, the participants were asked to indicate their level of (dis)agreement on a question based on the Likert Scale pattern, the five point rating scale format: Strongly Disagree (SD) = 1 points, Disagree (D) = 2 points, Moderately Agree (MA) = 3 points, Agree (A) = 4 points, and Strongly Agree (SA) = 5 points. The instrument was subjected to content validity by Test and Measurement experts in the Faculty of Education, University Technology Malaysia and Prior to the study, the research instrument was pilot tested. Cronbach's Alpha was used to assess internal consistency of the scores, the result of the reliability test revealed that the questionnaire had high internal consistency level with Cronbach's Alpha 0.74 this signifies a very adequate level of reliability (Taber, 2018). Thus, to identify the distributions of learning styles among the participants, the researchers used the adopted VARK inventory, it was analyzed by using simple percentage and frequency. The data collected on online interaction and relationship between learning style and online interaction were analyzed with the aid of Statistical Package for Social Science (SPSS) software version 20; Pearson Chi Square was used to determine the relationship between the students' learning styles and their online interaction at 0.05 level of significance.

Presentation of Results

A total of 210 questionnaires were disseminated to the participants, 150 questionnaires were entirely completed and returned, demonstrating 71.43% response rate; the results of the study were obtained and tabulated accordingly. The participants of this research were the post-graduate students of the University Technology Malaysia (UTM), among the 150 respondents, 56% were males while 44% were females. 81.3% were Masters Students, only 18.7% were PhD students; furthermore, 45.3% of the respondents were married whereas 54.7% were single.

Correlation Between Learning Styles and Online Interaction among ... Lawal, Y. & Rosli, M. S. (2026)

Table 1

The Learning Styles of the Respondents

Learning Styles	Frequency (F)	Percent (%)
Visuals	30	18.4
Aural	35	21.5
Read/Write	31	19.0
Kinaesthetic	67	41.1
Total	163	100%

Table 1 presents information on the learning style of the respondents, the data collected from the VARK questionnaire were analyzed using frequency and percentages in order to identify the distributions of learning style of the participants. It can be observed that the summation of the four categories is 163 instead of 150; this is because VARK questionnaire have endorsed multiple answers, owing to that, thirteen (13) participants had dual learning styles. The result presented indicates that the kinesthetic learning style had the highest percentage (41.1%), followed by Aural with 21.5%, Read/Write 19% and Visual learners 18.4%.

Table 2

Participants' Usage of Learning Styles

Item Statements	SD	D	MA	A	SA	MEAN	ST.DEV
I use my learning style to learn	3	1	15	79	52	4.17	.79
I learn easily if I use my learning style	3	3	8	84	52	4.19	.79
I learn faster if teaching is in line with learning style	5	2	12	79	52	4.14	.88
I use my learning style only if I have a complex learning task.	6	34	43	47	20	3.27	1.08
Using learning style is part of my learning strategy.	4	5	25	79	37	3.93	.89

Table 2 presents information on participant's usage of learning styles, the table reveals that the respondents unanimously agreed on all the items of the above table especially on: personal usage of learning style, simplicity and speed of learning if related to learning style with mean score of 4.17, 4.19 and 4.14 respectively. Other items in the table on the complexity of learning task and learning strategy all support the participants' usage of learning style looking at their mean score: 3.27 and 3.93.

Table 3

Rating of Respondents' Participation in Online Interaction

Rating	Frequency (F)	Percentage (%)
Very Low	3	2.0
Below Average	11	7.3
Average	67	44.7
Above Average	51	34.0
Very High	17	11.3

Table 3 presents the rating of respondents' level of participation in online interaction, Average was the highest with 44.7% of the total samples' responses; the second highest was Above Average with 34.0% while 11.3% believe that they were Above Average.

Table 4

Correlation between Learning Styles and Online Interaction

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.605 ^a	12	.264
Likelihood Ratio	16.769	12	.158



Correlation Between Learning Styles and Online Interaction among ... Lawal, Y. & Rosli, M. S. (2026)

Linear-by-Linear Association	.587	1	.443
N of Valid Cases	150		

Table 4 presents the result of the relationship between learning styles and online interaction, the correlation between the respondents' learning styles and their online interaction was performed using Pearson Chi-Square test, and the table indicates that the value is 14.605^a with 12 degree of freedom (DF) while the significance level is .264.

Discussion of Findings

A large number of the samples of this study was kinesthetic learners, this means that they possess exceptional hand-eye coordination abilities. Kinesthetic learners have a preference of learning by means of direct practice, besides, kinesthetic learning style is also branded as “learning by doing”. They learn effectively if they are engaged energetically with their environment and in activities such as practical and excursions especially if it involves the use of multiple senses, kinesthetic style can be instrumental in developing technical skills of students, a number of researchers have found that their samples were kinesthetic learners (Shah et al., 2013; Whillier et al., 2014). In a reputable study conducted at middle and high school students in Bosnia and Herzegovina, the result showed that the auditory learning style was the most preferred learning style for (Adela Mašić et al., 2020). In another study on Learning strategies and learning styles in distance learning in higher education the most preferred learning style was the logical learning style (Kuluşaklı, 2026). Apparently, a number of researches have shown that if learning styles of the learners are identified and instructions are focused toward the preferred learning styles of the learners, learning can be enhanced (El-Sabagh, 2021). This shows that the awareness of learning styles has implications for both the instructors and the students. If students discover their learning preferences, it considerably benefits them to use the proper learning strategies, and this makes the students to become self-directed learners and use most of their true potentials. Moreover, if teachers are aware of the students' learning styles they can integrate their teaching approaches to conform to the students' learning preferences, this produces an effective learning environment (Nurjannah et al., 2024). It is established that learning styles is an essential component of enhancing the efficiency of adaptive learning because every individual is unique in processing information, therefore, using VARK model gives room for customisation of leaning material to suit individual learner. This customisation enhances learning outcomes, motivation and online interaction during the learning process (Indriatik & Rahma, 2024).

The result of this research reveals that the participants used their learning styles, the samples strongly agreed that they used their learning styles to learn; this implies that learning style is very important to the samples and their decisions or actions affect their learning. When one uses his/her learning style he/she may not necessarily get the best academic result but he will be comfortable on the process of learning and can cope with complex learning situations. Some researchers have established that there is correlation between learning style and students' academic accomplishment. In another similar research conducted in higher institution and at the same time used VARK learning styles model established that based on students' learning style (kinesthetic; auditory; visual; read/write), adaptive content has a positive influence on adaptive individual's academic attainment and online interactions with content, peers, and instructors (El-Sabagh, 2021). In another correlational research, it was found out that kinesthetic learning styles proved to possess reasonable positive correlation with academic performance (Tedi Gandara et al., 2025). Nurjannah et al., (2024) established that learning styles stimulates the students to accomplish academic achievement. The participants of this research indicated that they use their VARK learning styles ubiquitously even in learning situations that are not complex, in addition, using their learning styles is one of their strategies for learning. This means that the samples internalize the attitude of using learning styles in their academic undergoing; the participants of this research showed that learning is faster if teaching is in line with their learning style. This is consistent with the some notable studies which have argued that teaching style should be planned in accordance with the learning styles of the learners (Kuluşaklı, 2026; Nurjannah et al., 2024). Moreover, on the issue of participants' partaking on online interaction, the findings of this research indicate that the respondents significantly rated themselves high that they frequently participate in online interaction. Thus, only 2.0% and 7.3% rated themselves very low and below average respectively. Furthermore, the data reveals the extent to which an individual sample participates in online interactions, the general belief of the samples is that they participate tremendously in online interaction. This study is very consistent with Lamon and his partners who established that interactive activities and external video links were the second most preferred learning activity in online postgraduate course, and that students value personal interaction and

Correlation Between Learning Styles and Online Interaction among ... Lawal, Y. & Rosli, M. S. (2026)

instantaneous feedback (Lamon et al., 2020). Thus, on the relationship between learning style and online interaction, the result of this research shows that the P value was 0.264 which is more than the alpha value ($p > 0.05$). This means that the null hypothesis is accepted, that is, there is no relationship between learning styles and online interactions. The implication is that the learning styles of students do not affect their online interactions; in other words, the online interactions of the participants are not determined by their learning styles. Shaw reported no significant relationship between learning styles and online participation, although the participants interact in the forum, yet no significant association was found between their learning styles and their interactive behaviours (Shaw, 2012). On the other hand, Wanpen (2013) stressed that relationships exist between some features of learning styles and the use of social network interactions, this information is very instrumental for planning discussion activities for the blended learning. In a learning situation, social interaction is very broad, it comprises working together with classmates, deliberating with the teacher, or engaging in group activities and virtually it also includes interaction by using keyboard, that is Learner-Key-board-Interaction. Nurjannah et al., (2024) found out that social interaction has a significant influence on learning outcomes. Thus, Huang and his colleagues found a significant association between learning styles and students' online participatory interaction; their study is inconsistent with the present research because this study have established that there is no relationship between learning styles and online interactions (Huang et al., 2012). Moreover, in online learning platforms, students who are visual and kinesthetic learners support more successfully with digital platforms and may benefit more from multimedia and interactive content (Tedi Gandara et al., 2025). Cheng and Chau found out that learning styles are significantly correlated with student's participation in information access, interactive learning, networked learning, and materials development; they concluded that that learning styles are significantly related to online participation (Cheng & Chau, 2016). The possible reason that may cause this inconsistency may be because this research was conducted in a University of Technology where majority of the students' learning style is kinesthetic who by their nature prefer practical engagement rather than passive participation.

Conclusion

Kinesthetic learning style is crucial for students in the area of technology; teachers should focus their instructional methods toward hands-on or proactive strategies in order to meet the needs of the kinesthetic learners. This research concludes that there is no relationship between learning styles and online interaction; however, the implication here is that instructors should not put so much emphasis on learning styles of the students while planning and engaging them in online interaction as it has no relationship with online interaction.

Recommendations

The Study recommended that;

1. Instructors should use multiple methods of teaching as much as possible for the fact that one method or strategy cannot satisfy all the learners.
2. Instructors should strive to understand students individually this helps in taking care of their differences.
3. Further researches should investigate if there is association between kinesthetic learning style and Learner-Interface interaction.

References

- Adela Mašić, Edda Polz, & Senad Bećirović. (2020). The Relationship between Learning Styles, GPA, School Level and Gender. *European Researcher*, 11(1). <https://doi.org/10.13187/er.2020.1.51>
- Cheng, G., & Chau, J. (2016). Exploring the relationships between learning styles, online participation, learning achievement and course satisfaction: An empirical study of a blended learning course. *British Journal of Educational Technology*, 47(2), 257–278. <https://doi.org/10.1111/bjet.12243>
- De Corte, E. (1990). Learning with new information technologies in schools: Perspectives from the psychology of learning and instruction. *Journal of Computer Assisted Learning*, 6(2), 69–87. <https://doi.org/10.1111/j.1365-2729.1990.tb00350.x>
- El-Sabagh, H. A. (2021). Adaptive e-learning environment based on learning styles and its impact on development students' engagement. *International Journal of Educational Technology in Higher Education*, 18(1), 53. <https://doi.org/10.1186/s41239-021-00289-4>
- Gravetter, F. J, Forzano, L.-A. B, & Witnauer, J.E. (2026). *Research Methods for the Behavioral Sciences (7th edition)*. Belmont, CA: Wadsworth Cengage Learning (7th edition). Wadsworth Cengage Learning.
- Hattie, J., & Yates, G. C. R. (2013). *Visible Learning and the Science of How We Learn* (0 edn). Routledge. <https://doi.org/10.4324/9781315885025>

Correlation Between Learning Styles and Online Interaction among ... Lawal, Y. & Rosli, M. S. (2026)

- Hillman, D. C. A., Willis, D. J., & Gunawardena, C. N. (1994). Learner-interface interaction in distance education: An extension of contemporary models and strategies for practitioners. *American Journal of Distance Education*, 8(2), 30–42. <https://doi.org/10.1080/08923649409526853>
- Huang, E. Y., Lin, S. W., & Huang, T. K. (2012). What type of learning style leads to online participation in the mixed-mode e-learning environment? A study of software usage instruction. *Computers & Education*, 58(1), 338–349. <https://doi.org/10.1016/j.compedu.2011.08.003>
- Indriatik, I., & Rahma, H. (2024). Personalized Learning Experiences Exploring Adaptive E-Learning Systems for Different Learning Styles. *Journal of Blended and Technical Education*, 1(1), 72–86. [https://doi.org/10.70764/gdpu-jbte.2024.1\(1\)-07](https://doi.org/10.70764/gdpu-jbte.2024.1(1)-07)
- Kuluşaklı, E. (2026). Learning strategies and learning styles in distance learning in higher education. *Frontiers in Psychology*, 16, 1659561. <https://doi.org/10.3389/fpsyg.2025.1659561>
- Lamon, S., Knowles, O., Hendy, A., Story, I., & Currey, J. (2020). Active Learning to Improve Student Learning Experiences in an Online Postgraduate Course. *Frontiers in Education*, 5, 598560. <https://doi.org/10.3389/educ.2020.598560>
- Lau Kiat Hiong & Ying-Leh Ling. (2020). *Learning Styles and Online Technology Learning Platform among Undergraduate Students in Sarawak*. 1(1), 11–23.
- Moore, M. G. (1989). Editorial: Three types of interaction. *American Journal of Distance Education*, 3(2), 1–7. <https://doi.org/10.1080/08923648909526659>
- Nurjannah, Riskawati.B, Syamsu Rijal, & Mustari. (2024). The Influence of Educational Technology, Social Interaction and Learning Style on Learning Outcomes with Learning Interest as An Intervening Variable in Class X Students in Madrasah Aliyah Negeri 1 Makassar City. *Sanskara Pendidikan Dan Pengajaran*, 2(02). <https://doi.org/10.58812/spp.v2i02>
- Rashid, A. B., Raja Ikram, R. R., Thamilarasan, Y., Salahuddin, L., Yusof, N. F. A., & Rashid, Z. B. (2023). A Student Learning Style Auto-Detection Model in a Learning Management System. *Engineering, Technology & Applied Science Research*, 13(3), 11000–11005. <https://doi.org/10.48084/etasr.5751>
- Shah, K., Ahmed, J., Shenoy, N., & N, S. (2013). How different are students and their learning styles? *International Journal of Research in Medical Sciences*, 1(3), 1. <https://doi.org/10.5455/2320-6012.ijrms20130808>
- Shaw, R.-S. (2012). A study of the relationships among learning styles, participation types, and performance in programming language learning supported by online forums. *Computers & Education*, 58(1), 111–120. <https://doi.org/10.1016/j.compedu.2011.08.013>
- Taber, K. S. (2018). The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education. *Research in Science Education*, 48(6), 1273–1296. <https://doi.org/10.1007/s11165-016-9602-2>
- Tedi Gandara, Rista Erika, Mia Siti Nurazizah, & Imas Masitoh. (2025). Analysis of the Relationship between Learning Styles and Student Learning Outcomes in the Digital Era. *At Turots: Jurnal Pendidikan Islam*, 7(2), 939–946. <https://doi.org/10.51468/jpi.v3i1.56>
- Wanpen, S. (2013). The Relationship between Learning Styles and the Social Network Use of Tertiary Level Students. *Procedia - Social and Behavioral Sciences*, 88, 334–339. <https://doi.org/10.1016/j.sbspro.2013.08.514>
- Whillier, S., Lystad, R. P., Abi-Arrage, D., McPhie, C., Johnston, S., Williams, C., & Rice, M. (2014). The learning style preferences of chiropractic students: A cross-sectional study. *Journal of Chiropractic Education*, 28(1), 21–27. <https://doi.org/10.7899/JCE-13-25>



Effects of Educational Games, Drills and Practice Strategies on Academic Achievement in Biology concepts among Secondary School Students in Abak LGA, Akwa Ibom State, Nigeria

ELIJAH, Akaninyene Monday¹

Email: elijah.akan123@gmail.com

09011427717

AKPAN, Iniobong Fred¹

ATABANG, Atim Anietie¹

¹Department of Science Education, Akwa Ibom State University, Mkpato Enin, Akwa Ibom State, Nigeria

Abstract

The study examined the effects of educational games, drills and practice strategies on senior secondary students' academic achievement in Biology in Abak Local Government Area, Akwa Ibom State, Nigeria. Two research questions and two hypotheses were formulated to guide the study. The design of the study was a quasi-experimental design of pre-test post-test non-randomized design. The population of the study consisted of all the two thousand, five hundred and twenty-four (2,524) SS two students studying Biology in the eleven (11) public secondary schools. Simple random sampling technique was used to select three co-educational secondary schools out of the population. The sample of the study comprised of one hundred and forty-three (143) students in three intact classes. The instrument for data collection was tagged: Biology Achievement Test on Respiratory System (BATRS) was adapted from past questions by the researcher. The reliability index of the instrument was found to be 0.81 using Kuder-Richardson 20 formula (K-R 20). Descriptive statistics of mean and standard deviation was used to answer the research questions. While the hypotheses were tested using Analysis of Covariance (ANCOVA) at $p \leq 0.05$ level of significance. Results showed that students taught respiratory system using educational games gained better than those taught using drill and practice, followed by those taught using expository strategy. There was a significant difference in academic achievement mean scores of male and female students taught the concept of respiratory system. Based on the findings it was recommended among others that teachers should incorporate active teaching strategies such as educational games, drills, and practice exercises to improve students' understanding and engagement in Biology. Students should participate in educational games and drills to enhance learning, problem-solving skills, and critical thinking in Biology.

Keywords: Educational Games, Drills, Practice, Biology Concepts, academic achievement

Introduction

Science is a means of finding practical ways of using scientific discoveries or turning scientific knowledge into use. Science is also addressed as a systematic process of acquiring the fundamental knowledge about the universe (Itighise & Akpan, 2021). The aim of learning science in secondary schools is to promote the understanding of concepts taught, with a view to applying knowledge of such understanding in the real-life situation. The National Policy on Education (FME, 2013) emphasizes that sciences should be taught in schools in such a way that it will have meaning and relevance to the needs of the students' and society; provide the students' the opportunity to explore; interact with and intercept certain scientific processes going on in their environment. Science is a necessity for any nation that wants to maintain its independence, sovereignty, self-reliance, ensure growth, and have its head held high among civilized nations (UNESCO, 2015). This is because science and technology provide the basic tools for industrialization and economic development in the areas of communication, transportation, energy, information, pollution and waste control. In Nigeria, the study of science is of great importance that a lot of emphasis had been laid on the learning of science, as contained in the National Policy of Education (FME, 2013). This can be achieved by the inculcation in the learners the necessary scientific skills and attitudes. The inculcation of scientific skills and attitudes in students can only be achieved through the proper of various science subjects. These include Mathematics, Health science, Agriculture, Chemistry, Physics and Biology.

Biology is a branch of science that deals with the study of living organisms which is divided into many specialized fields that cover their morphology, physiology, anatomy, behaviour, origin and distribution. It is a science subject that has its origin in the need of human beings to know more about themselves and the world around them. Biology contexts are often complex and studied at various levels from the individual molecule to global ecosystem (Edikpo, Akpan & Atabang, 2024). In all spheres of human activity, Biology plays a prominent role. Its application in genetic engineering has resulted in the production of high yielding plant and animal species. This has contributed in the meeting of food demands for the ever-

Effects of Educational Games, Drills and Practice Strategies on ... Elijah, A. M., Et. al. (2026)

growing human population (Shishua & Keraro, 2017). Biology is indispensable in the field of medicine such as organ transplant and controls a wide range of diseases. It also has application in industries such as the use of microorganisms in food processing. Areas where the knowledge of Biology is applied among others include Agriculture, Brewery, Geology, Mining, Population Control and Environmental Conservation (UNESCO, 2015). The knowledge of Biology is intrinsically related to nation building and a sustainable relationship exists between the nature and human society. Biology is a key discipline in understanding and responding to some of the most pressing issues of the day, from the many challenges arising from population growth, human impacts on ecosystem and services to climate change and sustainability. Its knowledge also helps to eliminate poverty and reduce the number of hungry people through expansion in diversity and magnitude of bioscience enterprise. The bioscience enterprises include raw bio- commodities like rubber; palm oil produced using seed materials, using hybrids, tissue culture and bio-fermentation, bio-pesticides, bio-fertilizers, bio- remediation and biotech seeds. Each of the enterprise is based on sound biological knowledge. The listed enterprises provide job opportunities for the student with knowledge of Biology in public and private sectors of the economy. In Nigeria, the Biology curriculum as a learning syllabus has National objectives at secondary school level. These include preparing students to acquire: adequate laboratory and fields skills in Biology; meaningful and relevant knowledge in Biology; ability to apply scientific knowledge to everyday life in matters of personal and community health and agriculture; and reasonable and functional scientific attitude (Montes et al., 2018). To ensure full realization of these objectives, the content and context of the syllabus placed great emphases on field studies, guide- discovery, laboratory techniques and skill coupled with conceptual thinking (FME, 2013). Biology education is an indispensable instrument for the development of any nation; It is offered in all senior secondary schools in Nigeria which attracts the greatest patronage of both science- oriented and art- based student (Atabang, Edikpo & Akpan, 2024; Nwosu, 2016). Biology provides a platform for students to develop the ability to apply science concept and principles in solving everyday life problems and building a progressive society. There are records in the field of Biochemistry, Physiology and Molecular Biology among others that made subject a central focus in most human activities including problem like radiation, family life, food scarcity management and conservation of natural resources as well as ethics are anchored on Biology. There are various concepts in Biology and there are ways of learning them effectively. Some Biology concepts described things which are not easily accessible or abstract concepts that cannot be fully comprehended at the first time. Students struggle to form their cognitive structures in many alternative conceptions. These include nervous co-ordination, respiratory system, genetic and evolution (Kurt et al., 2016).

Respiratory system refers to one of the vital system in living being which necessitates the intake of oxygen and release of carbon dioxide in a biochemical process of the body (Kurt et al., 2016). It is a structure or system that enhances respiration which is a common characteristic that are indicator of life for all living beings. Respiratory system is basically of two parts; upper respiratory parts which include nose, mouth, pharynx and the lower respiratory parts including the larynx, trachea, bronchi, bronchioles lungs and alveoli (Kurt et al., 2016). The concept of respiratory system is highly complex and has many dimensions as it pertains to all living beings from human to single cell organism and the dimension of respiratory system differs by species (Kurt et al., 2016). Gultepe et al. (2016) found alternative conception among others regarding human respiratory system such as air taken from outside goes to the stomach; breathing can only be executed through the mouth and nose; the respiratory system differs from single cell organism to higher animals. Also, the facts that the processes of respiration contained numerous concepts and each of these concepts is linked with one another thus render the respiratory structure more complex. These are several reasons why students fail to adequately construct the cognitive structure about the concept of respiratory system. Respiratory system plays a vital function in living beings and its learning requires the use of appropriate instructional strategies for the reduction of the complexities in the concept so as to improve students' performance in Biology. Umoetuk, Atabang and Babayemi (2025) noted that students' achievement in science is a function of instruction and instructional strategies used. Babayemi et al (2023) stated that teachers' mode of presentation of various science concepts affect students' performance in the subject. One of the most important factors in the learning process is students' failure to correlate the concept taught, in their minds as well as their cognitive structures. The cognitive structure is a structure that represents the relations of concepts in the students' long-term memory and that is based on assumption (Kurt et al., 2016). WAEC Chief Examiners' Report, (2018) has shown that students' performance in Biology examination is not encouraging. An examination of the performance of Biology students mirrored a decline in the percentage of Biology candidates obtaining credit grades. The senior secondary school Biology candidates have a number of problems associated



Effects of Educational Games, Drills and Practice Strategies on ... Elijah, A. M., Et. al. (2026)

with both the cognitive and motor skills which have culminated in the poor achievements in the certificate examination, (Chief Examiner's report, 2016-2020). Such problems identified in the Chief Examiners report, (2018- 2022) include: Lack of specific knowledge and inability to exploit; lack of deeper understanding and inability to explain, interprets and apply Biology principles; Lack of deeper understanding of cognitive skills; Inability to use proper biological terms where appropriate and lack of deeper understanding of biological concept. Ajayi and Ogbeba (2017) also attributed the poor performance partly to the teachers' choice of instructional strategies that do not keep the students actively involved through hands-on and minds-on activities during lesson deliveries. Another challenge contributing to poor performance of students in this technological age include the barriers to effective integration and utilization of digital technologies such as inadequate or outright lack of digital devices, lack of access to digital equipment due to high cost, slow internet connection, lack of digital based instructional materials and resources for teachers which in turn hinders the development of effective and professional teaching skills (Akpan & Uko, 2014; Itighise, 2016; Dele-Ajayi et al., 2019; Akpan et al., 2022 and Akpan & Udo, 2022, Itighise, & Akpan 2022). Other factors contributing to the failure may be connected to the way in which the teachers introduce their lesson at the beginning of each topic or unit, hence the need by the teachers to change their pattern of introduction, lack of or insufficient laboratory facilities and equipment, psychological factors such as anxiety and low self-esteem (Olatunji, 2015; Ajayi & Ogbeba, 2017).

Biology requires serious input by the teacher in terms of planning to teach to achieve instructional objectives (Nwosu, 2016; Edikpo et al., 2024). Thus, students' performance as generally observed has been attributed to teachers' failure to use effective teaching strategies such as educational games, Drill and practice strategies during the learning process in Biology. Biology requires serious input by the teacher in terms of planning to teach to achieve instructional objectives (Nwosu, 2016). This trend of poor performance of students in Biology and the high percentage of failure if not arrested, will spell doom for the scientific and technological development of the nation. Research have showed that the facilitating learning strategy for the learner and learning process in education is the learner- centered methods (Babajide, 2017; Agomuoh & Nzewi, 2018). In the words of Madu (2015) the teacher plays a dual role as a learner as well as a tutor by getting exposed to new knowledge /ideas, as such, he learns new things every day during the learning processes. With this, he becomes a resource rather than an authority. There are many learner- centered methods which include demonstration method, discussion method, cooperative method, and discovery or inquiry-based strategies, puzzle based instructional strategies, games, drill and practice and collaborative teaching strategies but for purpose of this research, the researcher focused on educational games, Drill and practice strategies. Educational game teaching strategy involves designing and incorporating educational content within a game format, where students actively participate and interact with the game mechanics to acquire knowledge or develop skills. It refers to using games as an educational tool or strategy to facilitate teaching and engagement (Li et al., 2021). According to Wordu and Atabang (2024); Priyaadharshini et al. (2020); Itighise and Udosen (2015) educational games teaching strategy is considered one of the most innovative teaching approaches for increasing students' interest in education by playing games. Different playful experiences can enable children to construct knowledge by playing and exploring a real-world problem often driven by students' interest in inquiry (Ukah, Atabang, & Eden 2025; Hirsh-Pasek, 2020). Educational games also referred to as gamification is a process that uses game elements, such as points, rewards, badges and competition during the teaching process, establishing interactive and engaging learning environments (Ukah, Atabang, & Eden 2025; Turan et al., 2016). It aims at enhancing motivation, engagement, and participation using the inherent appeal of games. Designing interactive and entertaining games, primarily for education, is a step forward in implementing educational games learning strategy. Serious games enable players to cultivate their knowledge and practice their skills by overcoming numerous interruptions during gaming (Yu, 2019). Itighise and Udosen (2015) comments that appropriate design of educational carton facilitates learning by stimulating creativity, igniting interest, promoting discourse, and cultivating a competitive drive for exploration in diverse fields. During an educational game class learning, students have fun and enjoy themselves with increased imagination and natural curiosity, which can lead to high levels of participation and the student's involvement in the learning process. In this way, students can be more successfully engaged in meaningful learning than traditional teaching methods (Karram, 2021). Educational games can be used at the beginning and end of a lesson. For this reason, they can foster students' interest and motivation towards lessons, or review, reinforce and assess the learned topics. Therefore, educational games promote students' active participation in lessons and thus assist with their learning (Atabang, Eden & Daniel, 2024; Adeyemi, 2017). Such games include among



Effects of Educational Games, Drills and Practice Strategies on ... Elijah, A. M., Et. al. (2026)

others, crossword picture puzzle. Crossword-picture puzzle (CPP) game strategy is an active learning and instructional strategy combining both verbal (crossword) and visual (picture-puzzle) elements. In practice, students are given specially designed puzzle-based tasks that integrate key science vocabulary/terminology (via crosswords) and pictorial or diagrammatic clues (via spot-the-change, cut-up, or rearrangement picture puzzles) to engage with scientific concepts (Babayemi & Akinsola, 2014). The strategy is intended to move beyond passive lecture (“chalk-and-talk”) by involving students in active retrieval, recall, concept association, and problem-solving in a collaborative or individual manner (Babayemi, 2014). Drill and practice learning strategy on the other hand involves a sequence of tasks, exercises, or words repeated over and over until they can be performed faultlessly. In a drill and practice design, words are presented to the students with questions to respond to or problems to solve, the student responds, the student informed whether the answer is correct and if the student is right, he/she is given another problem to solve, but if the student responds with a wrong answer, he or she is corrected. Drill and practice are interactive and help students remember the concepts they have been taught previously (Zubairu & Musa, 2020). Therefore, the use of Drill and practice strategy in teaching respiratory system in Biology might help students to retain better. Expository teaching strategy is another strategy considered in this study. It is a strategy the teacher uses to impart or expose knowledge to the students in a step-to-step way through lecture, explanation and the provision of guided practice through oral drills. It is often used by teachers to cover a lot of material in a short amount of time; present information in a clear and organized manner; it also allows for the teacher to control the pace of the lesson. According Sunday et al. (2025) it makes student to be inactive during lesson delivery. This is because it makes the lesson boring for students who are not interested in the subject matter; it does not allow for much interaction between the teacher and the students; does not allow for much interaction between the students themselves; and does not allow for much opportunity for students to ask questions or share their own ideas.

Gender is one of the factors that influence students’ academic performance and this calls for examining performance in relation. Gender is based primarily on the socio-cultural differences between girls and boys. Gender is a psychological term describing behaviour and attributes expected of individuals on the basis of being male or female (Atabang, & Umanah, 2024; Umanah & Sunday, 2022; Umanah & Akpan, 2024). Some vocations and professions have been regarded as men’s (engineering, arts and crafts, medicine and agriculture) while others as women’s (catering, typing and nursing) depending on the belief that girls are weaker sex, therefore, complex and difficult tasks are allocated to boys while the girls handle the relatively easy and less demanding tasks. According to Nworgu (2015), there is an acknowledged problem of female under performance when compared with their male counterparts apparently under equivalent conditions and this problem of female under performance appear to be more pronounced in Science and Mathematics. Atabang and Umanah (2024), noted that gender issue is an important factor in educational setting and could be a hindrance to high achievement of learners in science. Some research work has shown contradicting evidences in science due to gender. For instance, students’ academic achievement in science due to gender. Umanah and Sunday (2025), Sunday and Edet (2024); Edet et al. (2025a) found out that there is no significant difference in the academic achievement of male and female in Biology, Chemistry and Basic science respectively. It is therefore worthwhile to see how educational games, Drill and practice strategies would bridge the gap in science achievement between male and female students in Biology. This study intends to find out the effects of educational games, Drill and practice strategies on students’ academic achievement in Biology in Abak Local Government Area.

Statement of the Problem

In spite of the significant role of Biology in life, the performance of students in Senior School Certificate Examinations has been experiencing a decline. The poor performance in Biology examination is a problem to teachers and a cause of concern to the public. The undesirable achievement of Biology students has been attributed to poor teaching and learning strategies adopted by teachers during classroom instruction. This situation has created the need to explore the efficacy of alternative teaching strategies. The use of alternative teaching strategies such as educational games, Drill and practice strategies may allow new materials especially difficult concept on Biology to be easily assimilated with the students’ prior knowledge, thus enabling them to develop an understanding of the concept. It is on this basis that the researcher poses the question; What is the effect of educational games, Drill and practice teaching strategies on students’ academic achievement in the concept of respiratory system in Biology?



Effects of Educational Games, Drills and Practice Strategies on ... Elijah, A. M., Et. al. (2026)

Purpose of the Study

The main purpose of this study is to examine the effects of educational games, Drill and practice strategies on senior secondary students' academic achievement and retention in Biology in Abak Local Government Area, Akwa Ibom State. Specifically, the objectives of the study are to:

1. Compare the difference in the academic achievement mean scores of students taught the concept of respiratory system using educational games, drill and practice and expository teaching strategies.
2. Examine the difference in the academic achievement mean scores of male and female students taught the concept of respiratory system using educational games, drill and practice and expository teaching strategies.

Research Questions

1. What is the difference in the academic achievement mean scores of students taught the concept of respiratory system using educational games, drill and practice and expository teaching strategies?
2. What is the difference in the academic achievement mean scores of male and female students taught the concept of respiratory system using educational games, drill and practice and expository teaching strategies?

Research Hypotheses

1. There is no significant difference in the academic achievement mean scores of students' taught the concept of respiratory system using educational games, drill and practice and expository teaching strategies.
2. There is no significant difference in the academic achievement mean scores of male and female students taught the concept of respiratory system using educational games, drill and practice and expository teaching strategies?

Research Methodology

The researcher adopted the quasi-experimental design of pre-test, post-test and non-equivalent control group design. This is for obvious reasons as it is not always practicable to have complete randomization of the subjects due to the possibility of disrupting school organization in the process. The study was conducted in Abak Local Government Area of Akwa Ibom State, Nigeria. The population of the study consisted of all the two thousand, five hundred and twenty-four (2,524) SS two students studying Biology in the eleven (11) public secondary school in Abak Local Government Area, Akwa Ibom State (Source: Local Education Committee, Abak Educational Zone, 2023). Simple random sampling technique was used to select three co-educational secondary schools out of the 11 public co-educational secondary schools in the study area. The sample of the study consisted of SS 2 Biology students from 3 intact class representing experiment group 1, experimental group 2 and control groups respectively. The total number of participants from the three selected intact classes formed the sample for the study. The sample of the study comprised one hundred and forty-three (143) SS II Biology students in three intact classes. Simple random sampling techniques were employed in selecting schools for the study. The instrument for data collection was tagged: Biology Achievement Test on Respiratory System (BATRS) was adapted by the researcher. The instrument was made up of two sections, section A and section B respectively. Section A was on personal data of the subjects while section B will be made up of (50) fifty multiple choice test questions. Having four options A, B, C and D with one correct option and three distractors. The instruments were subjected to face validation by three experts, one experienced biology teacher, a lecturer from the Department of Science Education and one in Test and Measurement Department of Science Education, Akwa Ibom State University. The validators scrutinized the instrument in terms of proper wording of items, appropriateness and adequacy of the items for the study. The test items were administered on thirty (30) students in one of the coeducational secondary schools that was not part of the sample size. The results were subjected to the Kuder-Richardson 20 formula (K-R 20) and a reliability coefficient of 0.81 was obtained. Data collected were analyzed using descriptive statistics of mean and standard deviation to answer the research questions. While the hypotheses were tested using Analysis of Covariance (ANCOVA) at $p \leq 0.05$ level of significance.

Presentation of Results

Research Question 1: What is the difference in the academic achievement mean scores of students taught the concept of the respiratory system using educational games, drill and practice and expository teaching strategies?

Table 1: Mean and standard deviation of students' pre-test and post-test mean achievement scores by teaching strategies

Groups	N	Pretest		Posttest		Mean Difference
		Mean	SD	Mean	SD	



Effects of Educational Games, Drills and Practice Strategies on ... *Eljah, A. M., Et. al. (2026)*

Educational games	48	6.19	2.40	34.71	7.22	0.49
Drill and practice	45	6.33	3.88	34.22	6.86	
Educational games	48	6.19	2.40	34.71	7.22	15.81
Expository	50	6.34	1.77	18.90	8.57	
Drill and practice	45	6.33	3.88	34.22	6.86	15.32
Expository	50	6.34	1.77	18.90	8.57	

Results in Table 1 shows the mean difference (post-test and pre-test) in the academic achievement mean scores of students taught the concept of respiratory system using educational games and drill was 0.49 while that of students taught using educational games and expository was 15.81 and that of drill and practice and expository teaching strategies was 15.32, respectively. This result indicates that students taught respiratory system using educational games gained better than those taught using drill and practice, followed by those taught using expository strategy.

Research Question 2: What is the difference in the academic achievement mean scores of male and female students taught the concept of respiratory system using educational games, drill and practice and expository teaching strategies?

Table 2: Mean and standard deviation of pre-test and post-test mean achievement scores by gender

Groups	N	Pretest		Posttest		Mean Difference
		Mean	SD	Mean	SD	
Male	66	5.65	2.36	30.76	7.66	3.21
Female	77	6.83	2.99	27.55	12.48	

Source: Field work 2025

Result in Table 2 shows the mean difference (post-test and pre-test scores) for male and female Biology students in all the groups taught the concept of respiratory system. The result reveals that the pre-test mean achievement scores of male students in all the groups taught the concept of respiratory system was 5.65 while the pre-test of the female counterparts was 6.83. The post-test result revealed that the mean achievement scores (30.76) of male students in all the groups taught the concept of respiration was higher than the post-test mean achievement scores (27.55). This was observed with a remarkable mean difference of 3.21 indicating that male students in all group achieved academically better than their female counterparts in respiratory system.

Hypothesis one: There is no significant difference in the academic achievement mean scores of students taught the concept of respiratory system using educational games, drill and practice and expository teaching strategies, respectively.

Table 3: Analysis of Covariance (ANCOVA) of students' post-test achievement classified by teaching strategies with pre-test as covariate

Source	Sum of squares	Df	Mean	F	Sig	
Corrected model	10852.27 ^a	6	1808.71	47.71	.00*	Significant*
Pre-test (Covariate)	32.12	1	32.12		.85	.36
Main effect:						
Teaching Strategy	8152.14	2	4076.07	107.52	.00*	
Error	5155.62	139	37.91			
Corrected total	16007.88	142				

*significant at $p < .05$

The result on Table 3 shows the ANCOVA on the effect of teaching strategy (educational games, drill and practice and expository) on students' achievement in the concept of respiratory system. The result shows that an F-ratio of ($F(2, 142) = 107.52, p < 0.05, \eta^2_p = 0.00$) was obtained. Since the associated probability value of 0.000 is less than 0.05 set as level of significance, the null hypothesis was rejected. Thus, inference drawn is that there was a significant difference in the academic achievement mean scores of students taught the concept of respiratory system using educational games, drill and practice and expository teaching strategies, respectively. In order to determine the direction of significance, a Scheffe's Posthoc test was done as shown in Table 4



Effects of Educational Games, Drills and Practice Strategies on ... Elijah, A. M., Et. al. (2026)

Table 4: Summary of Scheffe's Posthoc pair wise comparison of students' post Test achievement classified by teaching strategies

Treatment groups (I)	(J)	Mean Diff (I-J)	Std. Error	Level of sig.
Educational games	Drill and practice	0.520*	1.581	1.000
Expository		15.84*	1.540	0.000
Drill and practice	Educational games	-0.520	1.581	1.000
Expository		15.32*	1.581	0.000
Expository	Educational Games	-15.84*	1.540	0.000
Drill and practice		-15.32*	1.565	0.000

R Squared = .678 (Adjusted R Squared = .664) *p<0.05

Table 4 shows the post-hoc result of the significant difference in the mean achievement scores of students in respiratory system who were exposed to educational games, drill and practice and expository. From the result, the mean difference of 0.520 at p=1.000 between educational games and drill and practice. This implies that there is no significant difference in the mean achievement scores of students taught the concept of respiratory system using educational games and drill and practice teaching strategies. The result also shows a mean difference of 15.84 at p=.000 between educational games and expositor. This implies that there is a significant difference in the mean achievement scores of students taught the concept of respiratory system using educational games and expositor teaching strategies. Lastly, the result shows a mean difference of 15.32 at p=.000 between drill and practice and expository. This result indicates that there is a significant difference in the mean achievement scores of students taught the respiratory system using drill and practice, and expository teaching strategies.

Hypothesis two: There is no significant difference in the academic achievement mean scores of male and female Students taught the concept of respiratory system

Table 5: Analysis of Covariance (ANCOVA) of students' post-test achievement classified by teaching strategies with pre-test as covariate

Source	Sum of squares	Df	Mean	F	Sig
Corrected model	10852.27 ^a	6	1808.71	47.71	.00*
Pre-test	32.12	1	32.12	.85	.36
(Covariate)					
Main effect:					
Teaching Strategy	8152.14	2	4076.07	107.52	.00*
Gender	710.80	1	710.80	18.7	.00*
Error	5155.62	139	37.91		
Corrected total	16007.88	142			

R Squared = .885 (Adjusted R Squared = .879)

p<.05

Table 5 shows the ANCOVA of the effect of teaching strategy (educational games, drill and practice and expository students' achievement scores in the concept of respiratory system. The result shows that an F-ratio of ($F(1, 142) = 18.75$, $p < 0.05$, $\eta^2_p = .00$) was obtained. The obtained associated exact probability value of 0.00 is less than 0.05 set as level of significance, the null hypothesis was rejected. Hence, it is concluded that there was a significant difference in academic achievement mean scores of male and female students taught the concept of respiratory system.

Discussion of Findings

Findings showed that there was a significant difference in the academic achievement mean scores of students taught the concept of respiratory system using educational games, Drill and practice and expository teaching strategies. This can be attributed to increased students' motivation and participation of concepts due to educational games compared to passive expository teaching. Active teaching through the use of educational games also enhances understanding and performance. Again, educational games often incorporate problem-solving and decision-making, fostering critical thinking skills that enhance understanding compared to traditional methods. This is in line with Etiubon *et al.*, (2021) who found that students taught computer tutorial achieved higher than those taught with computer drill-practice and lecture methods. This finding is in contrast with Zuabiru and Musa (2020) who found that there was no significant difference in the post-test performance



Effects of Educational Games, Drills and Practice Strategies on ... Elijah, A. M., Et. al. (2026)

scores of students taught Biology with the use of computer game and drill and practice. This finding is also in contrast with Majebi and Akin (2022) who found that the exploratory strategy was more effective than the game based on science process skills and knowledge. Findings showed that there was a significant difference in academic achievement mean scores of male and female students taught the concept of respiratory system. This may be due to differing confidence levels between males and females when engaging in science-related topics. Competition or active participation might have influenced one gender's engagement more than the other. Also, previous exposure to biology concepts or interest in human anatomy could vary between genders, leading to differences in motivation, curiosity, and academic performance in the topic. This finding is in line with Atabang and Umanah (2024) whose findings showed that males achieve better than females in Basic Science. This finding is in contrast with Maduabuchi and Iheanacho (2016) which shows that there is no significant difference in the performance of male and female students taught with drills. This finding is in contrast with Zuabiru and Musa (2020) who found that there was no significant difference in the performance of male and female students taught Biology with the use of computer Game. This finding is also in contrast with Sunday et al. (2025) Edet et al. (2025b); Wordu and Atabang (2024) and Etiubon *et al.*, (2021) which showed that gender is a non-significant factor in academic achievement of students.

Conclusion

The study showed that there was a significant difference in the academic achievement means scores of students taught the concept of respiratory system using educational games, Drill and practice and expository teaching strategies on senior secondary students' academic achievement in Biology in Abak Local Government Area. Additionally, gender differences in academic achievement were observed. It was there concluded that active teaching strategies, such as educational games, significantly improved students' academic achievement compared to traditional expository teaching.

Recommendations

Based on the findings, it is recommended that;

1. Teachers should incorporate active teaching strategies such as educational games, drills, and practice exercises to improve students' understanding and engagement in Biology.
2. Students should participate in educational games and drills to enhance teaching, problem-solving skills, and critical thinking in Biology.
3. Curriculum Planners should integrate active teaching strategies such as educational games and practice drills into the senior secondary school Biology curriculum and ensure that gender considerations are incorporated into curriculum design to cater to diverse teaching needs and abilities.

References

- Adeyemi, T. O. (2017). Effects of educational games on students' understanding of respiration in Biology. *Journal of Education and Human Development*, 6 (2), 1-6.
- Agomouch, P. C. & Nzewi, U., M. (2018). Effects of videotaped instruction on secondary school students' achievement in physics. *Journal of Science Teachers Association of Nigeria*. 38 (182), 88-93.
- Ajayi, O. V. & Ogbaba, J. (2017). Effect of gender on senior secondary chemistry students' performance in stoichiometry using hands-on activity. *American Journal of Educational Research*, 5 (8), 839-842
- Akpan, A. O. & Udo, N. M. (2022). Teachers' awareness and competencies in utilization of 21st century skills in science teaching. 62nd Annual Conference Proceeding of Science Teachers Association of Nigeria, 41-53.
- Akpan, A. O., Itighise, A. E. & Umo E. B. (2022). Integration of digital technologies in STEM teaching and learning in Universities in Akwa Ibom State. *The Nigerian Academy of Education Conference Proceeding*. 162-177
- Akpan, B. & Uko, E. (2014). The role of ICT in science teacher education. *Journal of Science Education Research*, 12(3), 45-58.
- Atabang, A. A. Eden, M. I & Daniel, I. B (2024). Simulation and Virtual Labs: Enhancing STEM Education through immersive learning experiences. In Egbedokun, A. O. (ed) *Educational Technology and innovations for global best practices in instructional delivery*, A Book of Reading in Honour of Prof. David Kunle Akanbi & Dr. Abimbola A. Adekomi . *Publication of the Educational Technology and Library Studies, Obafemi Awolowo University* 52-68
- Atabang, A. A., Edikpo, L. V. & Akpan, A. O. (2024). Effects Of Improvised DNA Model and Flip Charts on Students' Performance and Retention in Biology in Eket Local Government Area, Akwa Ibom State. *Inter-Disciplinary Journal of Science Education (IJ-SED)* Vol. 6(1), 113-123.



Effects of Educational Games, Drills and Practice Strategies on ... Elijah, A. M., Et. al. (2026)

- Atabang, A. A. & Umanah, F. I. (2024). Effect of computer animation on students' academic achievement and retention in Basic Science and Technology in Ukanafun Local Government Area, *Journal of Science Education (IJ-SCE)*, 5 (2), 35-43
- Babajide, C. O. (2017). Learner-centered methods and academic achievement in biology. *Journal of Educational and Human Development*, 6(2), 1-8.
- Babayemi, J. O. & Akinsola, M. K. (2014). Effects of crossword-picture puzzle teaching strategy and mental ability on students' achievement in Basic Science in Southwestern Nigeria. *IOSR Journal of Research & Method in Education (IOSR-JRME)*, 4(4&III), 08-13.
- Babayemi, J. O. (2014). Effects of crossword-picture puzzle and enhanced explicit teaching strategies on students' learning outcomes in basic science in Southwestern Nigeria. In partial fulfillment of the requirements for the award of Degree of Doctor of Philosophy in Science Education University of Ibadan.
- Babayemi, J. O. & Olagunju, A. M. (2014). Effects of crossword-picture puzzle teaching strategy and gender on students' attitude to Basic Science. *The International Journal of Science and Technoledge*, 2(6), 399-404.
- Babayemi, J. O., Udofia, S. E., Abasi, A. U., Itighise, A. E. & Ntegwung, J. G. (2023): Preparing Science Teacher Trainees for the Needs of Postmodern Society and Acquisition of 21st Century Teaching Skills. Proceedings of the 36th iSTEAMS Accra Bespoke *Multidisciplinary Innovations Conference*. University of Ghana/Academic City University College, Accra, Ghana. 127-138.
- Barr, R. D. (2015). *Research on Learning of Reading*. In V. Richardson (Ed.) *Handbook of Research on Learning*. American Educational Research Association, 360-415.
- Dele-Ajayi, Ayodele, V. Oluwafemi, A., Emma, A., Strachan, R. & Emembolu, I. (2019). Barrier and identified solutions to the integration of digital technologies in the classroom. A case study of teachers in Nigeria. Proceedings of IEEE Global Engineering Education Conference, Dubai, 985-990.
- Edet, A. A., Akpan, I. F., & Umanah, F. I. (2025). Comparative effects of three (3) constructivist instructional strategies on students' academic achievement in chemical bonding. *GAS Journal of Education and Literature (GASJEL)*, 2(11), 14-26.
- Edet, A. A., Sunday, E. S., Abasi, A. U., Akpan, E. I. & Akai, E. I. & Ukafia, O. P. (2025). Instructional materials and secondary school students' attitude and performance in mathematics in Mkpato Enin Local Government Area. *International Journal of Modern Science and Research Technology*, 3(11), 486-498.
- Edikpo, L. V., Akpan I. F. & Atabang, A. A. (2024). Teaching methods and Biology students' achievement in Eket Federal Constituency of Akwa Ibom state. *Inter-disciplinary Journal of Science Education*, 5(2), 24-34.
- Etiubon, R. U., Etiubon, A. H. & Akpan, I. W. (2021). Computer tutorials and drill-practice strategies on senior science students' academic achievement on energy transformation in nature, Uyo, Nigeria. *International Journal for Innovation Education and Research*, 9 (7), 387- 401.
- FME (2014). *National Policy on Education*. Federal Government Press.
- Gultepe, M. B., Yildirim, O. & Sinan O. (2016). *The Effects of instructional based constructivist approach on 6th Grade Students Achievement about Respiration System*. *Elementary Education or Line*, 7 (2), 522-536.
- Hirsh-Pasek, R. (2020). A new path to education reform: Playful learning promote 21st century skills in schools and beyond Policy Big Ideas about the Authors. Available at <http://www.researchgate.net>
- Itighise, A. E. & Akpan, I. F. (2021). Science Educators Utilization of ICT Facilities for Mastery Learning in Post COVID-19 Era in selected Universities in South South, Nigeria. *Journal of Qualitative Education*, 15(1) 301-316.
- Itighise, A. E. & Akpan, I. F. (2022). Acquisition of literacy skills using mobile handheld devices and Science Education students' academic performance in Universities in Akwa Ibom State, Nigeria. *Kampala International University (KIU) Journal of Humanities*, 7(2): 101-108.
- Itighise, A. E. & Udosen, I. N. (2015). Selection and utilization of concept carton for effective teaching of Business education. *Journal of Sustainable Education*, 6 (1), 116-127.
- Itighise, A. E. (2016). Innovation in higher education: An imperative for achievement of sustainable national development. *A Journal of Educational Media and Technology*, 21 (1), 264-273.
- Karram, E. (2021). Fostering meaningful learning experiences: A review of the literature. *Journal of Educational Research*, 114(4), 439-451.
- Kurt, H. Gulay, E. Murat, A. & Ozlem, A (2016). Determining cognitive structures and alternative conceptions on the concept of Production (pre-service Biology teachers). *Creative Education*, 4(9), 572-587.
- Li, M. Hwang, W. Y., Chen, C.C., & Lin, Y. T. (2021). Strategies to facilitate learning performance in a flipped classroom. *Journal of Educational Technology Development and Exchange*, 4 (1), 1-24.
- Madu, B. C. (2015). *Effects of a Constructivist Based Instructional Model on Students' Conceptual Change and Retention in Physics*. Ph.D Thesis, University of Nigeria, Nsukka. 1-116.



Effects of Educational Games, Drills and Practice Strategies on ... Eljah, A. M., Et. al. (2026)

- Maduabuchi & Iheanacho (2016). Use of Drills and Secondary School Students' Achievement in the English Language Spelling. *International Journal on Studies in English Language and Literature (IJSELL)*, 4(1), 17-30.
- Majebi, I. O. & Akin, Y. G. (2023). Effects of Game-Based and Exploratory Strategies on Science Content Knowledge and Science Processing Skills of Pre-Primary Children in Akinyele, Oyo State. *Indonisian Journal of Early Childhood Education Studies*, 12 (1), 1-9.
- Montes, L. H., Ferreira, R. A. & Rodríguez, C. (2018). Explaining secondary school students' attitudes towards Chemistry in Chile. *Chemistry Education Research and Practice*, 19(2), 1-17.
- Nworgu. B. G. (2015). *Evaluating the Effects of resource material types reduction to students' cognitive achievement, retention and interest, in Integrated Science*. PhD Thesis University of Nigeria Nsukka. 1-4.
- Nwosu, A. A. (2016). *Using the Instructional Model to Communication Science*. 39th STAN Annual conference Proceedings, 349-353.
- Olagunju, A.M. & Babayemi, J.O. (2014). Effects of enhanced explicit teaching (explicit teaching + peer-tutoring) strategy and gender on students' achievement in basic science in Southwestern Nigeria. *Ibadan Journal of Educational Studies*, 11(1&2), 119-132.
- Olatunji, F. (2015). Readability of Basic Science and Technology for primary school. *Research Journal in Organizational Psychology and Educational Studies*, 1 (1), 23-36.
- Priyadharashini, R., Dakshina, S. & Sandhya, S. (2020). Educational games: A tool for effective learning, *Journal of Educational Technology*, 11(2), 1-9.
- Shishua, S. & Keraro, F. G. (2017). Analysis of factors affecting food demand in Ethiopia. *Journal of Food Economics*, 6(1), 1-9
- Sunday, E. S, Umanah, F. I, Udofia, S. E. (2025). Enhancing students' academic achievement in chemical reactions through computer-based molecular modelling and hackathon teaching strategies. *International Journal of Research and Innovation in Social Science (IJRISS)*, IX(IIIS), 1816-1824.
- Sunday, E. S. & Edet, A. A. (2024). Renewable resources in teaching chemistry practical and students' learning outcome in secondary schools. *Asia-Africa Journal of Education Research (AAJER)*, 4(1), 119-127.
- Sunday, E. S., Edet, A. A. & Akpan, E. I. (2025). Effects of computer assisted instructions and computer animation on the teaching of chemistry in secondary schools. *International Journal of Modern Science and Research Technology*, 3(11), 499-509.
- Turan, S., Avinc, Z., Kara, & Goktas, Y. (2016). Examining the relationship between learning environment and students' engagement, *Journal of Education and Learning*, 5(2), 129-138.
- Ukah, J. U, Atabang, A. A. & Eden, M. I.(2025). *Gamification of learning*. In Ofoegbu, T. O.; Johnson, I. E (eds). Digitalization of education: Novel dimensions in educational technology A Festschrift for Professor Inyang-Abia, M. E. Calabar: University of Calabar Press.
- Umanah, F. I. & Akpan A. O. (2024). Effect of 5E and 7E learning cycle model on students' academic achievement and retention in Chemistry. *Global Journal of Academic Research Forum*, 12(1), 92- 106
- Umanah, F. I. & Sunday, E. S. (2022). Crosswords puzzle, flashcards teaching strategies and senior secondary school students' academic performance in chemistry. *International Journal of Educational Benchmark*, 22(2), 1-12
- Umoetuk, E. U., Atabang, A. A. & Babayemi, J. O. (2025). Teaching Strategies and Students' Learning Outcomes in Basic Science and Technology in the Eket Local Government Area, Nigeria. *Pakistan Journal of Educational Research (PJER)*, 8(1), 26-41.
- UNESCO. (2015). A Place to Learn, Lesson from Research on Learning Environment. Conaldge: UNESCO. *Institute for Statistics*. P4
- WAEC (2016-2020). West Africa Examination Council Chief Examiner Reports For 2016-2018 May/June *Senior Secondary School Certificate Examinations. O Level Paper*, Lagos: WAEC Press.
- WAEC (2018-2022). West Africa Examination Council Chief Examiner Reports for 2016-2018 May/June *Senior Secondary School Certificate Examinations. O Level Paper*, Lagos: WAEC Press. P4
- West African Examination Council, (2019). *Analysis of Result*, Lagos WAEC. P2
- Wordu, N. C. & Atabang, A. A. (2024). Game-Based Learning and Academic Performance of Basic 5 Pupils in Private Primary Schools in Obio/Akpor. *Web of Semantic: Universal Journal on Innovative Education*, 3(4), 46-53.
- Yu, S. (2019). Exploring the educational potential of games: A systematic review, *Journal of Educational Computing Research*, 57(4), 419-438.
- Zuabiru, S. A. & Musa, Y. S. (2020). Effect of computer game, drill and practice on academic performance in biology among senior secondary school students in Maiduguri Metropolis, Borno State, Nigeria, *Bulgarian Journal of Science and Education Policy*, 2(14), 462- 477.



Leveraging Creativity in Science Education: Inclusive Special Education's Pathway to Self-Sufficiency among Basic School Learners in Nigeria

AYUA, Geoffrey Aondolumun¹

ayuageoffrey@gmail.com

+2348069337213

OJOKO, Augusta Ndidi²

danausta817@gmail.com

+2348104617993

TERHEMBA, Wisdom Kwaghfan¹

kwatexwisdom@gmail.com

+2347063631099

EMMA-IWUOZO, Ogechukwu Uzoamaka¹

ogemmaiwozo@gmail.com

+2348064823687,

OKANCHE, Samuel¹

sokanche-pg26@bsum.edu.ng

+2349164825455

OBIABO, Isaac Otache¹

obiaboisaac@gmail.com

+2348163746181

¹Science Education Department, Rev. Fr. Moses Orshio Adasu University, Makurdi, Benue State, Nigeria.

²Department of Integrated Science, Faculty of Science, Federal University of Education, Kontagora, Niger State, Nigeria

Abstract

In Nigerian basic schools, inclusive special education often fails to promote learners' self-sufficiency due to the dominance of non-interactive, outdated teaching methods that limit skill development and foster dependence, especially among learners with disabilities. This paper argues that integrating creativity into science education offers a transformative alternative. Through hands-on, inquiry-based activities, creative science instruction enhances critical thinking, problem-solving, and independence, equipping learners with special needs with the confidence and competencies needed for self-reliance. The study examines the challenges hindering effective implementation of inclusive special education in Nigeria, outlines strategic pathways for embedding creativity in science teaching, and discusses the educational implications for fostering self-sufficiency among basic school learners with special needs. It concludes that purposeful adoption of creative teaching methods can significantly improve learning outcomes for learners with disabilities, provided that systemic barriers are addressed to ensure equitable access to quality, needs-based education.

Keywords: Creativity, Science Education, Inclusive Special Education, Self-Sufficiency, Basic Education.

Introduction

Ideally, education is supposed to be a bedrock of an individual's, wealth (irrespective of status) and health of a nation's progress, empowering people to contribute meaningfully and functionally to a society's advancement. Akande (2022) confirms that education is the key to the development of both the human and natural resources of a nation. It has been recognized as a crucial tool for national development, driving economic growth, fostering social cohesion, and nurturing future generations; especially if anchored on creative science and values education for combating national development challenges (Amoor, 2023; Ayua & Terhemba, 2025; Ode et al., 2019). However, for this truth to be actualised, basic education which is the foundation to any step-forward in education may be made inclusive special education and accessible to all school eligible learners' and self-sufficient regardless of all round status. Inclusive special education is an important part of practical development, particularly in developing nations like Nigeria, where learners with varied needs want attention. One of the actual ways to guarantee that education meets the needs of all learners, including those with disabilities, is by incorporating creativity into inclusive science education. This approach could nurture creative and critical thinking (Ayua, 2019), problem-solving, and innovation, thereby encouraging self-sufficiency among all school eligible learners in inclusive Basic education level. Basic Education in Nigeria, as defined by the Federal Republic of Nigeria (2013), is provided to children aged 0-15 years with the objectives of fostering a strong consciousness for education, ensuring compulsory, free, and universal access for all eligible children, reducing dropout rates, and equipping learners



Leveraging Creativity in Science Education: Inclusive Special Education's Pathway to ... Ayua, G. A., Et. al. (2026)

with literacy, numeracy, communicative, life, and civic skills for lifelong learning and self-reliance. However, the attainment of these objectives in creativity in science education at the basic school level is constrained by structural and professional challenges, as Ayua et al. (2026) observed that inadequate instructional materials, insufficient laboratory facilities, overcrowded classrooms exceeding the 1:35 teacher-pupil ratio, and limited time allocation hinder effective curriculum implementation by restricting practical activities and learner participation. Consequently, addressing these challenges through improved resources, reduced class sizes, enhanced facilities, and continuous teacher professional development, backed by strong institutional support, is essential for realizing the goals of creativity in science education at the basic school level that would produce self-reliant individuals. To be self-reliant is a desirable trait of personality. In this 21st century, the demand to encourage learners to learn constantly increases exponentially as such in this industrial era where work situations are dynamically complex and more unpredictable; which children wish their teachers and parents knew (Ayua, 2021; Hoepfner & Koch, 2015). In order to create such a learning environment in the school, the proportion of responsibilities between teachers and its learners in doing actions in class has shifted a lot more to the learners. Teachers are no longer seen as the sole transmitters of knowledge, values and skills but rather as facilitators who are responsible for creating a suitable creative inclusive special learning environment.

Inclusive special education is the incorporation of eligible schoolchildren with disabilities into mainstream classrooms, making sure that they receive adequate support to participate fully in learning activities (Adetoro, 2019). In Nigeria, inclusive education is a growing concern, especially at the basic education level, where access to quality education for learners with disabilities remains limited due to inadequate resources, teacher preparation, and societal stigma (Obiakor & Offor, 2021). To promote inclusion, the Universal Basic Education (UBE) program in Nigeria mandates that schools accommodate children with special needs. Nigeria in her efforts has approved the United Nations' Convention on Rights of Persons with Disabilities (UNCRPD) which is part to Article 24 which provides that, all schools must be inclusive of and accessible to all children including those with disabilities. Moreso, Nigeria has signed-up to the 17 Sustainable Development Goals (SDGs), Goal 4 of which targets that by 2030, all school-age children including those with disabilities must have access to quality and functional education. However, implementation has been slow due to systemic challenges. Creativity in science education can provide a practical solution to these issues by creating learning environments that cater to diverse learning needs (Onyebuchi & Nwafor, 2020). Creativity in science education involves engaging learners with varied needs in activities that require innovative thinking and the application of scientific concepts to real-world problems. This approach encourages mind-on, hands-on learning and experimentation, which can be particularly beneficial for learners with disabilities, as it allows them to explore concepts at their own pace and using methods that align with their abilities (Gibson et al., 2020). Incorporating creative methods in teaching science can also make abstract concepts more accessible to all learners, particularly those with learning disabilities (Ayua 2019; Ayua & Eriba, 2023; Olayemi, 2021). For instance, using visual aids, models, and experiments can help demystify complex scientific ideas, making them easier for learners to grasp. Such methods align with Universal Design for Learning (UDL), which advocates for multiple means of engagement and representation in the inclusive science education classroom.

Science education, when taught creatively, equips learners with wisdom, understanding, knowledge and all kinds of skills that can contribute to learners of different needs' self-sufficiency. Learners engage in problem-solving activities that mirror real-life challenges, helping them develop creative and critical thinking and technical skills necessary for the labour force. For learners with special needs, this is particularly vital, as since they often face additional difficulties to employment and self-reliance (Uche & Nweze, 2019). Through the incorporation of creative inclusive science education, learners with disabilities can be taught creative skills in fields like Basic Science, Agricultural Science, Information and Communication Technology (ICT), and health sciences (Physical and Health Education - PHE). These fields offer opportunities for self-employment and entrepreneurship, which can help reduce the dependence of learners with disabilities on external support (Bello & Muhammad, 2018). By fostering creativity, teachers can help learners develop innovative solutions to societal problems, preparing them for a productive and self-reliant future.

Creative Inclusive Science Education (CISE) and its Strategic Implementation

Creative Inclusive Science Education (CISSE) is a transformative approach that goes beyond the mere transmission of scientific facts. It involves teaching science in a way that encourages learners of all kinds to think creatively, critically,



Leveraging Creativity in Science Education: Inclusive Special Education's Pathway to ... Ayua, G. A., Et. al. (2026)

engage in minds-on, hands-on activities, and apply their knowledge to solve real-world problems for self-sufficient and even for national development. The incorporation of creativity in inclusive science education helps to spark curiosity, foster innovation, and empower learners particularly with disabilities to become proactive contributors to their lives, the immediate community and the society at large. Strategically implementing CISSE involves adopting methods that prioritize universal design for learning, interactive learning environments, problem-based learning, and the use of technology to facilitate scientific discovery. Teachers play a critical role by using innovative instructional materials, fostering collaboration among learners of all kinds, and connecting scientific principles to everyday life. Such an approach ensures that learners do not only understand scientific theories but also acquire the skills to innovate solutions to challenges faced by learners themselves and in the national development (Smith & Johnson, 2022). Creative Inclusive Special Science Education (CISSE) is an educational pattern that emphasizes the incorporation of creativity with scientific learning. Unlike the old-style of science teaching, which often focuses on rote memorization and standardized testing, CISSE encourages experiential learning, creative and critical thinking, and the application of scientific principles to real-world problems (Robinson, 2011). By fostering an environment where creativity and scientific inquiry coexist, CISSE aims to develop innovative thinkers regardless of learners' status capable of addressing national complex challenges. According to researches implementing CISSE strategically involves several key components (Organisation for Economic Co-operation and Development - OECD, 2018):

- i. **Curriculum design:** Integrating creative projects, interdisciplinary studies, and problem-based learning into the inclusive special science education curriculum.
- ii. **Teacher training:** Equipping educators with the minds-on, hands-on skills and methodologies to foster creativity in the inclusive special education classroom through professional development programmes.
- iii. **Learning environment:** Creating spaces that encourage creativity, experimentation, collaboration, and exploration, such as laboratories, maker spaces, and innovation hubs. Above all, the environment should be creative in nature to cater for all learners including those with disabilities (inclusive special education).
- iv. **Assessment methods:** Moving beyond outmoded assessments (standardised testing such as academic performance test) to include evaluation of creativity, critical thinking, and practical application of the acquired knowledge to meet the demands of inclusive special education.
- v. **Policy support:** Securing governmental and institutional support to prioritize creative inclusive special science education within the national inclusive special education framework.

By so doing, benefits such as enhancement of creative thinking, critical thinking and problem-solving skills would be achieved by inclusive special education. Fostering innovation and adaptability among inclusive special learners. Bridging the gap between theoretical knowledge and practical application and preparing inclusive special education learners for the demands of a dynamic workforce encouraging self-sufficiency and stability.

Major Problems Militating against Creative Inclusive Special Science Education to Practice

Inclusive special Science education in Nigeria faces numerous problems that impede its effective implementation. These problems cut across infrastructural inadequacies, funding constraints, lack of trained personnel, societal stigma, and ineffective policy enforcement.

Inadequate infrastructure: A significant problem to creative inclusive special science education in Nigeria is the lack of appropriate infrastructure. Most basic schools are not designed to accommodate learners with special needs, especially in rural areas. Facilities such as ramps, accessible classrooms, assistive devices, and specialized learning environments are largely absent in many Nigerian basic schools (Ajuwon, 2018). This makes it difficult for learners with disabilities to access science education classrooms and other school facilities, thereby limiting their participation in mainstream education.

Insufficient funding: The underfunding of inclusive education is another major problem. The budgetary allocation to education in Nigeria is generally low, and even less is allocated to special education programs. As a result, there are inadequate resources for the procurement of indispensable materials, such as braille machines, hearing aids, and communication devices for learners with special needs (Obiakor, 2020). Furthermore, schools often lack sufficient funds to employ and retain specialist teachers and caregivers who can provide the necessary support for learners with disabilities.

Lack of teacher training: Teachers in mainstream schools are often not adequately trained to handle learners with special needs. Many Nigerian teachers lack the required knowledge and skills to implement creativity in inclusive teaching practices effectively (Afolabi et al., 2019). This creates a significant gap in the delivery of creativity in inclusive education,



Leveraging Creativity in Science Education: Inclusive Special Education's Pathway to ... Ayua, G. A., Et. al. (2026)

as teachers struggle to modify their instructional methods, classroom management techniques, and evaluation strategies to meet the diverse needs of all learners. Moreover, continuous professional development programs for teachers, aimed at enhancing their competence in special education, are limited.

Negative societal attitudes and stigma: Societal attitudes towards disability children is another critical problem to inclusive education. Cultural beliefs in Nigeria often stigmatize individuals with disabilities, viewing them as dependent or incapable of contributing meaningfully to society (Adejumo, 2021). This social stigma translates into discrimination within the school environment, where learners with disabilities may be marginalized by their peers and teachers. Parents of children with disabilities are also discouraged from enrolling their children in mainstream schools due to fears of social rejection and discrimination.

Policy implementation gaps: While Nigeria has made efforts to implement policies promoting inclusive education, there is still a significant gap between policy formulation and practice. The National Policy on Education emphasizes the need for inclusive education, yet there are discrepancies in how these policies are executed at the national, state and local levels (Ajuwon & Brown, 2019). Often, there is inadequate monitoring and evaluation of inclusive education programs, and many basic schools do not adhere to the guidelines provided by the Ministry of Education. Moreover, coordination between governmental agencies responsible for special education services is often weak, resulting in fragmented support systems for learners with special needs.

Limited awareness and advocacy: Another issue is the lack of awareness and advocacy surrounding inclusive education. Many parents, teachers, and community members are unaware of the rights of children with disabilities to access mainstream education. Consequently, advocacy efforts to promote inclusive education remain limited. Awareness campaigns targeting both educators and the general public are needed to foster a better understanding of the importance of inclusive education to practices (Afolabi et al., 2019).

Cultural and religious barriers: Cultural and religious beliefs also hinder the successful practice of inclusive education in Nigeria. In certain communities, disabilities are sometimes attributed to spiritual or superstitious causes, leading to further marginalization of learners with special needs (Adejumo, 2021). These beliefs discourage parents from seeking appropriate educational services for their children and contribute to the exclusion of such children from mainstream schooling.

Creativity as Pathways to Creative Inclusive Special Education Problems in Nigeria

Creative Inclusive special education in Nigeria faces various problems such as inadequate teacher training, lack of resources, poor infrastructure, and weak policy implementation. These problems hinder the proper incorporation of learners with disabilities into mainstream education. However, creativity in science education offers various pathways to address these challenges by encouraging creative teaching strategies, developing adaptive learning materials, and fostering an inclusive school culture.

Creative teaching strategies: One of the critical pathways to solving inclusive special education problems is the use of creative teaching strategies. Science education can be transformed through creative methods that adapt to the diverse needs of learners. Ayua and Eriba (2023), Olajide and Olanrewaju (2021) and Ayua (2019) maintained that constructivist teaching strategies such as creative exploration, Torrance incubation model of creative-teaching, problem-based learning and the likes in conjunction with creativity-based assessment techniques when applied in science classrooms, learners with different abilities could enthusiastically collaborate in the learning activities and apply the gained knowledge and skills in solving real-world science problems. This implies that these teaching methods could promote creative and critical thinking, teamwork, and inclusiveness. Thus, in utilizing creative teaching tactics, science educators can engage learners with disabilities in meaningful learning activities, making them active participants in the learning process rather than passive recipients (Ode, et al., 2019).

Developing adaptive learning materials: Creativity in inclusive science education can lead to the development of adaptive learning materials personalised to meet the needs of all learners including those with disabilities. For instance, tactile models can be used to teach visually impaired learners about complex scientific concepts such as the structure of molecules or the human body (Aina & Adeniyi, 2018). Similarly, interactive and multimedia resources can be adapted to suit the needs of all learners with hearing impairments. These creative materials enhance the learning experience for learners with disabilities, allowing them to grasp scientific concepts in a way that out-of-date lesson delivery materials and methods may not provide.



Leveraging Creativity in Science Education: Inclusive Special Education's Pathway to ... Ayua, G. A., Et. al. (2026)

Incorporating assistive technology: The incorporation of assistive technologies is another pathway for addressing the problems of creative inclusive special science education in Nigeria. Creative inclusive special science education can incorporate the use of tools like speech recognition software, screen magnifiers, and communication devices that support learners with disabilities in accessing scientific content (Akpan & Beard, 2019). For example, learners with physical disabilities can use robotics kits to engage in practical science experiments, which would otherwise be difficult to perform manually. These technologies not only enhance accessibility but also foster independence and confidence among learners.

Collaborative learning and peer support: Creativity in inclusive special science education encourages collaborative learning, where learners with disabilities can work alongside their peers. Group-based science projects, where learners of varying abilities collaborate, foster a sense of inclusion and promote mutual understanding (Salami, 2022). Peer tutoring programs can also be introduced, where learners without disabilities assist those with disabilities in science lessons. This approach creates a supportive learning environment where learners with disabilities feel valued and included.

Teacher training in creative inclusive special science education: Providing teachers with training in creative inclusive science education is essential for inclusive education to thrive. Many Nigerian teachers lack the specialized skills needed to support learners with disabilities in science subjects (Ajuwon & Craig, 2020). Training programs should focus on equipping teachers with the knowledge, wisdom, understanding and all kinds of skills to use creative teaching methods that accommodate all learners. For instance, science teachers can be trained on how to simplify complex scientific concepts using analogies, visual aids, minds-on and hands-on experiments, making science more accessible to learners with cognitive impairments.

Curriculum flexibility and differentiation: Creativity in inclusive science education also involves making the curriculum supple enough to accommodate diverse learners. Science curricula can be differentiated to cater to the individual needs of learners with disabilities (Aina & Adeniyi, 2018). This includes breaking down lessons into smaller, more manageable components, using a variety of teaching aids, and incorporating multiple modes of assessment to evaluate student understanding. Curriculum differentiation ensures that all learners, regardless of their abilities, can engage meaningfully with science content.

Promoting inclusivity through extracurricular science activities: Extracurricular activities, such as science clubs, fairs, and competitions, can be designed to include learners with disabilities. These activities provide opportunities for learners with disabilities to showcase their talents and engage in creative problem-solving outside the traditional classroom setting (Salami, 2022). For instance, learners can participate in science exhibitions where they present innovative solutions to real-life challenges, reinforcing their skills and boosting their confidence.

Educational Implications for Inclusive special Education Self-Sufficiency in Nigeria

Inclusive special education aimed to provide equal learning opportunities for all learners, regardless of their disabilities, in mainstream classrooms. In Nigeria, the drive for inclusive education is gradually gaining momentum, although significant challenges remain. The key focus is to empower individuals with special needs to achieve self-sufficiency through quality education, thereby improving their social, economic, and personal outcomes. Here are the educational implications of inclusive special education for self-sufficiency in Nigeria:

Curriculum Adaptation: A major implication of inclusive education in Nigeria is the need for curriculum adaptation. Standard curricula are often not designed to cater to the specific needs of learners with disabilities. According to Ayua and Eriba (2023), special education curriculum or methods are those modified to accommodate students with special needs or persons with learning disabilities like the blind, deaf and dumb, physically challenged or deformed besides learners with difficulty in organizing information, speaking, reading, spelling and writing; also, mental health disorders such as mood, psychotic, eating or personality disorders. Therefore, it is essential to adapt the content, teaching methodologies, and assessment procedures to ensure that learners with diverse needs can access and benefit from creative science education (Olayiwola, 2021). This could include using creative resources for learners with visual impairments or providing simplified texts and augmented communication tools for learners with cognitive disabilities. Without these adaptations, learners with special needs may struggle to develop the creative skills necessary for self-sufficiency.

Teacher training and professional development: Effective inclusive education demands well-trained teachers who can handle diverse classroom needs. Unfortunately, many Nigerian teachers lack adequate training in special education (Adeniran & Ayoade, 2020). This is sadly confirmable as many teacher training institutions of higher education in Nigeria do not include in their teacher training programmes even one core course in special needs education, yet over 90% of



Leveraging Creativity in Science Education: Inclusive Special Education's Pathway to ... Ayua, G. A., Et. al. (2026)

schools in Nigeria are inclusively ran. Teachers need to understand different disabilities, be skilled in using assistive technologies, and be patient and empathetic in addressing the challenges faced by special needs learners. Regular professional development programs for teachers are crucial to ensure they can create an inclusive environment that promotes self-sufficiency among all learners.

Use of assistive technology: Another critical educational implication is the incorporation of assistive technology in basic schools. In Nigeria, the use of assistive devices, such as screen readers, hearing aids, and other supportive tools, is limited due to financial constraints and lack of awareness (Ibrahim, 2019). These tools are essential for enabling learners with disabilities to actively participate in the learning process and achieve self-sufficiency. The government and private sector must work together to ensure these technologies are available and accessible to all learners.

Policy implementation and monitoring: Nigeria has enacted several policies aimed at promoting inclusive education, including the National Policy on Special Needs Education (Federal Ministry of Education -FME, 2015). However, the practice of these policies remains a problem due to inadequate funding, lack of political will, and insufficient monitoring mechanisms (Abang & Effiong, 2022). Strengthening policy practice and establishing monitoring bodies to assess the progress of inclusive education initiatives are critical to ensuring that learners with disabilities can achieve self-sufficiency through creative science education.

Inclusive classroom practices: Inclusive education encourages the use of differentiated instruction, cooperative learning, and peer tutoring to meet the diverse needs of learners. By applying such practices, Nigerian basic schools can help foster a supportive learning environment where learners with special needs can acquire the skills necessary for self-sufficiency (Onyejiaka, 2020). Furthermore, inclusive practices help to promote empathy and social skills among non-disabled peers, which can contribute to a more inclusive society overall.

Parental and community involvement: Inclusive education requires the involvement of parents and communities to be fully successful. Parents of schoolchildren with disabilities need to be engaged in their child's learning process and informed about the available support systems. In the same way, community awareness programs can help break down the stigma surrounding disabilities and encourage a more inclusive mindset, which is essential for fostering self-sufficiency in individuals with disabilities (Omojuwa, 2021).

Conclusion

Education underpins individual prosperity and national development. In Nigeria, Basic Education aims to provide free, compulsory access for learners aged 0–15, equipping them with essential skills for self-reliance. However, creativity-driven science education is hindered by inadequate resources, overcrowded classrooms, poor infrastructure, insufficient teacher training, limited funding, stigma, and weak policy implementation. Creative Inclusive Special Science Education addresses these challenges by integrating creativity, critical thinking, and universal design to engage all learners in hands-on scientific inquiry.

Way Forward

1. Nigeria must improve infrastructure and resources, increase funding, strengthen teacher training, adopt flexible curricula, raise public awareness, and leverage assistive technology and inclusive activities.
2. Strategic implementation will enable Basic Education to achieve its goals and empower all learners as self-reliant contributors to national development.

References

- Abang, O. & Effiong, P. (2022). Policy implementation challenges for inclusive education in Nigeria: A critical review. *Journal of Special Needs Education*, 15(3), 45-60.
- Adejumo, O. (2021). Cultural perceptions and their impact on inclusive education in Nigeria. *Journal of Inclusive Education Studies*, 4(2), 45-58.
- Adeniran, S. A. & Ayoade, M. O. (2020). Teacher preparation and inclusive education in Nigeria: The way forward. *African Journal of Educational Research*, 8(2), 25-37.
- Adetoro, R. A. (2019). Inclusive education: Challenges and strategies in Nigerian schools. *African Journal of Special Education*, 5(1), 67-79.
- Afolabi, O. A., Yusuf, A., & Ogunniyi, M. (2019). Challenges of inclusive education in Nigeria: Teacher training and preparation. *Nigerian Educational Review*, 11(1), 35-47.
- Aina, J. K., & Adeniyi, O. I. (2018). Creativity in science education: A catalyst for inclusive education. *Journal of Education and Practice*, 9(15), 18-26.



- Leveraging Creativity in Science Education: Inclusive Special Education's Pathway to ...* Ayua, G. A., Et. al. (2026)
- Ajuwon, P. M. (2018). Infrastructure deficits in Nigerian schools and their effects on inclusive education. *International Journal of Special Education*, 33(3), 21-29.
- Ajuwon, P. M., & Brown, J. D. (2019). Policy and practice of inclusive education in Nigeria: Progress and challenges. *African Educational Research Journal*, 7(4), 210-222.
- Ajuwon, P. M., & Craig, K. (2020). Barriers to inclusive education in Nigeria: Perspectives of educators. *International Journal of Special Education*, 35(3), 10-23.
- Akande, J.A.C (2022). *A guide to teacher competency evaluation*. University Press.
- Akpan, I. J., & Beard, J. (2019). Technology and inclusion: The role of assistive technologies in inclusive education in Nigeria. *Journal of Disability Studies*, 24(2), 5-12.
- Amoor, S. S. (2023, December). *Curriculum delivery in the 21st century for the attainment of national development*. Lead paper at the 2nd National Conference of the Faculty of Education, Federal University of Lafia, Nasarawa State, Nigeria held at Mallam Adamu Adamu Twin Lecture Theatre.
- Ayua, G. A. (2019). Creative-Teaching of science in the 21st century. In P. O. Agogo and E. E. Otor (Eds.), *Methods and Resources in Science Teaching in Nigeria* (PP 174-192). Optimism Academic Publishers.
- Ayua, G. A. (2021, July). *Child education: What children wish their teachers and parents knew*. A Keynote Speech Delivered on the Occasion of the 4th Graduation and Prize-Giving Ceremony of Vertex Nursery and Primary School, Makurdi, Benue State, Nigeria. <https://www.researchgate.net/publication/354438368>
- Ayua, G. A. & Eriba, J. O. (2023). Adapting creative-teaching of Basic Science in special needs education. In J. A. Ademokoya, N. Akuma, E. O. Idiodi & S. O. A. Obih (Eds.), *Special Needs Education from the Lens of Interdisciplinary Dialogue* (PP 314 - 325). Citihall International.
- Ayua, G. A. & Terhemba, W. K. (2025). Creative science and values education for combating top-10 national development challenges in Nigeria. In E. E. Achor, S. A. Iyekekpolor, J. B. Omonu, S. U. Mabera, B. Ojobor & E. Ikpe (Eds.), *Educational Responses to Contemporary Challenges in National Development*, (PP.377-392). Decapacem Int. Ltd. <https://www.researchgate.net/publication/394170433>
- Ayua, G. A., Tofi, M., Omega, J. O., Godo, S. T., Ogah, A. H., & Bebatso, M. G. (2026). Dilemmas faced by teachers in implementing the science curriculum in public basic schools in Makurdi Metropolis. *Faculty of Natural and Applied Sciences Journal of Mathematics, and Science Education*, 7(3), 55-63. <https://doi.org/10.63561/fnas-jmse.v7i3.1169>
- Bello, M., & Muhammad, S. (2018). Vocational skills acquisition in special education: A tool for self-reliance of disabled learners. *Journal of Education and Vocational Studies*, 12(2), 99-113.
- Federal Ministry of Education - FME. (2015). *National policy on special needs education*. Federal Ministry of Education.
- Federal Republic of Nigeria - FRN. (2013). *National policy on education*. Nigeria Educational Research and Development Council (NERDC) Printing Press.
- Gibson, K., McKeown, S., & Jones, P. (2020). The role of creativity in science education: A pathway to inclusive learning. *Science Education Review*, 29(4), 203-215.
- Hoepfner, H. D. & Koch, H. (2015). *Self-reliant learning in technical education and vocational training*. http://tvvet-online.asia/wp-content/uploads/2020/03/PWP_vol-4_Hoepfner_Koch.pdf.
- Ibrahim, A. (2019). Assistive technology and inclusive education: Challenges and opportunities in Nigeria. *Nigerian Journal of Educational Technology*, 12(1), 78-89.
- Obiakor, F. E. (2020). Funding challenges in inclusive education in Nigeria. *Journal of Special Needs Education*, 15(2), 102-114.
- Obiakor, F. E., & Offor, N. (2019). Promoting inclusive practices through collaborative problem solving. *International Journal of Special Education*, 34(3), 67-78.
- Ode, J. O., Ayua, G. A. & Alabi, O. A. (2019, August). *Towards enhancing the entrepreneurial skills of primary school pupils through creative teaching of Basic Science*. Paper at the Annual Conference on Creativity, Innovation and Entrepreneurship Education: Harvesting from the Cradle. Organised by Faculty of Education, University of Nigeria Nsukka (UNN), and Held at Princess Alexandria Auditorium (PAA), UNN.
- Olajide, A., & Olanrewaju, T. (2021). Teacher professional development and inclusive education: Implications for Nigeria. *African Journal of Special Needs Education*, 8(1), 45-58.
- Olayemi, K. (2021). Enhancing science learning for students with disabilities through creative approaches. *International Journal of Inclusive Education*, 17(3), 225-238.
- Olayiwola, R. (2021). Adapting the Nigerian curriculum for students with special needs: A case study. *International Journal of Curriculum Studies*, 14(4), 112-130.
- Omojuwa, T. (2021). Parental involvement in inclusive education in Nigeria: An empirical analysis. *Journal of Social Education Research*, 9(1), 101-117.



Leveraging Creativity in Science Education: Inclusive Special Education's Pathway to ... Ayua, G. A., Et. al. (2026)

Onyebuchi, I., & Nwafor, V. (2020). Achieving inclusive education through creativity in the classroom: A focus on science education. *Journal of Contemporary Issues in Education*, 8(2), 114-128.

Onyejiaka, S. (2020). Inclusive classroom practices in Nigerian schools: A review of the literature. *Journal of Inclusive Education*, 6(2), 33-49.

Organisation for Economic Co-operation and Development (OECD). (2018). *OECD economic outlook 2018*. OECD Publishing.

Robinson, J. P. (2011). *Media consumption and civic engagement: New forms of participation*. Cambridge University Press.

Salami, M. (2022). Collaborative learning in inclusive classrooms: The role of science education. *Nigerian Journal of Educational Research*, 14(2), 23-35.

Smith, J., & Johnson, L. (2022). *Creative Science Education: Principles and Practices*. Educational Excellence.

Uche, C. I., & Nweze, C. J. (2019). Science education and self-reliance in Nigeria: The way forward for special needs learners. *Journal of Science and Technology Education*, 6(1), 55-66.



Effects of 8-Weeks Combat Sports Skills Training on Social Inclusion and Functionality among Adolescents with Mild Intellectual Disabilities in Benin City, Nigeria

¹OGBUMA, S.

solomon.ogbouma@uniben.edu

+2348035023354

¹ABAYOMI, C. Y.

celina.abayomi@uniben.edu

²ATUMA, U.

ufuomaoghene.atuma@uniben.edu

¹Department of Human Kinetics and Sports Science, Faculty of Education, University of Benin, Edo State, Nigeria

²Department of Educational Evaluation and Counseling Psychology, Faculty of Education, University of Benin, Edo State, Nigeria

Abstract

This study investigated the effectiveness of eight weeks' selected combat sports skills training in improving social inclusion and functionality among adolescents with mild intellectual disabilities. Four research questions and four corresponding hypotheses were raised to guide the study. The study adopted a mixed-methods design. Sample was selected using purposive sampling to select 29 participants with age range 12 to 19. The participants were assigned to experimental group of 15 persons with age range 12 to 19 and control group of 14 persons with age range 12 to 18. Quantitative data were collected using standardized assessments of motor performance, physiological fitness, social inclusion, and quality of life before and after the intervention. Qualitative data were obtained through focus group discussions involving caregivers, researchers, and participants. The findings revealed significant improvements in motor performance, with participants demonstrating improvement in agility, balance, movement speed, and power following the intervention. Physiological fitness indicators of cardiovascular endurance, flexibility, and body composition also improved. However, no improvements were noticed in variables such as coordination, reaction time, muscular strength, and muscular endurance. In addition, qualitative data revealed that participants exhibited increased peer interaction, greater participation in social activities, and a stronger sense of belonging. Furthermore, qualitative findings indicated enhanced self-esteem, emotional wellbeing, confidence, and functional independence among participants. Based on the findings of the study, it was recommended among others that adapted combat sports skills training should be incorporated into the daily routine of persons with intellectual disabilities in order to improve their physical performance as well as their physiological attributes. This will in turn enhance their overall functionality and translate into better social inclusion.

Keywords: Combat sports, social inclusion, functionality, physiological fitness, quality of life, adolescents.

Introduction

Disability is a phenomenon that has always been present among every human population. The World Health Organisation (2023) observed that about 16% of the world population representing approximately 1.6 billion people live with significant disabilities. In Nigeria, Abdulahi (2023), citing the National Commission for Persons with Disabilities, noted that about 35 million persons currently live with disabilities. This is against the World Health Organization's estimated 29 million in 2018 which goes to show that the problem of disability among Nigerian population is growing. Among this number of persons with disabilities, those with intellectual disability stand out. Intellectual disability is considered to be among the most common types of disabilities recognized in the literature (Lasisi et al, 2024). The incidence and attendant challenges of intellectual disabilities have been with the human population from time immemorial. Government efforts in addressing the challenges of persons with disabilities have been complemented by some private initiatives that provide some training for people with special needs. These efforts notwithstanding, not all persons with special needs in Nigeria today have access to educational, vocational, and fitness/sports rehabilitation opportunities (Onalu et al., 2023). Only a few are actually captured within the framework of formal human development programme. Most of the programmes designed for rehabilitating people with disabilities including adolescents with intellectual disabilities only include the provision of basic means of subsistence such as food, shelter and clothing. Little or no provision is made for any meaningful form of educational and health rehabilitation programmes. This therefore creates a situation where adolescents with intellectual disabilities are left in a state of frustration and near or total dependence. This condition further compromises their physical and physiological functionalities and their level of social inclusion which ultimately have a negative impact on their quality



Effects of 8-Weeks Combat Sports Skills Training on Social Inclusion and ... Ogbouma, S., Et. al. (2026)

of life (Ayub & Abubakar, 2022; Onalu et al., 2023; Rahman et al., 2024). When movement is hampered by any form of disability, this usually has an attendant effect on almost all facets of the sufferer's life. Consequently, discrimination and social exclusion may follow. Drawing from the foregoing, there is obvious systemic failure in terms of government policies and programmes to address the problems of social exclusion, poor functionality, and low quality of life among adolescents with intellectual disabilities. This is evident in the poor implementation of existing policies and programmes designed to address the problems. The situation is further compounded by the low research effort on issues relating to disabilities as can be observed in the few research output on disability studies. This, therefore, calls for the need to undertake research exercise aimed at addressing this research gaps with a view to providing evidence-based solutions to the challenges faced by persons with disabilities in Nigeria.

Research Questions

The following research questions were raised to guide the study:

1. What is the effect of 8 weeks adapted combat sports skill training on motor performance indices involving agility, balance, coordination, and movement speed among adolescents with mild intellectual disabilities?
2. What is the effect of 8 weeks adapted combat sports skill training on physiological fitness indicators involving cardiovascular endurance, muscular endurance, muscular strength, body composition, and flexibility among adolescents with mild intellectual disabilities?

Hypotheses

Research questions 1 and 2 were hypothesized and tested at .05 level of significance as follows:

1. Eight weeks adapted combat sports skill training will have no significant effect on motor performance indices involving agility, balance, coordination, and movement speed among adolescents with mild intellectual disabilities.
2. Eight weeks adapted combat sports skill training will have no significant effect on physiological fitness indicators involving cardiovascular endurance, muscular endurance, muscular strength, body composition, body composition and flexibility among adolescents with mild intellectual disabilities.

Overview of Disability and Intellectual Disability

The concept of disability is explained by the World Health Organization (WHO, 2024) as any impairment in body structure or function that significantly limits the activities of sufferers as well as restricts their participation in life's events. Disabilities can encompass a wide range of dysfunction in areas such as vision, hearing, verbal communication, physical performance and intellectual ability. Although disability involves restriction and limitation in performance, it does not totally prevent such performance. Persons with disabilities have been known to participate in fitness and sports activities to the extent that the nature and severity of their disability permits. Such activities and events are usually adapted to the specific abilities of the affected persons (Ben et al., 2025; Sapre et al., 2025). Several types of disabilities are recognized in the literature according to the manifestation of the disability. The term intellectual disability is a condition that is typically characterized by a deficiency in the ability to perform mental tasks (Totsika et al., 2022). This usually manifests in learning difficulties and an impairment in intellectual adaptive behaviour. The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders [DSM-5] (American Psychiatric Association, 2013) observed that intellectual disabilities is usually identified during the individual's developmental years between birth and age 18.

Research Instrumentation in Disabilities

Due to the peculiarity of the physical, physiological, and behavioural characteristics of persons with disabilities, the design and development of measurement instrument for this group of persons usually differ from what is applied to apparently healthy population (Winnick & Short, 2005; Ogbouma et al., 2020; Ogbouma & Abayomi, 2022). Consequently, several specially designed measurement instruments have been applied in the collection of data relating to physical performance among persons with disabilities. In the assessment of physiological and physical performance variables among persons with disabilities, several instruments have been designed and modified over the years with regards to the nature and severity of the disabilities to be addressed. Although some test protocols have been designed as a composite of instruments to assess physical and physiological variables, others have also been designed as a stand-alone instrument to assess a given physical or physiological variable. The major classification of physiological variables usually assessed in relation to performance among persons with disabilities are the same as those among apparently healthy persons. These include cardiorespiratory fitness, muscular fitness, flexibility, and body composition. Within this major classification are distinct sub-units of



Effects of 8-Weeks Combat Sports Skills Training on Social Inclusion and ... Ogbouma, S., Et. al. (2026)

physiological variables that can be assessed individually, and whose level of fitness may or may not be influenced by other sub units of physiological variables within the same major classification.

Exercise Protocols as Intervention for Special Populations

Researches have shown that physical and physiological responses to exercise interventions are the same in direction and magnitude among special populations as it is among apparently healthy persons. Researches have also demonstrated that untrained persons with initial low level of fitness such as persons within special populations, respond faster and relatively higher to exercise intervention programmes than trained persons whose level of fitness are already at the peak (Hoeger & Hoeger, 2011). Over the years, several exercise training programmes have been designed and used to bring about desired changes in the target subjects. These exercise training programmes are, in addition to the general principles of frequency, intensity, time, and type (FITT), often guided by broader principles intended to bring about maximum gains among participants (Agwubike, 2016; Hoeger & Hoeger, 2011). However, when designing exercise training programmes for persons with special needs, such programmes are usually designed not for the development and perfection of athletic skills and wellbeing, but are tailored to address the specific physiological and or physical needs of the participants for whom the programmes have been designed. Thus, such programmes are adapted and customized in line with the nature of limitations observed among the affected persons and the degree to which such limitations impede functionality (ACSM, 2014).

Combat Sports and Improvement in Functionality and Social Inclusion

The uniqueness of combat sports is hinged on the fact that they integrate discipline, respect, emotional tolerance, focus, and controlled aggression. These qualities are taught through repeated, structured routines that can be particularly beneficial for adolescents with mild intellectual disability. Literature has demonstrated that combat sports improve physical functionality through enhanced motor coordination, strength, balance, and flexibility and overall functional capacity (Valdés-Badilla et al., 2022; Ciaccioni et al., 2025). Combat sports have been known to help build resilience, patience, and self-confidence. As participants progress through skill levels and receive positive reinforcement, they develop a sense of achievement and self-worth. Moreover, the self-discipline required in combat sports can reduce impulsiveness and help adolescents regulate their emotions more effectively. These improvements contribute to better emotional stability and a reduced likelihood of disruptive behaviors which can translate into better social inclusion (Gama et al, 2023; Zabala-Dominguez et al., 2024)

Method and Materials

Research design

The study employed mixed method research involving quantitative and qualitative research approach. The quantitative strand of the study adopted pretest-posttest control group experimental design. This involved the random assignment of participants into experimental and control groups. The suitability of this design for the study is hinged on its ability to control almost all threats to internal and external validity as attested to by Thomas et al. (2015).

Population, sample and sampling

The population of the study was made up of all adolescents with mild intellectual disabilities in an institution for persons with disability in Benin City. Sample for the study was made up of all members of the population who were willing and ready to participate in the study. They were selected through purposive sampling from the population in line with predetermined inclusion and exclusion criteria. Purposive sampling was used to select 29 participants with age range 12 to 19. The participants were assigned to experimental group of 15 persons with age range 12 to 19 and control group of 14 persons with age range 12 to 18.

Research instruments

The research instruments for the study included several test protocols and devices. The test protocols adapted for use included the Brockport Physical Fitness Test (BPFT) which is a criterion-referenced health-related test of physical fitness appropriate for use with people with disabilities; the Minnesota Rate of Manipulation Test or Minnesota Manual Dexterity Test which is a series of tests of eye-hand coordination and motor abilities for special population; the Eurofit Special Test, which is a battery of motor fitness tests addressing strength, speed, flexibility, and balance among special population; the Rockport Walking Test for estimating VO₂Max among special population; the Short Physical Performance Battery (SPPB) for testing functional abilities in the lower extremity among special population; and the Chair Rise Test protocol for testing agility, speed of movement, and power among special population. The devices included Omron body composition monitor which was used to measure body weight, body composition, body mass index, resting metabolism, water mass, muscle

Effects of 8-Weeks Combat Sports Skills Training on Social Inclusion and ... Ogbouma, S., Et. al. (2026)

mass, visceral fat level, and percentage body fat, Omron M1 Basic Automatic BP Monitor for measuring cardiovascular characteristics such as heart rate, pulse rate, and for estimating VO₂max, and digital voice recorders for recording the focus group discussion sessions. Though all instruments and devices that were used for the quantitative aspect of the study are standardized, they were, however, subjected to validity and reliability tests to establish their suitability for use in this study. The validity of the instruments were established through content validity. In addition, instruments that need calibration were constantly recalibrated before administration to ensure that errors resulting from poor calibration were reduced to the barest minimum. To establish the reliability of the instruments, the interrater method of estimating reliability was adopted. This involved simultaneous administration of the test instruments by the researchers. Interclass correlation coefficient was then computed for scores obtained by the two test administrators using Cohen's Kappa to determine the reliability coefficient of the instruments which yielded reliability coefficients of 0.84, 0.89, 0.76, 0.85, 0.79, 0.77, and 0.82 for the BPFT, Rockport Walking Test, Manual Dexterity test, Nelson Hand Reaction Time test, SPPB test, PPB test, and Eurofit special test respectively. In addition, the Omron M1 Basic Automatic BP Monitor device yielded correlation coefficients of 0.73.

Intervention procedures

The intervention programme for the study was a structured selected adapted combat sports skill training programme. It was designed in line with the recommendations of the American College of Sports Medicine (ACSM, 2018), and Kisner and Colby (2012). The programme was designed and implemented for 8 weeks at a frequency of three days per week (Mondays, Wednesdays, and Fridays) and an intensity level of mild, through moderate, to vigorous, with due consideration of the conditions of the participants. The duration of the programme was 20 minutes for week 1 and week 2, 25 minutes from week 3 to week 5, and 30 minutes from week 6 to week 8. Each intervention session was preceded by five minutes warm up session and followed by five minutes cool down session. The specific exercises for the programme were designed to incorporate play activities so as to make them enjoyable to the participants and sustain their attention and participation in accordance with their age and health status. The adapted combat sports skills included basic front and roundhouse kicks and basic punches involving straight jabs and hooks. These were performed without due consideration for accuracy of body forms and mechanics.

Data analysis

In analyzing data generated from the study, inferential statistics involving the general linear model (GLM) was adopted to analyze difference in means between groups. This involved the use of Analysis of Covariance (ANCOVA) to analyze the difference between pretests and posttests of the experimental and control groups. The Statistical Package for Social Science (SPSS) application (version 30) by IBM was used for data analyses. The alpha was set at 0.05 level of significance.

Qualitative strand

The qualitative strand of the study adopted focus group discussions. The population was made up of families and caregivers of adolescents with mild intellectual disability, and employees in the target institution who were willing and ready to take part in the study. The sample was made up of all members of the population, hence it was a census. The instrument used in the qualitative strand of the study was a focus group discussion guide which was validated by experts in measurement and evaluation to ensure that they satisfy face and content validity. The focus group discussion was administered by the researchers and data collected were analyzed thematically.

Presentation of Results

Results obtained from the study are presented in tables 1 to 4.

Table 1” ANCOVA Results for Motor Performance Variables

Variable	Df	F	p-value	Partial Eta Squared (η^2)	Decision
Agility	1	12.84	.001	.33	Significant
Balance	1	9.67	.005	.27	Significant
Movement Speed	1	10.56	.000	.29	Significant
Power	1	11.92	.000	.31	Significant
Coordination	1	1.42	.245	.05	Not Significant
Reaction Time	1	0.98	.331	.04	Not Significant



Effects of 8-Weeks Combat Sports Skills Training on Social Inclusion and ... Ogbourma, S., Et. al. (2026)

Table 1 revealed statistically significant differences between the experimental and control groups in agility $F(1, 41) = 12.84, p < .001$, partial $\eta^2 = .33$, balance $F(1, 41) = 9.67, p < .001$, partial $\eta^2 = .27$, movement speed $F(1, 41) = 10.56, p < .001$, partial $\eta^2 = .29$, power $F(1, 41) = 11.92, p < .001$, partial $\eta^2 = .31$, after adjusting for pre-test scores ($p < .05$). However, no significant differences were observed in coordination $F(1, 41) = 1.42, p > .05$, partial $\eta^2 = .05$ and reaction time $F(1, 41) = 0.98, p > .05$, partial $\eta^2 = .04$. This indicates that the combat sports training programme was effective in improving selected motor performance variables but did not significantly affect coordination and reaction time.

Table 2: ANCOVA Results for Physiological Fitness Variables

Variable	Df	F	p-value	Partial Eta Squared (η^2)	Decision
Cardiovascular Endurance	1	13.46	.000	.34	Significant
Flexibility	1	8.91	.006	.25	Significant
Body Composition	1	7.88	.003	.23	Significant
Muscular Strength	1	1.11	.301	.04	Not Significant
Muscular Endurance	1	1.54	.226	.06	Not Significant

Results presented in table 2 showed significant improvements in cardiovascular endurance $F(1, 47) = 13.46, p < .001$, partial $\eta^2 = .34$, flexibility $F(1, 47) = 8.91, p < .001$, partial $\eta^2 = .25$, and body composition $F(1, 47) = 7.88, p < .001$, partial $\eta^2 = .23$ among participants exposed to the combat sports training programme compared to those in the control group. No significant improvements were found in muscular strength time $F(1, 47) = 1.11, p > .05$, partial $\eta^2 = .04$ and muscular endurance $F(1, 47) = 1.54, p > .05$, partial $\eta^2 = .06$. Therefore, the intervention was effective in enhancing some aspects of physiological fitness but not all.

Qualitative Findings

Thematic analysis of focus group discussions with caregivers yielded four principal themes: (1) enhanced peer interaction and social participation; (2) strengthened sense of belonging and Community Engagement (3) improved self-esteem and emotional wellbeing; and (4) greater confidence and functional independence. Theme 1: Enhanced Peer Interaction and Social Participation. Caregivers consistently reported observable increases in the participants' willingness and ability to engage with peers following participation in the combat sports programme. Several caregivers described the participants initiating social contact more frequently, participating in group activities with greater confidence, and demonstrating improved capacity to take turns, share space, and cooperate with others. One caregiver noted, "Before the training, my son would stand at the edge during any group activity. Now he is the one calling others to come and play." These observations align with the structured cooperative elements embedded within the combat sports training programme, which deliberately emphasized partner work, cooperative drills, and peer modelling as mechanisms for social skill development.

Theme 2: Strengthened Sense of Belonging and Community Engagement. Caregivers reported that participation in the programme appeared to foster a stronger sense of belonging and identity among participants. Many described their children exhibiting pride in their participation, speaking about the training positively with family members, and demonstrating a desire to continue attending sessions. Caregivers further noted increased interest in community activities and social events following the intervention, which shows broader generalization of social gains beyond the training context. As one caregiver expressed, "She now feels like she is part of something. Through her gesticulations, she talks about the programme every day and tries to tell everyone she is learning combat sports." Theme 3: Improved Self-Esteem and Emotional Wellbeing. A prominent theme across all three focus groups was the perceived improvement in participants' self-esteem and emotional wellbeing. Caregivers described visible changes in demeanour, including more frequent smiling, reduced withdrawal behaviours, greater willingness to attempt new tasks, and more positive self-expressions. Several caregivers highlighted a reduction in anxiety-related behaviours and emotional outbursts, attributing these changes to the discipline, structure, and sense of achievement that the training provided. One caregiver reflected, "She used to cry whenever she felt she could not do something. Now she tries harder and does not give up easily. I think the training has given her belief in herself." Theme 4: Greater Confidence and Functional Independence. Caregivers reported meaningful improvements in participants' functional independence and confidence in performing daily living tasks. Observable changes included greater willingness to dress independently, navigate familiar environments without prompting, and engage in household tasks. Caregivers attributed these changes to the programme's emphasis on self-discipline, sequential skill execution, and the experience of mastery that combat sports training provided. The structured nature of the



Effects of 8-Weeks Combat Sports Skills Training on Social Inclusion and ... Ogbouma, S., Et. al. (2026)

programme, with clear task progressions and achievable goals, was identified as particularly important in fostering the confidence necessary for increased functional independence.

Discussion of Findings

The significant improvements observed in agility, balance, movement speed, and power among experimental group participants following the eight-week combat sports skills training programme are consistent with the broader adapted physical activity literature documenting positive motor performance outcomes following structured physical intervention (Ogbouma et al., 2020). The demands of combat sports training, including rapid directional changes, dynamic balancing tasks, explosive movement patterns, and coordinated partner interactions, provide sufficient motor learning stimuli that can effectively challenge and develop the neuromuscular systems underpinning these qualities (Ciaccioni et al., 2025). However, there were no significant improvements in coordination and reaction time. Several explanations may account for these findings. First, coordination and reaction time are recognized as relatively complex motor qualities requiring sustained, high-frequency practice and extended learning periods to elicit measurable change, particularly in populations where neural processing speed is intrinsically affected by the cognitive characteristics of intellectual disabilities. An eight-week intervention period may therefore have been insufficient to generate statistically detectable improvements in these specific capacities. Second, the particular combat sports techniques selected and the pacing of skill introduction may not have provided sufficiently specific or intensive stimulation for these motor qualities. The significant improvements in cardiovascular endurance, flexibility, and body composition observed in the experimental group align with established evidence regarding the physiological benefits of structured physical training among adolescents with ID (Ogbouma et al., 2020; Valdés-Badilla et al., 2022; Ciaccioni et al., 2025). The sustained aerobic demands of combat sports training sessions encompassing continuous movement, dynamic partner drills, and technique repetition are consistent with the exercise intensities known to promote cardiovascular adaptations in this population (Valdés-Badilla et al., 2022).

However, the lack of significant improvement in muscular strength and muscular endurance may be ascribed to technical nature of the combat sports activities employed. Unlike resistance training or bodyweight conditioning programmes specifically designed to progressively overload muscular systems, the combat sports curriculum prioritized technique acquisition, movement pattern development, and social skill integration. The relatively low resistance and load-bearing demands of the adapted techniques used may have been insufficient to generate the physiological overload necessary for measurable muscular strength and endurance gains within eight weeks. The qualitative findings of this study provide compelling evidence that structured combat sports training can serve as a meaningful vehicle for promoting social inclusion, peer interaction, and quality of life among adolescents with mild intellectual disabilities. The four themes identified are consistent with a growing body of literature documenting the psychosocial benefits of sport and physical activity for individuals with intellectual (Gama et al, 2023). The structured social elements embedded within the combat sports programme, including partner work, cooperative drills, turn-taking, and shared physical achievement, appear to have created optimal conditions for the development of social competencies and positive peer relationships. These findings align with the position of Gama et al. (2023). Similarly, the improvements in self-esteem and emotional wellbeing reported by caregivers are consistent with evidence linking physical mastery experiences and sport participation to positive identity formation and psychological wellbeing in adolescents with developmental disabilities (Zabala-Dominguez et al., 2024). The reported gains in functional independence and confidence are of particular practical significance, as functional independence represents a primary goal of intervention for adolescents with mild intellectual disabilities and a key determinant of long-term quality of life and community participation outcomes. The structured, task-sequenced nature of combat sports training, with its inherent emphasis on discipline, progressive skill mastery, and self-regulation, appears to have provided participants with transferable competencies that extended beyond the training environment into daily living contexts, consistent with the programme's overarching goals.

Conclusion

Based on the findings of this study, it is thus concluded that an eight-week structured combat sports skills training programme can generate significant and meaningful improvements across multiple dimensions of motor performance, physiological fitness, social inclusion, and quality of life among adolescents with mild intellectual disabilities. Specifically, the programme can provide significant improvement in agility, balance, movement speed, power, cardiovascular

Effects of 8-Weeks Combat Sports Skills Training on Social Inclusion and ... Ogbouma, S., Et. al. (2026)

endurance, flexibility, and body composition in addition, it can also improve peer interaction, community belonging, emotional wellbeing, self-esteem, and functional independence among participants.

Recommendations

Consequent upon the findings and conclusion, it is therefore recommended that:

1. Adapted combat sports skills training should be incorporated into the daily routine of persons with intellectual disabilities in order to improve their physical performance as well as their physiological attributes. This will in turn enhance their overall functionality and translate into better social inclusion.
2. Intervention programmes should be extended beyond eight weeks to provide sufficient time for improvements in complex motor qualities such as coordination and reaction time, and to promote the durability of fitness gains.
3. Future programme designs should integrate supplementary strength conditioning components to address the muscular strength and endurance dimensions not effectively stimulated by technical combat sports training alone.

Acknowledgement

This research was funded by TETFund Institution-Based Research grant, Years 2024/2025 (Merged), Batch 20

References

- Abdulahi, M. (2023, December 2). 35m people living with disabilities in Nigeria, says NCPWD. *The Cable*. Available at <https://www.thecable.ng/35m-people-living-with-disabilities-in-nigeria-says-ncpwd/>
- American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders* (5th ed). Washington DC: Author
- Ayub, A. O. & Abubakar, U. (2022). Institutional challenges faced by persons with disabilities in Nigeria. *Ifa Social Sciences Review*, 30(2), 124-135
- Ben, R. O., Bassiri, M., & Lotfi, S. (2025). Adapted pedagogical strategies in inclusive physical education for students with special educational needs: A systematic review. *Pedagogy of Physical Culture and Sports*, 29(2), 67-85.
- Ciaconni, S., Lee, Y., Guidotti, F., Stankovic, N., Pocecco, E., Izzicupo, P. & Capranica, L. (2025) Combat sports and wellbeing: Advancing health and inclusion in athletes and practitioners. *Frontiers in Psychology*, 16, 1587672. doi: 10.3389/fpsyg.2025.1587672
- Gama, L. D., Brandão P. C. J, Borba-Pinheiro, C.J., & Rodrigo G. S. V. (2023). Effect of combat sports on physical fitness and activities of daily living of older adults: A systematic review and meta-analysis of randomized con-trolled trials. *Journal of Gerontology and Geriatrics*, 71, 115-126.
- Hoeger, W. W. K. & Hoeger, S. A. (2011). *Lifetime physical fitness and wellness: A personalized program* (11th ed). Wadsworth: Cengage Learning
- Lasisi, M. D., Nuhu, F. T., Okechukwu, O., Adebayo, F., Sheikh, T. L. Edwin, E. E. & Moneme, P. (2024). Prevalence, levels and correlates of intellectual disability among adolescents incarcerated in a correctional facility in Kaduna, North-Western Nigeria. *African Journal of Health Sciences*, 36(4). <https://ojs.ajhsjournal.or.ke/index.php/home/article/view/175>
- Ogbouma, S., & Abayomi, C. Y. (2022). Research instrumentation in physical activities for special population. *Journal of Human Kinetics and Sports Science*, 6(1), 43-60.
- Ogbouma, S., Abayomi, C.Y., & Oke, K.I. (2020). Structured exercise programmes in promoting healthy body composition in youths with intellectual disability. *Journal of Basic and Applied Medical Sciences*, 1(1), 41-46.
- Onalu, C., Chukwu, N., Nnama-Okechukwu, C. U., Iwuagwu, A., Agha, A., Anazonwu, N., & Okoye, U. O. (2023). An exploratory study of the situation of persons with disabilities in Nigeria: Practice consideration for social workers. *Journal of Evidence-Based Social Work*, 21(1), 90–103.
- Rahman, F.N., Iwuagwu, A.O., Ngwu, C.N., Kalu, M.E., Kasherwa, A., Chowdhury, M.R.K. & Kader, M. (2024). Connecting the experiences of persons with disabilities and social workers in Nigerian care institutions regarding COVID-19 vaccine uptake: A qualitative descriptive-interpretive design. *Frontiers in Public Health* 12:1466313. doi: 10.3389/fpubh.2024.
- Thomas, J. R., Nelson, J. K., & Silverman, S. (2015). *Research methods in physical activity* (7th ed.). Champaign, Illinois: Human Kinetics
- Sapre, T., Miller, H. L., Schwartz, A., Ketcheson, L. R., Price, A., Winkelseth, K., Barcelona, J. M., Zernicke, R. F., & Hasson, R. E. (2025). Enhancing home-based physical activity for neurodivergent children: Adapting the InPACT at Home program with AI and universal design. *Frontiers in Physiology*, 15, 1496114. <https://doi.org/10.3389/fphys.2024.1496114>
- Strong, W.B., Malina, R.M., Blimkie, C.J., Daniels, S.R., Dishman, R.K., Gutin, B., & Trudeau, F. (2005). Evidence-based physical activity for school-age youth. *Journal of Pediatrics*, 146, 732–737.



Effects of 8-Weeks Combat Sports Skills Training on Social Inclusion and ... Ogbouma, S., Et. al. (2026)

The American College of Sports Medicine (2018). *ACSM's Exercise Testing and Prescription*. Philadelphia: Wolters Kluwer

Totsika, V., Liew, A., Absoud, M., Adnams, C., & Emerson, E., (2022). Mental health problems in children with intellectual disability. *The Lancet Child & Adolescent Health*, 6(6), 432-444,

Valdés-Badilla, P., Herrera-Valenzuela, T., Guzmán-Muñoz, E., Delgado-Floody, P., Núñez-Espinosa, C., Monsalves-Álvarez, M., & Andrade, D. C. (2022). Effects of Olympic combat sports on health-related quality of life in middle-aged and older people: A systematic review. *Frontiers in Psychology*, 12, 797537. <https://doi.org/10.3389/fpsyg.2021.797537>

Winnick, J. P., & Short, F. X. (2005). Conceptual framework for the Brockport physical fitness test. *Adapted Physical Activity Quarterly*, 22, 323-332

World Health Organization (2024). *Disability*. Available at <https://www.afro.who.int/health-topics/disabilities>

Zabala-Dominguez, O., Lázaro Fernández, Y., Rubio Florido, I., & Olasagasti-Ibargoien, J. (2024). Psychological well-being of young athletes with physical disabilities: A systematic review. *Behavioral Sciences (Basel, Switzerland)*, 14(9), 822. <https://doi.org/10.3390/bs14090822>



Effects of Multimodal Instructional Strategy on Self-Efficacy in ... Sani, J., Et. al. (2026)

Effects of Multimodal Instruction on Self-Efficacy in English Speaking skills among Colleges of Education Student in North-West, Nigeria

SANI, Jamilu¹

jamilusanimakamagumel@gmail.com

+2348062084660

INUSA, Auwalu²

LAWAL, Hamisu³

AUWALU, Kabiru⁴

KABIRU, Nura⁵

LAWAN, Asma'u Muhammad⁶

¹Department of English, Jigawa State College of Education, Gumel, Jigawa State, Nigeria

^{2,3}Department of Arts and Social Science Education, Ahmadu Bello University, Kaduna State, Zaria

^{4,5}Department of Hausa, Jigawa State College of Education, Gumel, Jigawa State, Nigeria

⁶Department of Hausa, Jigawa State College of Education, Gumel, Jigawa State, Nigeria

Abstract

This study examined the effectiveness of multimodal instruction on students' self-efficacy in English speaking skills in Colleges of Education, North West Zone, Nigeria. The research followed up earlier investigation on multimodal instruction on students' performance in English speaking conducted by the author(s). The aim is to discover whether the earlier multimodal treatment had increased learners' self-efficacy in English speaking. Thus, experimental subjects, comprising intact National Certificate in Education One (NCE 1) classes of Jigawa State College of Education, Gumel (JSCO, Gumel) and Kano State College of Education and Preliminary Studies (KASCEPS), constituted the 97 sample of the study. The instrument for data collection was a Multimodal English Speaking Self-efficacy Scale. It was a Likert type of questionnaire consisting of 21 items, 7 for each of the three categories namely: Linguistic Dimension of Self-efficacy, Interpersonal Dimension of Self-efficacy and Performance Dimension of Self-efficacy. The instrument was administered one week after the completion of the quasi-experimental research on the effects of Multimodal Instruction on Students' Performance in English Speaking Skills. Descriptive statistics was used to answer the three questions. Results showed multimodal instruction was effective on students' performance in self-efficacy in English speaking skills: subjects' self-efficacy in English oral performance increased across linguistic, interpersonal and performance criteria. It was concluded that multimodal instruction was potent enough to raise college-level learners' degrees of self-efficacy in English speaking skills in second language contexts. It was then recommended that a North West Zonal conference be organized by Colleges of Education Academic Staff Union in collaboration with National Commission for Colleges of Education to come up with multimodal frameworks for teaching English speaking skills in Colleges of Education in Nigeria.

Keywords: Multimodal Instruction, Self-Efficacy, English Speaking, Students

Introduction

Over the years, there has been a growing concern over the declining performance of students in English speaking skills in Nigeria. Students display varying dispositions and low self-efficacy levels towards English speaking skills at all levels of education in the country. To substantiate this, for example, Nigerian Tribune (24th April, 2025) and The Vanguard (5th May, 2012) reveal a dwindling communicative competence of students in Nigeria resulting in poor performance of learners in national examinations. The Vanguard further cites a report of an error-ridden use of English by a graduate of English with Second Class Upper Division. It has become apparently observable that the spoken English skills of Nigerian graduates are not in commensurate with the demands of the 21st century society and expectations. Guided by these fears, in reality, in the study area and, indeed, in most states in Nigeria, employment into the teaching profession is subjected to rigorous pre-job tests and pre-job trainings to enable the graduates meet the standards expected of them in the teaching industry. More worrisome is when such problems manifest also persistently in the performance of English language learners in colleges of education. This is because such learners would soon become teachers of the English language in primary and lower secondary schools. Thus, from the personal observation of the researcher, in colleges of education, teachers are still ignorant of the fact that pre-service English teachers are already multimodal savvy. For this, the prevalent use of the mono-modal, traditional lecture method would not enable such learners perform up to the expectations in the



Effects of Multimodal Instructional Strategy on Self-Efficacy in ... Sani, J., Et. al. (2026)

English-speaking skills (Al Hosni, 2014; Banzato & Coin, 2009; Nash, 2018). This would also further inform the basis of the persistent low self-efficacy of college-level learners in English speaking skills in the study area.

Multimodal classroom approach is a contemporary response to the changes in the 21st century mode of communication which also finds reflection and expression in teaching English as a second language contexts (Crawford & Carmen, 2018; Zamani, 2016; Zafiri & Kourdis, 2016). It is an approach involving a mixture of multiple modes, such as audios, videos, texts, gestures, pictures and technology, and the ways these modes interact and enable language production and perception skills (Onyebuchi & Ibrahim, 2017). In English speaking pedagogy, self-efficacy is seen as the learners' belief in their ability to successfully engage and perform meaningful speaking tasks in the classroom. According to Rafiq and Hasheem (2018), one of the several speaking problems of learners of English as a second language include low self-efficacy. Thus, learners are required to interact, engage and perform tasks using multiple modes in an English speaking classroom which will enable the learners express their opinions, participate in socialization and practice the English language speaking skills (Masinde, Mandillah, & Barasa, 2023; Kusumawardani & Mardiyani, 2018; Belabbas, 2024). Unfortunately, in the North West Zone of Nigeria, learners grow in the Hausa language almost entirely (Sani, 2021). The researcher personally observes that, by culture and orientation, speaking the English language outside the classroom has been a source of scornful jocular and ridicule in some contexts in the region. Impliedly, this practice has the tendency to instil scepticism and low self-efficacy in learners even while speaking the language for academic purposes. Against this development. However, as far as the researcher is concerned, no empirical study has established the extent to which multimodal instruction can increase learners' self-efficacy in English speaking skills in colleges of education in North West Zone, Nigeria. This study is expected to contribute to theory, practice and curriculum in English Language Education in the following major ways: (1) in terms of theory, the study contributes to the emerging field of research on multimodality in education; (2) practically, it provides teacher-educators in North West Zone, Nigeria, with empirical evidence and guidance on the use of multimodal framework in the actual English speaking classroom for the enhancement of learners' self-efficacy; (3) in terms of curriculum, the study would enlighten the regulatory body of Colleges of Education in Nigeria (NCCE) to re-assess the areas of English pedagogy in the curriculums of Colleges of Education in order to integrate multimodal framework.

Research Objectives

The main aim of the present study is to investigate the effects of multimodal instruction on students' self-efficacy in English speaking skills in colleges of education in North West Zone, Nigeria. However, this broad aim is reduced to the following specific objectives:

1. To find out the effects of multimodal instruction on students' Linguistic dimension of self-efficacy in English speaking skills in Colleges of Education in North West Zone, Nigeria.
2. To investigate the effects of multimodal instruction on students' interpersonal dimension of self-efficacy in English speaking skills in Colleges of Education in North West Zone, Nigeria.
3. To investigate the effects of multimodal instruction on students' performance dimension of self-efficacy in English speaking skills in Colleges of Education in North West Zone, Nigeria.

Research Questions

Three questions guided the investigation as follows:

1. What are the effects of multimodal instruction on students' Linguistic dimension of self-efficacy in English speaking skills in Colleges of Education in North West Zone, Nigeria?
2. How effective is multimodal instruction on students' interpersonal dimension of self-efficacy in English speaking skills in Colleges of Education in North West Zone, Nigeria?
3. To what extent does multimodal instruction improve students' performance dimension of self-efficacy in English speaking skills in Colleges of Education in North West Zone, Nigeria?

Previous Studies on Multimodal Instruction, Self-efficacy and English-Speaking Skills

Bernarte and Digo (2024) studied multimodal reading model for a rural elementary school. The aim was to provide teachers at the elementary levels in Philippines with a model of reading informed by the principles of multimodal instruction. Data for analysis was acquired through documentary reviews, interviews and focus group discussion with the respondents selected purposively. Based on the results which showed consistent improvement in learners' reading ability following the multimodal reading intervention, the study proposed multimodal reading model for rural elementary school. Although



Effects of Multimodal Instructional Strategy on Self-Efficacy in ... Sani, J., Et. al. (2026)

Bernarte and Digo (2024) focussed on reading, the proposition of multimodal reading framework for rural elementary school would appear to be in consonance with the present study. Despite this, however, Bernarte and Digo did not accommodate the relevance of multimodal instruction in enhancing learners' self-efficacy in English speaking skills. This is a significant research gap for further investigation. Kummin, Surat, Mydin, Othman and Muslim (2020) investigated the use of multimodal texts in teaching English oral skills. The study was motivated by the desire to provide an instructional framework that reflected the latest developments in communication. The study specifically focussed on auditory and visual modes encompassing video recording, YouTube videos, songs and Adobe voice. Based on the tasks learners were engaged, it was found out that students were more proactive; more critical and creative in their use of language and were able to develop language skills both individually and in teams. This provides a significant basis for the present study. Since Kummin et al (2020) concluded that multimodal instruction improves learners' proactivity and engagement, it is essential also to find out how similar approach can enhance self-efficacy of college-level learners. Regina and Ochuba (2024) carried out a study on the effect of multimodal instructional strategy on the students' academic performance in English grammar. The study adopted quasi exponential research design. Purposive sampling procedure was used to select 75 subjects for the research from three Secondary Schools in Yenagoa Local Government Area of Bayelsa State, Nigeria. The data collection instrument was a searcher-made multimodal instructional package titled "English Language Performance Test". Findings revealed that female students outperformed male students in English grammar tasks when taught using multimodal instructional strategy. Based on the findings, it was recommended that teachers of English should incorporate multimodal instructional strategies in English grammar classes to enhance learners' performance. On the basis of Regina and Ochuba's findings and recommendations, the present study investigates whether multimodal instruction is essential in increasing learners' self-efficacy in English speaking skills.

Theoretical Framework

Bandura's Self-efficacy Theory (1997) is adopted for the present study. As a Canadian-American psychologist, Bandura was the first to coin the term self-efficacy. Originally, Bandura utilized the concept to refer to a personal judgment of how well one can carry out courses of action required to deal with prospective situations (Lopez-Garrido, 2023). According to Bandura (1997), self-efficacy is a person's particular set of beliefs that determine how well the person can carry out a prospective action in some defined contexts (Bandura, 1997). In educational settings, academic self-efficacy is a person's belief in his/her ability to succeed in a particular learning task (Bandura, 1977). Similarly, Kolbe (2009) believes that self-efficacy also relates to one's determination and perseverance to withstand obstacles that would seem to discourage one from achieving one's learning goals. Thus, since research on second language learning has shown that learners are characterized with differing levels of performance following various degrees of self-efficacy in writing skills (Maghsoudi, et al 2022), it is imperative to investigate the same approach on self-efficacy in relation to the other language skills. As far as the researcher is concerned, there is little or no empirical evidence linking self-efficacy and English speaking skills among pre-service English teachers in colleges of education. It is even more compounded when the notion of multimodal instruction is introduced into the English speaking classroom in such colleges. This is an important gap in research. It is thus necessary to investigate how effective is multimodal instruction on learners' performance English speaking self-efficacy in colleges of education in North West Zone, Nigeria.

Research Methodology

This study employed a follow-up descriptive method. The population of the study comprised all the 488 NCE 1 students of the nine state-owned colleges of education in North West Zone, Nigeria. The sample size was the 97 NCE 1 students of JSCOE Gumel and KASCEPS who were the multimodal instruction experimental subjects selected purposively and be assigned to experimental groups in the earlier investigation. The instrument for the present study was English Speaking Self-efficacy Scale (ESSES) adapted from Maghsoudi et al (2022). It was intended in the present study to find out whether earlier exposure to multimodal instruction could increase learners' various degrees of self-efficacy in English speaking skills. Thus, to ensure adequacy and coverage of the subjects' English-speaking-related efficacy, the scale was divisible into three subcategories: Linguistic Self-Efficacy, Performance Self-Efficacy and Interpersonal Efficacy. The instrument was a modified Likert type of scale consisting of 21 items; seven for each of the three subcategories. Each item in the scale demonstrated the degree of self-efficacy of the subjects in their capabilities to engage in English speaking after exposure to multimodal instruction.



Effects of Multimodal Instructional Strategy on Self-Efficacy in ... Sani, J., Et. al. (2026)

Presentation of Results

Research Question 1: To find out the effects of multimodal instruction on students' Linguistic dimension of self-efficacy in English speaking skills in Colleges of Education in North West Zone, Nigeria.

Table 1: Frequencies and Percentages of Experimental Learners' Responses on the Effects of Multimodal Instruction on Students' Linguistic Dimension of Self-Efficacy in English Speaking Skills in Colleges of Education, North West Zone, Nigeria

LDSE	N	Frequencies	Percentages
Always	97	62	9.1
Usually	97	305	44.9
Sometimes	97	283	41.7
Rarely	97	24	3.5
Ne	97	5	0.7

From Table 1 above, cumulatively, the results of the analyses on Linguistic Dimension of Self-efficacy (LDSE), it can be concluded that most of the learners (53.1%) believed that multimodal instruction was highly effective on the linguistic dimension of English-speaking self-efficacy. Others (41.7%) were neutral (sometimes true). However, only few of them (4.2%) showed the approach was rarely effective.

Research Question 2: To investigate the effects of multimodal instruction on students' interpersonal dimension of self-efficacy in English speaking skills in Colleges of Education in North West Zone, Nigeria.

Table 2: Frequencies and Percentages of Experimental Learners' Responses on the Effects of Multimodal Instruction on Students' Interpersonal Dimension of Self-Efficacy in English Speaking Skills in Colleges of Education, North West Zone, Nigeria

IPDSE	N	Frequencies	Percentages
Always	97	63	9.3
Usually	97	298	43.9
Sometimes	97	276	40.6
Rarely	97	42	6.2
Never	97	0	0

Table 2 above revealed that the largest percentage of the responses (53.9) represented higher confidence of the learners in IPDSE after exposure to the multimodal English speaking treatment. Contrastively, 40.6% showed neutrality while only 6.2% showed little confidence in the approach. From the above, it can be concluded that multimodal instruction was effective on students' IPDSE dimension of English speaking skills. Thus, it can be generalized that multimodal instruction was effective on students' IPDSE dimension of English speaking skills.

Research Question 3: To investigate the effects of multimodal instruction on students' performance dimension of self-efficacy in English speaking skills in Colleges of Education in North West Zone, Nigeria.

Table 3: Frequencies and Percentages of Experimental Learners' Responses on the Effects of Multimodal Instruction on Students' Performance Dimension of Self-Efficacy in English Speaking Skills in Colleges of Education, North West Zone, Nigeria

PDSE	N	Frequencies	Percentages



Effects of Multimodal Instructional Strategy on Self-Efficacy in ... Sani, J., Et. al. (2026)

Always	97	65	9.6
Usually	97	289	42.6
Sometimes	97	298	43.9
Rarely	97	27	4
Never	97	0	0
	97		

From Table 3 above, it can be concluded that most of the responses (52.2%) showed that participants had a higher level of confidence in their abilities to accomplish PDSE dimension of the English speaking skills after exposure to multimodal instruction. However, a good number of the responses revealed the neutrality of the participants in whether multimodal instruction could increase PDSE dimension of the English speaking skills. The least of all fell on very low level of confidence of the participants in PDSE dimension of the English speaking skills after exposure to multimodal instruction. This was represented by 4% of the total responses.

Discussion and Summary of Findings

By way of discussion, the finding revealed that the students in experimental group have performed higher with mean score (M=8.16) and standard deviation (SD= 1.563) than the students in the control group who had mean score (M=3.60) and standard deviation (SD=.840) in the area of consonant articulation. At the beginning of the treatment, some consonants were found challenging for the students to pronounce, especially in isolation. Examples are: / ʃ, s, ŋ, θ, and ð / Achieving this significant effect in performance refute the finding by Mahzoun and Han (2019) that the two fricatives consonants /θ/ and /ð/ had the highest number of mispronunciation is minimized through drilling of the students on the places of articulation (dental fricatives) during instruction. The finding showed 4.56 mean difference in favour of the group taught using phonemic transcription-based teaching strategy was significant over the group taught using conventional method in the area of consonant articulation. The finding number two signifies that the students in experimental group did perform higher with the mean score (M=8.13) and standard deviation (SD=1.556) than the students in the control group who had mean score (M=3.19) and standard deviation (SD=1.128) in area of vowel articulation. The mean difference was 4.946 in favour of the experimental group, the one taught using phonemic transcription-based teaching strategy. During the treatment, it was revealed that majority of the students had little knowledge of how sounds, particularly vowels (diphthongs), are pronounced. They were ignorant of vowel sounds beyond monophthongs and features of English vowels e.g tense, lax, round etc. This finding proves right the findings of Sarwat et al (2023) and Aziz et al (2021) about sound substitution error of some vowels (monophthongs /ʌ/, /e/, /æ/, and /ə/ and difficulty in pronouncing diphthongs /uə /, /eə /) in words into normal English orthography. The result indicated that there was positive effect of the instrument on the oral English performance of senior secondary students in Niger State in the area of vowel articulation.

The results from the research questions and null hypotheses are hereby summarized, that;

1. Niger state senior secondary school students taught oral English using phonemic transcription-based teaching strategy had significantly higher performance than their counterparts taught by conventional method in the area of consonants articulation.
2. The students taught oral English using phonemic transcription-based teaching strategy had significantly higher performance than their counterparts taught by conventional method in the area of vowel articulation.

Discussion of Findings

This study essentially established the effect of multimodal instruction on students' self-efficacy in English speaking skills in College of Education, North West Zone of Nigeria. This result was presented earlier in Tables 1, 2 and 3. From the analyses, LDSE scored the highest. This was followed by PDSE and, finally, the IPDSE. Thus, the new ground broken by the finding of the present study is that multimodal instruction has he potent potentials to increase learners' three levels of the English-speaking self-efficacy. This finding is evident also in the works of Bernarte and Digo (2024) and Maghsoudi, Golshan and Naeimi (2022). For example, the former investigated using multimodal writing to motivate struggling students to write and found out that multimodal writing procedures possessed motivational tendencies. In the same vein, the latter also investigated the impact of digital multimodal composition on writing ability of learners with respect to their self-

Effects of Multimodal Instructional Strategy on Self-Efficacy in ... Sani, J., Et. al. (2026)

efficacy. Regina and Ochuba (2024) also discovered that multimodal instruction increased learners' grammar skills in Yenagoa Local Government Area of Bayelsa State, Nigeria. However, the main difference between the present study and the previously accounted research was that both the previous studies were directed at motivation and self-efficacy in English writing skills. Unlike the above, thus, the present study found out the relevance of multimodal instruction in enhancing learners' self-efficacy in English speaking skills. Thus, the ground-breaking revelation of the present investigation is that multimodal instruction effectively increased learners' performance in the three major dimensions of English-speaking self-efficacy, although unevenly. For clarity, LDSE scored the highest. This was followed by the PDSE. Finally, IPDSE scored the least.

Conclusion

In light of the results of the study, it is concluded that the self-efficacy of the experimental learners in English speaking skills increased after being exposed to multimodal instruction. Thus, learners demonstrated higher level of belief in their capabilities to engage in linguistic, interpersonal and performance components of the English-speaking self-efficacy after the treatment. For this, it was concluded that multimodal instruction enhanced learners' self-efficacy in English speaking skills in Colleges of Education in North West Zone, Nigeria.

Recommendations

1. The present study discovered that high self-efficacy is a correlate of better English-speaking skills. Thus, since multimodal instruction has been found to increase learners' English-speaking self-efficacy, then it is recommended that students be provided with regular feedbacks on their performances during multimodal English classroom practices. This is essential because learners would realize consistent improvements in their performances in the language through such exposure and, by extension, in their abilities to accomplish tasks in multimodal English-speaking classrooms.
2. Teachers of English in Colleges of Education need to transit to the modern ways of teaching. The emphasis today champions learner-centeredness: in pairs, in groups and individually. This is in line with the demands of multimodal instruction in which the teachers' role is a facilitator.
3. Teachers of English should optimize the fact that learners possess different learning styles and thus would require diverse multimodal modes to cater for their classroom practices. This would help such diverse learners cope with the classroom practices as earlier argued by Gardner in multiple intelligence theory.

References

- Al Hosni, S. (2014). Speaking Difficulties Encountered by Young EFL Learners. *International Journal on Studies in English Language and Literature*, 2 (6), 22-30, 260-267, 2014. DOI: <http://dx.doi.org/10.17507/tpls.0602.06>.
- Balebbas, B. (2024). Investigating the Effectiveness of the Multimodal Approach in Developing Speaking Skills among EFL Students. The Case of Second-Year Students of English Department of Mohamed Kheider Biskra University, People's Democratic Republic of Algeria. Unpublished M A Dissertation.
- Bandura, A. (1997). Self-Efficacy: The Exercise of Control. *Journal of Cognitive Psychotherapy*, Volume 13, Issue 2; DOI: 10.1891/0889-8391.13.2.158.
- Banzato, M. and Coin, F. (2009). Does a Multimodal Narrative Workshop Enhance Motivation in Multicultural Class? An Exploratory in a Primary School. *Formazione & Insegnamento* 1 (17), 77-89, 2019
- Bernarte, M. and Digo, G. S. (2024). Multimodal Reading Model for a Rural Elementary School. *International Journal of Social Science and Education Research Studies*. Vol. 4(3), 2770-2782; <https://doi.org/10.55677/ijssers/V0413Y2024-08>.
- Crawford, B. C. and Carmen, M. C.C (2018). Introduction: The Nexus of Multimodality, Multimodal Literacy and English Language Teaching in Research and Practice in Higher Education Settings. *System: An International Journal of Educational Technology and Applied Linguistics*, 77, pp. 1-9
- Kolbe, D. H. (2009). The Semantic and Grammatical Overlap of 'as' and 'that': Evidence from Non-standard English. *Exploring the Lexis-Grammar Interface*, 137-152; 2009. DOI: doi.org/10.1075/sci.35.10kol
- Kummin, S., Surat, S., Mydin, F., Othman, Z. and Muslim, N. (2020). The Use of Multimodal Texts in Teaching English Oral Skills. *Universal Journal of Education Research*. Vol. 8 (12): 7015-7021, 2020.
- Kusumawardani, S. A., and Mardiyani, E. (2018). The correlation between English grammar competence and speaking fluency. *PROJECT (Professional Journal of English Education)*, 1(6), 724-733. Learners. *The Electronic Journal for English as a Second Language*, 18 (4), 2013.
- Lopez- Garrido, G. (2023). Self-Determination Theory: How It Explains Motivation. *Simply Psychology*, 2023 www.simplycomplicated.me/self-determination.



Effects of Multimodal Instructional Strategy on Self-Efficacy in ... Sani, J., Et. al. (2026)

- Maghsoudi, N., Golshan, M. and Naemi, A. (2022). The Impact of Digital Multimodal Composition on Writing Ability of Iranian EFL Learners with Respect to Their Self-Efficacy. *Journal of Modern Research in English Language Studies*, 9 (1), <https://doi.org/10.30479/jmrels.2020>.
- Masinde, R. A., Mandillah, L., and Barasa, D. (2023). Multimodal approaches in the competency of listening and speaking skills among Grade 1 learners in Kenya. *International Journal of English Language Studies*, 5(3), 67-81.
- Nash, B. (2018). Exploring Multimodal Writing in Secondary English Classrooms: A Literature Review. *Journal of English Teaching Practice and Critique*, Vol. 17(4), 2018; www.emeraldinsight.com/1175-8708.htm
- Nigeria, F.R (2020) *National Language Policy*. Lagos: Nigerian Educational Research and Development Council.
- Onyebuchi, C. and Ibrahim, M. (2017). Effect of Multimodal Strategies on the Learning of Listening Skills among Junior Secondary School Students in Sokoto State Metropolis, Sokoto State, Nigeria. *Sokoto Educational Review* 17 (1), 33-47, 2017. Sokedureview.org.
- Rafiq, K. R. M., and Hashim, H. (2018). Augmented reality game (ARG), 21st Century skills and ESL classroom. *Journal of education and learning studies*, 1, 29-34. <https://doi.org/10.32698/0232>.
- Regina, A., and Ochuba, O.O. (2024). Effects of Multimodal Instructional Strategy on Students' Academic Performance in English Grammar in Bayelsa State. *FUO – Journal of Educational Research*, 2024 – foe.fuotuo.ke.edu.ng
- Sani, J. (2021) Effects of Systemic Functional Linguistic Genre Pedagogy on Students' Performance in Narrative Report Writing in English in Senior Secondary Schools, Jigawa State, Nigeria: Unpublished M. Ed Dissertation, Department of Arts and Social Science Education, Ahmadu Bello University, Zaria, Nigeria.
- Vanguard, (2012, May 5). Poor Quality of Education in Nigeria.
- Zafiri, M. and Kourdis, E. (2016). Semiotics in foreign language teaching, boo illustrations as inter-semiotic translation in English language course books. *Discourse and interaction* 4 (2) 1-7.
- Zamani, S. (2016). Semiotics and language teaching (teaching English to Kurd students). *World Scientific*, 42, (3) 293-305 News. <http://www.worldnewsscificnews.com>.



Influence of Artificial Intelligence Technology Integration on Occupational Health and Safety among workplaces in Nigeria

OLIKIABO, Samuel Osaretin¹

osaretin.olikiabo@uniben.edu

AIDEYAN, Daniel Osarenmwanta¹

¹Department of Health, Safety and Environmental Education, Faculty of Education, University of Benin, Edo State, Nigeria

Abstract

This paper explores how artificial intelligence can improve occupational health and safety service delivery in Nigerian workplaces. It frames OHS as a service function that supports prevention through hazard identification, training, and timely incident management. It notes systemic constraints such as weak documentation and reporting, limited enforcement capacity, gaps in awareness and professional skills, and extensive informal work. The discussion is situated within Nigeria's OHS framework, including the Factories Act, the National OSH Policy, the Employees' Compensation Act and NSITF coverage, and the Nigeria Data Protection Act 2023. Six AI capability areas were examined which are risk prediction, natural language processing of incident narratives, computer vision in high risk settings, wearables for exposure and fatigue monitoring, AI supported learning, and decision support for safety officers and clinics. It concludes that AI adoption should be phased and NDPA compliant, with investments in power, connectivity, data quality, and workforce skills to sustain safer, more productive operations. It was then recommended that AI should be deployed in OHS in Nigerian workplace to facilitate smooth service delivery and that all present and perceived constraints to the deployment of AI should be promptly addressed to forestall their negative impact on the deployment of AI.

Keywords: Artificial intelligence, occupational health and safety, risk management, workplace safety, service delivery

Introduction

The concept of occupational health and safety (OHS) is used to describe the ideal practices, policies and procedures designed to protect the health, safety and wellbeing of workers in any occupation. It involves the regulation and procedure intended to prevent accidents, injuries, illness or death in all workplaces or any public spaces (Abina et al., 2023). Occupational health and safety is often considered as a compliance requirement. However, in practice, it is a service function. It provides prevention, response, and recovery support to workers and management through risk assessments, controls, training, incident investigation, medical referral pathways, and continuous improvement. In Nigeria, this service role is difficult to deliver consistently because many workplaces operate with limited safety staffing, uneven documentation, and unreliable reporting channels (Otitolaiye & Abd-Aziz, 2025). The situation is further complicated by the structure of Nigeria's labour market, where informal employment dominates total employment. The National Bureau of Statistics (NBS) reported an informal employment rate of about 92.7 percent in the first quarter of 2024, reflecting the scale of work taking place outside formal systems that typically support structured safety management (NBS, 2024). Artificial intelligence (AI) offers a set of tools that can improve how OHS services are delivered. In the Nigerian workplace, the most useful AI applications are not futuristic robotics. They are systems that help people do core tasks better such as spotting hazards early, triaging incident reports faster, improving training retention, predicting high risk conditions, and reducing paperwork delays that lead to poor follow up (Babashahi, 2024; El-Helaly, 2024). In addition, AI can also support companies' regulators and insurers by improving data quality and enabling more consistent reporting and analysis which can translate into better occupational health service delivery (Ola-Oluwa, 2024). However, Nigeria's workplaces face constraints that affect AI adoption such as electricity and connectivity gaps, limited high quality data, and uneven digital skills (Yelwa et al., 2022). This therefore calls for an approach that emphasizes practical deployment, strong governance, and low friction integration with existing processes.

Legal and Institutional Context of Occupational Health and Safety in Nigeria

In order to provide an insight into how AI can impact optimum service delivery in the workplace through OHS, there is need to understand the legal and institutional landscape of OHS in Nigeria. This requires looking at current laws guiding OHS in Nigeria. these include the Factories Act, the National Policy on Occupational Safety and Health, the Employee Compensation Act, and the Nigeria Social Insurance Trust Fund (NSITF).

Influence of Artificial Intelligence Technology Integration on Occupational Health and ... Olikoabo, S. O. & Aidedyan, D. O. (2026)

The Factories Act and compliance expectations

Nigeria's Factories Act establishes a structured framework around factory regulation, including registration requirements and multiple provisions tied to health, safety, welfare, and accident notification (Dyregborg et al., 2022; Uchendu et al., 2023). The Act is explicitly arranged around registration of factories and related obligations, signaling the importance of formal oversight for industrial workplaces. While many Nigerian work settings are not factories in the strict sense, the Act remains a foundational reference point for industrial safety, especially in manufacturing and processing environments (Uchendu et al., 2023).

National Policy on Occupational Safety and Health

Nigeria's National Policy on Occupational Safety and Health sets a prevention-oriented approach, referencing Nigeria's ratification of International Labour Organization (ILO) Convention No. 155 in 1994 and linking worker safety to constitutional principles on safeguarding health, safety, and welfare in employment (Otteburn & Axel, 2025). The policy emphasises notification systems, annual statistics on occupational accidents and diseases, and the establishment of a national information management system linked to health information systems. This policy direction is important because AI systems perform best when they operate within consistent data channels and feedback loops (El-Helaly, 2024).

Employees' Compensation Act 2010 and the NSITF scheme

The Employees' Compensation Act (ECA) 2010 repeals the earlier Workmen's Compensation regime and provides for compensation relating to death, injury, disease, or disability arising from or in the course of employment (Umukoro, 2025). The Nigeria Social Insurance Trust Fund (NSITF) describes compensation coverage under the ECA as including injury, mental stress, occupational diseases, hearing impairment, injuries occurring outside the normal workplace during work, and fatal cases (Umukoro, 2025). From an AI integration perspective, the ECA is not just a legal framework. It creates an operational need for accurate incident capture, traceable evidence, and timely case management, all of which can be strengthened through well governed digital systems (Farber, 2025).

Data protection and workplace monitoring under Nigeria Data Protection Act

AI-enabled OHS often involves monitoring and inference. This involves the use of wearable sensors for heat stress, computer vision for personal protective equipment compliance, predictive analytics for near misses, or automated triage of incident narratives. These activities intersect directly with the Nigeria Data Protection Act (NDPA) of 2023 (FGN, 2023). The Act requires that data subjects be informed about key issues such as the purpose and retention period, and it specifically addressed automated decision-making, including profiling, and envisaged consequences and the right to object and challenge such processing. It also requires a data privacy impact assessment where processing is likely to result in high risk to rights and freedoms (FGN, 2023). This is essential for OHS because poorly governed safety monitoring can result in disciplinary actions, discrimination, or unfair performance management. In Nigeria, where trust in workplace processes can be fragile, administrative processes that aligns with the mandate of NDPA is essential for uptake and legitimacy.

The Need for Improved Service Delivery in Nigerian Occupational Health and Safety

Occupational Health and Safety is a critical aspect of any nation's workforce, ensuring the well-being and productivity of its labor force. In Nigeria, however, the delivery of OHS services faces significant challenges that necessitate urgent and comprehensive improvement. In many Nigerian organizations, OHS performance is evaluated mainly through audits and incident counts. But improvement in service delivery should be measured by whether safety services reach workers effectively and consistently. In Nigeria, the biggest service gaps typically include delayed incident response where incidents are reported late or not at all, especially for contractors and casual workers; weak reporting where fear of blame and job loss reduces reporting; limited supervisor capacity where supervisors are overloaded and safety checks become superficial; and informal work settings where large portions of work happen outside systems that support structured OHS management (National Bureau of Statistics, NBS, 2024). Another main issue plaguing Nigerian OHS is the lack of adequate enforcement of existing regulations. While the country possesses a legal framework for OHS, its implementation remains weak. This is due, in part, to insufficient resources allocated to regulatory bodies, leading to infrequent inspections and a lack of deterrents for non-compliance (Adebowale & Agumba, 2024). Consequently, many workplaces operate with substandard safety measures, exposing workers to preventable hazards. Furthermore, there is a significant gap in awareness and training regarding OHS best practices (Vitrano & Micheli, 2024; Mixafenti et al., 2025). Many employers, particularly in small and medium-sized enterprises (SMEs), lack the knowledge and resources to implement effective safety programs (Wu et al., 2025). This is compounded by a shortage of qualified OHS professionals and trainers, limiting the availability

Influence of Artificial Intelligence Technology Integration on Occupational Health and ... Olíkíabó, S. O. & Aídéyan, D. O. (2026) of relevant education and skill-building opportunities for both employers and employees (Elegbede & Akinbile, 2024). The result is a workforce that is often ill-equipped to identify and mitigate workplace risks. The consequences of these deficiencies are far-reaching. Workplace accidents and illnesses contribute to significant economic losses through lost productivity, healthcare costs, and compensation claims. Moreover, they have a profound human cost, leading to pain, suffering, and even death for affected workers and their families. A stronger OHS system is therefore essential not only for economic reasons but also for overall improvement in service delivery. Addressing these challenges requires a variety of approaches among which there is the application of AI. When AI is carefully implemented in the workplace, it can support service delivery by reducing friction and expand reach by increasing coverage and consistency of workers' services without compromising their jobs.

Application of Artificial Intelligence into Occupational Health and Safety in Nigeria

The application of AI to OHS in Nigeria is particularly relevant given the country's industrial landscape which is heavy on oil & gas, construction, and manufacturing, in addition to its specific challenges regarding regulatory enforcement (Dhali et al., 2023). In Nigeria, where human supervision resources can be stretched and manual compliance enforcement is often inconsistent, AI can provide advantage by offering constant monitoring and predictive capabilities that don't rely solely on physical inspections. For the purpose of optimum service delivery, the application of AI in workplace safety can be grouped into six practical capability areas as follows:

Risk prediction and prioritization: Machine learning models can use incident history, shift patterns, weather, production pressure indicators, and equipment maintenance logs to predict where injuries are more likely (Aminzadeh et al., 2025). In Nigeria, this is especially relevant where supervisors manage large teams and hazards change quickly due to improvisation, power fluctuations, or supply chain disruptions.

Natural language processing (NLP) for incident narratives: Many Nigerian incident reports, when they exist, are written as free text in simple English, Nigerian English, or a mix of English and local expressions (Decker, 2021; Oladipupo & Akinola, 2022). NLP tools can classify incidents, detect recurring root causes, and flag severe cases for immediate escalation (Khurram et al., 2025; Mohamed, 2025). This improves service delivery by shortening the time between report and action.

Computer vision for high-risk environments: Computer vision can detect PPE use, unsafe proximity to moving equipment, fall risks, blocked exits, and unsafe manual lifting postures (Liu et al., 2021). However, in Nigeria, the priority is often selective deployment of computer vision where risk is high and controls are hard to enforce consistently, such as construction sites, warehouses, and manufacturing lines (Liu et al., 2021; Alateeq., 2023). This can truncate the overall efficacy of computer vision in OHS thereby negatively affecting service delivery in the workplace.

Personal exposure monitoring and wearables: Wearables can track heat stress, fatigue proxies, noise exposure, or vibration (Moshawrab et al., 2022). This is important for Nigeria's hot climates, outdoor work, and generator-prone environments where fumes, noise, and heat interact.

AI supported learning and competence management: AI can personalize safety learning, test retention, and provide micro coaching (Sajja et al., 2024). In environments with multicultural work force, AI can help deliver short training in simplified English or translated versions, with voice-based support.

Decision support for safety officers and clinics: AI can support triage, referral, and follow up (Abdel-Hafez et al., 2023). Nigeria's health services vary widely by location, so decision support tools can standardize first response protocols and improve documentation.

Improving Service Delivery in Nigerian Workplace through Incorporation of AI into OHS In Nigeria, where many workplaces still rely on manual inspections, paper reports, and reactive responses after incidents which negatively impacts overall service delivery in these workplaces. One major way AI improves service delivery is by speeding up hazard detection and response. This can be done through risk prediction and prioritization, computer vision for high-risk environments, and personal exposure monitoring and wearables (Khurram et al., 2025; Kolivand et al., 2025). In factories, construction sites, warehouses, and oil and gas facilities, AI powered camera systems can flag unsafe conditions such as missing protective equipment, overcrowded work areas, blocked emergency exits, or unsafe proximity to machinery (Sanjeevani et al., 2024). When these issues are detected early, supervisors can respond before they cause injury. AI can also support quicker reporting by helping workers capture hazards through mobile apps that classify the risk, suggest the right category, and guide next steps (Shah & Mishra, 2024). This reduces delays that often happen when staff are unsure

Influence of Artificial Intelligence Technology Integration on Occupational Health and ... Olikiabo, S. O. & Aideyan, D. O. (2026)

of what to report or how to describe it. Through prediction, AI can also strengthen prevention. Many incidents follow patterns, such as repeated near misses in the same location, equipment problems, poor housekeeping, or fatigue from overtime and long shifts. By analysing incident records, maintenance logs, shift schedules, and environmental conditions like heat or dust exposure, AI tools can identify high risk areas and periods (Aminzadeh et al., 2025). This supports smarter planning for inspections, better allocation of safety officers, and targeted controls where risk is building up. For Nigerian organisations that have limited health, safety, and environment personnel (Ayeleso et al., 2024), this ability to prioritize is a direct boost to service quality. Training and compliance are another area where AI can raise standards. Nigerian workplaces often face uneven training, especially when staff are spread across branches or sites (Adamu et al., 2022). AI can help by recommending training based on job roles, recent incidents, and observed safety gaps. Short, personalized learning modules delivered through mobile phones can reinforce safe behaviour without pulling staff away for long classroom sessions. In higher risk sectors, simulated training can also build confidence and improve decision making during emergencies, which is often where mistakes become costly. AI can reduce paperwork and improve the quality of inspections and audits (Alhazmi et al., 2025). Rather than having unorganized paperwork such as scattered checklists and reports, AI-enabled systems can standardize inspections, highlight missing information, and automatically generate clear action lists with deadlines and accountability (Sinha et al., 2024). This can improve documentation for internal reviews, client requirements, and regulatory expectations. Over time, the same data can be turned into dashboards that show trends, repeated hazards, and recurring noncompliance. These insights can help management make better decisions and invest in the most effective safety improvements.

Equipment and maintenance safety can also improve significantly. In manufacturing, power, and oil and gas settings, failures in machines and tools contribute to injuries and operational downtime (Sinha & Lee, 2024). AI can support predictive maintenance by analyzing sensor data such as temperature, vibration, or abnormal performance patterns to detect faults early (Polymeropoulos et al., 2025). This reduces sudden breakdowns and emergency repairs, which are often high-risk moments for workers. When equipment reliability improves, service delivery improves too, because safety teams spend less time reacting to crises and more time preventing them. In Nigerian workplaces, the benefits of AI must be balanced with real constraints. For example, power supply, internet coverage and cost, and data quality can limit the application of AI. However, these challenges can be managed through practical approaches such as offline-first reporting tools, starting with small pilot projects, and focusing on high impact areas like PPE compliance, hazard reporting, and equipment monitoring. Clear policies on privacy and responsible use are also worthy of note so workers can understand that the goal is safety and service improvement.

Conclusion

Integrating AI into occupational health and safety in Nigeria is not primarily a technology project. It is a service delivery reform. Nigeria's OHS ecosystem is shaped by legal frameworks alongside a labour market where informal work is the dominant reality. AI can improve safety outcomes by strengthening reporting, speeding response, improving training retention, and helping safety teams focus on the highest risk activities. However, success depends on NDPA compliant governance, trust building, and phased deployment that respects Nigeria's infrastructure constraints and workforce diversity. If these conditions are met, AI enabled OHS can move from a compliance driven function to a consistent service that protects workers and improves productivity across Nigerian workplaces.

Recommendation

Consequent upon the conclusion drawn from this paper, it is therefore recommended that:

1. AI should be deployed in OHS in Nigerian workplace to facilitate the smooth service delivery
2. All present and perceived constraints to the deployment of AI such as power supply, poor internet facilities, and low technical know-how should be promptly addressed to forestall their negative impact on the deployment of AI

References

- Abdel-Hafez, A., Jones, M., Ebrahimabadi, M., Ryan, C., Graham, S., Slee, N., & Whitfield, B. (2023). Artificial intelligence in medical referrals triage based on clinical prioritization criteria. *Frontiers in digital health*, 5, 1192975. <https://doi.org/10.3389/fdgth.2023.1192975>

- Influence of Artificial Intelligence Technology Integration on Occupational Health and ...* Olíkiabo, S. O. & Aídeyan, D. O. (2026)
- Abina, O.G., Ogunbayo, B.F. & Aigbavboa, C.O. (2023). Enabling technologies of health and safety practices in the fourth industrial revolution: Nigerian construction industry perspective. *Front. Built Environ.* 9,1233028. doi: 10.3389/fbuil.2023.1233028
- Adamu, M. G., Aliyue, S., & Musa, A. (2022). Behavioural factors affecting civil servants' intention towards covid-19 vaccination in Kaduna Polytechnic. *Creative Business Research Journal* 2(1), 99-104
- Adebowale, O. J. & Agumba, J. N. (2024). A systematic review of challenges undermining the efficacy of construction health and safety regulations in major African countries. *Construction Economics and Building*, 24(4/5), 1–24.
- Alateeq, M. M., Rajeeva, F. P. P., & Ali, M. A. S. (2023). Construction site hazards identification using deep learning and computer vision. *Sustainability*, 15(3), 2358. <https://doi.org/10.3390/su15032358>
- Alhazmi, A. H. J., Islam, S. M. N., & Prokofieva, M. (2025). The impact of artificial intelligence adoption on the quality of financial reports on the Saudi stock exchange. *International Journal of Financial Studies*, 13(1), 21. <https://doi.org/10.3390/ijfs13010021>
- Aminzadeh, A., Sattarpanah K. S., Majidi, S., Dabompre, C., Azaiez, K., Mitride, C., & Sénéchal, E. (2025). A machine learning implementation to predictive maintenance and monitoring of industrial compressors. *Sensors*, 25(4), 1006. <https://doi.org/10.3390/s25041006>
- Ayeleso, A. O., Alqahtani, F. M. & Aroh, C. O. (2024). Empirical evidence from nigeria on environmental health and occupational safety at work. *Trends in Ecological and Indoor Environmental Engineering*, 2(1), 11–17. <https://doi.org/10.62622/TEIEE.024.2.1.11-17>
- Babashahi, L., Barbosa, C. E., Lima, Y., Lyra, A., Salazar, H., Argôlo, M., Almeida, M. A. d., & Souza, J. M. (2024). AI in the workplace: A systematic review of skill transformation in the industry. *Administrative Sciences*, 14(6), 127. <https://doi.org/10.3390/admsci14060127>
- Decker, T. (2021). Handwritten in Lagos: Selfhood and textuality in colonial petitions. *History in Africa*, 48, 355–382. doi:10.1017/hia.2021.4
- Dhali, M., Hassan, S., & Subramaniam, U. (2023). Comparative analysis of oil and gas legal frameworks in Bangladesh and Nigeria: A pathway towards achieving sustainable energy through policy. *Sustainability*, 15(21), 15228. <https://doi.org/10.3390/su152115228>
- Dyrborg, J., Lipscomb, H. J., Nielsen, K., Törner, M., Rasmussen, K., Frydendall, K. B., Bay, H., Gensby, U., Bengtsen, E., Guldenmund, F., & Kines, P. (2022). Safety interventions for the prevention of accidents at work: A systematic review. *Campbell Systematic Reviews*, 18(2), e1234. <https://doi.org/10.1002/cl2.1234>
- Elegbede, O. T. & Akinbile, B. F. (2024). Perception of professionals on factors influencing skilled labor shortages in the Nigerian construction industry. *Journal of Civil Engineering and Construction Technology*, 14(1), 1-24
- El-Helaly M. (2024). Artificial intelligence and occupational health and safety, benefits and drawbacks. *La Medicina del Lavoro*, 115(2), e2024014. <https://doi.org/10.23749/mdl.v115i2.15835>
- Farber S. (2025). AI as a decision support tool in forensic image analysis: A pilot study on integrating large language models into crime scene investigation workflows. *Journal of forensic sciences*, 70(3), 932–943. <https://doi.org/10.1111/1556-4029.70035>
- FGN (2023). *Nigeria Data Protection Act, 2023*. Retrieved from https://cert.gov.ng/ngcert/resources/Nigeria_Data_Protection_Act_2023.pdf
- Khurram, M., Zhang, C., Muhammad, S., Kishnani, H., An, K., Abeywardena, K., Chadha, U., & Behdinan, K. (2025). Artificial Intelligence in Manufacturing Industry Worker Safety: A New Paradigm for Hazard Prevention and Mitigation. *Processes*, 13(5), 1312. <https://doi.org/10.3390/pr13051312>
- Kolivand, P., Azari, S., Bakhtiari, A. *et al.* AI applications in disaster governance with health approach: A scoping review. *Arch Public Health* 83, 218 (2025). <https://doi.org/10.1186/s13690-025-01712-2>
- Kruk, M. E., Gage, A. D., Arsénault, C., Jordan, K., Leslie, H. H., Roder-DeWan, S., Adeyi, O., Barker, P., Daelmans, B., Doubova, S. V., English, M., García-Elorrio, E., Guanais, F., Gureje, O., Hirschhorn, L. R., Jiang, L., Kelley, E., Lemango, E. T., Liljestrand, J., Malata, A., ... Pate, M. (2018). High-quality health systems in the Sustainable Development Goals era: time for a revolution. *The Lancet. Global health*, 6(11), e1196–e1252. [https://doi.org/10.1016/S2214-109X\(18\)30386-3](https://doi.org/10.1016/S2214-109X(18)30386-3)
- Liu, W., Meng, Q., Li, Z., & Hu, X. (2021). Applications of computer vision in monitoring the unsafe behavior of construction workers: Current status and challenges. *Buildings*, 11(9), 409. <https://doi.org/10.3390/buildings11090409>
- Mixafenti, S., Karagkouni, A., & Dimitriou, D. (2025). Integrating business ethics into occupational health and safety: An evaluation framework for sustainable risk management. *Sustainability*, 17(10), 4370. <https://doi.org/10.3390/su17104370>

- Influence of Artificial Intelligence Technology Integration on Occupational Health and ...* Olíkíabó, S. O. & Aídéyan, D. O. (2026)
- Mohamed, N. (2025). Artificial intelligence and machine learning in cybersecurity: a deep dive into state-of-the-art techniques and future paradigms. *Knowledge and Information Systems* 67, 6969–7055.
<https://doi.org/10.1007/s10115-025-02429-y>
- Moshawrab, M., Adda, M., Bouzouane, A., Ibrahim, H., & Raad, A. (2022). Smart wearables for the detection of occupational physical fatigue: A literature review. *Sensors*, 22(19), 7472. <https://doi.org/10.3390/s22197472>
- National Bureau of Statistics (2024). *The Nigerian labour force statistics report, Q 1, 2024*. Retrieved from https://www.nigerianstat.gov.ng/pdfuploads/NLFS_Q1_2024_Report.pdf
- Oladipupo, R., & Akinola, A. (2022). Nigerian English pronunciation preferences: A corpus-based survey of pronunciation variants. *Cogent Arts & Amp; Humanities*, 9(1). <https://doi.org/10.1080/23311983.2022.2061104>
- Ola-Oluwa, . J. A. . (2024). Impact of artificial intelligence (AI) in enhancing knowledge sharing and boosting organizational efficiency in Nigerian enterprises. *African Journal of Management and Business Research*, 17(1), 76-95. <https://doi.org/10.62154/ajmbr.2024.017.010470>
- Otitolaiye, V. O., & Abd Aziz, F. S. (2025). Understanding the mechanism through which safety management systems influence safety performance in Nigerian power and electricity distribution companies. *Safety*, 11(4), 98. <https://doi.org/10.3390/safety11040098>
- Otteburn, K. & Axel, M. (2025). The international labour organization, in J. Chaisse & C. Herrmann (eds). *The International Law of Economic Integration* (online edn), Oxford Law Pro), <https://doi.org/10.1093/law/9780192871626.003.0014>
- Polymeropoulos, I., Bezyrgiannidis, S., Vrochidou, E., & Papakostas, G. A. (2025). Bridging AI and maintenance: Fault diagnosis in industrial air-cooling systems using deep learning and sensor data. *Machines*, 13(10), 909. <https://doi.org/10.3390/machines13100909>
- Sajja, R., Sermet, Y., Cikmaz, M., Cwiertny, D., & Demir, I. (2024). Artificial intelligence-enabled intelligent assistant for personalized and adaptive learning in higher education. *Information*, 15(10), 596. <https://doi.org/10.3390/info15100596>
- Sanjeevani, P., Neuber, G., Fitzgerald, J., Chandrasena, N., Potums, S., Alavi, A., & Lane, C. (2024). Real-time personal protective equipment non-compliance recognition on AI edge cameras. *Electronics*, 13(15), 2990. <https://doi.org/10.3390/electronics13152990>
- Shah, I. A., & Mishra, S. (2024). Artificial intelligence in advancing occupational health and safety: an encapsulation of developments. *Journal of Occupational Health*, 66(1), uiad017. <https://doi.org/10.1093/joccuh/uiad017>
- Sinha, S. & Lee, Y.M. (2024). Challenges with developing and deploying AI models and applications in industrial systems. *Discov Artif Intell* 4, 55 <https://doi.org/10.1007/s44163-024-00151-2>
- Uchendu, O., Nwanyanwu, D. M. A. N., & Nkechi, E. (2023). A legal appraisal of industrial safety in Nigeria: A comparative approach. *AJIEEL*, 6(01). Retrieved from <https://ajieel.com/index.php/a/article/view/40>
- Umukoro, B.E. (2025). Employee's compensation scheme in Nigeria: A comparison of two legal regimes. *International Journal of Law and Management*. <https://doi.org/10.1108/IJLMA-11-2024-0417>
- Vitrano, G., & Micheli, G. J. L. (2024). Effectiveness of occupational safety and health interventions: A long way to go. *Frontiers in Public Health*, 12, 1292692. <https://doi.org/10.3389/fpubh.2024.1292692>
- Wu, Z., Wang, J., & Kang, L. (2025). Advancing safety in SMEs through unitized integration: Research based on the SME safety alliance in Pukou District, Nanjing City. *Sustainability*, 17(7), 3240. <https://doi.org/10.3390/su17073240>
- Yelwa, M. M., Abdulhameed, S., & Maigari, M. A. (2022). Artificial intelligence and the future of work in Nigeria: A shift from educational requirements to skills possession. *Social Science Research*, 6(1). Retrieved from <https://journals.aphriapub.com/index.php/SSR/article/view/1408>



Qualitative Study on Hausa Language Teaching Using E-Learning Instructional Strategy at Tertiary Level of Education in Nigeria: Challenges and Way Forward

GOMA, Bala Bawa¹

Julaibeebfaiza@gmail.com

+1234-8068109912

GELE, Nasiru Dantani²

Nasgele234@gmail.com

+2348038484057

¹Department of Arts and Social Science Education Faculty of Education, Ahmadu Bello University, Zaria, Nigeria

²Department of Hausa, School of Undergraduate Studies, Adamu Augie College of Education, Argungu, Kebbi State, Nigeria

Abstract

This paper examines the challenges and the way forward of teaching Hausa Language through e-learning in tertiary institutions in Nigeria. Electronic learning (e-learning) is a product of information and communication technology (ICT) which has affected human life since its emergence in the early 90s. Online learning and particularly online resources can catch the attention of even the most passive learner. Also, e-learning offers a favourable external environment for Hausa Language teaching and learning. The researcher discussed the need for Hausa Language education through e-learning in Nigeria and one of the recommendations given is that computer literacy training programmes for Hausa language teachers and adequate information technology facilities should be provided for tertiary academic institutions for effective teaching and learning of Hausa Language through e-learning to be reliable and feasible for both the teachers and the learners of Hausa language in Nigerian tertiary institutions.

Keywords: E-learning, teaching, Hausa language, information and communication technology (ICT).

Introduction

E-learning has been variously defined by several authors and educationists. Hedge and Hayward (2004) define it thus; “e-learning is an innovative approach for delivering electronically mediated, well designed, learner centered and interactive learning environment to anyone, at any place, any time by utilizing the internet and digital technologies in concert with institutional design principles”. E-learning to Rosenberg (2001) is “the use of internet technologies to deliver a broad array of solutions that enhance knowledge and performance”. He sees e-learning as being based on three fundamental principles or criteria namely; that e-learning is networked, which makes it capable of instant updating storage/retrieval, distribution and sharing of instruction or information, its content delivery to the end-user is via a computer using standard internet technology, and it focuses on the broadcast view of paradigms of training. E-learning, therefore can be seen as the latest form of distance learning mediated by state-of-the-art technologies like the Internet and World Wide Web (www). Moreover, the development of information and communication technology (ICT) has greatly minimized the use of traditional means of teaching and learning known as face to face (F2F) method, where the teacher and the learner are physically present in the classroom environment, by implementing either a blended/mixed learning or totally change it into full time online learning (e-learning). Hence, the rapid development in ICT has greatly changed and influenced strategies and concepts of teaching and learning in the modern world. Martimore (1999) and Tomei (2003) state that e-learning is much more than online training or computer-based training (CBT) as it encompasses knowledge management, electronic performance support and computer conference enabling group communication made possible by the Internet and World Wide Web (www) as one of the key characteristics of e-learning which makes it qualitatively more superior to the conventional distance learning method. In addition, the Economic Times of India defines e-learning as “a learning system based on formalized teaching but with the help of electronic resources”. E-learning can also be termed as a network enabled transfer of skills and knowledge and the delivery of education made to a large number of recipients at the same or different times. In Nigeria, so many institutions of higher learning, secondary and primary schools have adopted the use of e-learning as an alternative means of teaching and learning. This was reinforced and made evident during the Covid-19 Pandemic period (March-September, 2020) but it has been observed that the implementation of this technology-based learning system is prevalent mostly in privately owned schools where the parents of students are usually the wealthy and well-to do in the society. This is so because it is only this exclusive group of people that can afford the high cost of computers and data

Qualitative Study on Hausa Language Teaching Using ... Goma, B. B. & Gèle, N. D. (2026)

subscription with which their wards surf the Internet and link up with online classes. However, Rodinadze & Zarazoia (2012) are of the opinion that ICT opens the doors for better distance learning programs, allowing those in disadvantaged areas to have access to the same education as the privileged. E-learning makes information accessible from nearly any location, any time with a mobile device or laptop computer. In addition to the above, e-learning makes courses student take to be more flexible, meaning that learners with full schedules who may not have the time or opportunity to further their education can choose to enroll in programmes or courses online. This invariably attests to the fact that e-learning has widened access to education in different countries of the world including Nigeria. The definition of the concept of e-learning will be incomplete without that of Saluwadeen (2006) who defined e-learning as the convergence of the Internet and learning or Internet enabled learning. It is the delivery of individualized, comprehensive, dynamic learning content in real time, aiding the development of communities of knowledge, linking learners and practitioners with experts. It is obvious from the foregoing that the world has moved at an unprecedented speed in the area of access to information and its dissemination. Hence, the need to meet up the challenges of modern learning strategies in the teaching of English language through e-learning. Presently in Nigeria, one of the most popular supports for e-learning is the Learning Management System (LMS) which is the highest form of e-learning. LMS is a special software which provides multipurpose support for teaching and learning. The system contains a set of tools for creating, administering and distributing of e-learning courses or subjects and also the tools for communication makes it different from web-based training where testing, evaluation and feedback are not possible.

Types of E-Learning Platforms

There are different ways of classifying the types of e-learning. Some educational scientists simply identify two primary types' namely computer-based e-learning and Internet based e-learning. Algahtani (2011) describes computer-based learning as one which comprises the use of a full range of hardware and software generally that are available for the use of Information and Communication Technology and could be used for either computer-managed instruction or computer-assisted learning. In Computer-Assisted Learning (CAL) or Computer-Assisted Instruction (CAI), computers are used together with traditional teaching by providing interactive software as a support tool within the class or for self-learning outside the class. This computer-assisted training methods use a combination of multimedia such as text, graphics, sound and video in order to enhance learning. The primary value of CAI is interactivity as it allows students to become active learners instead of passive learners, by utilizing various methods such as quizzes and other computer-assisted teaching and testing mechanisms. On the other hand, Computer-Managed Learning (CML) or Computer-Managed Instruction (CMI) is used by educational institutions for storing and retrieving information which aids in educational management like lecture information, training materials, grades, curriculum information, enrolment information and so on. Here, computers are used to manage and assess learning processes. These learning systems operate through information databases which contain bits of information which the student has to learn together with a number of ranking parameters. This enables the system to be individualized according to the preferences of each student. If the student's learning outcome is not satisfactory at the end of the learning exercise, the process can be repeated until the student has achieved their desired learning goals. Moreover, Internet-based learning according to Almosa (2002) is a further improvement of the computer-based learning which makes educational content available on the Internet. The knowledge sources like e-mail services and references on the internet could be used by learners at any time and place even when teachers and instructors are available or absent. Zeitoun (2008) classified Internet-based learning by the extent of such features used in education; mixed or blended mode, assistant mode, and completely online mode. According to him, the assistant mode supplements the traditional method as needed, the mixed or blended mode offers a short-term degree for a partly traditional method and the completely online mode involves the exclusive use of the Internet (network) for learning activities. Internet-based learning allows students to learn at their own pace, access the information at a time that is convenient for them, and provides education to remote students that otherwise would not be able to travel to a classroom. Another classification of e-learning is based on the timing of instruction; namely synchronous e-learning and asynchronous e-learning. Synchronous e-learning also known as real-time learning involves the teachers and the learners being online and also interacting at the same time from different locations with the use of tools such as video conferencing (zoom) and online chats. This type of e-learning according to Almosa (2002) offers the advantage of instantaneous feedback. Also, the participants can share their ideas and opinions during the lecture. This is currently one of the most popular and quickest growing types of e-learning. Asynchronous e-learning, on the other hand, involves students studying independently at different times and locations from each other,



Qualitative Study on Hausa Language Teaching Using ... Goma, B. B. & Gèle, N. D. (2026)

without real-time communication taking place. It is pause-and-resume kind of learning and the learner and teacher cannot be online at the same time. In asynchronous e-learning, participants can post communications to any other participant over the Internet through thread discussions and e-mails after the learning has taken place. Another advantage is that this type of e-learning method is considered to be more students- centered than the synchronous counterpart as they give students more flexibility. Students who do not have flexible schedules prefer it because it allows them to utilize self-paced learning as they can set their own time frames for learning and are not required to learn at specific time intervals together with other students.

Teaching of Hausa Language through E-Learning in Nigeria

In Nigeria today, Hausa language is not only the medium of instruction in primary, secondary schools and institutions of higher learning (Colleges of Education, Monotechnic/Polytechnics and Universities), but it has also become a common Lingua Franca, Hausa language functions as a lingua franca particularly in West Africa because it is widely spoken beyond ethnic Hausa communities, it served as a common language in countries including, Nigeria, Niger, Ghana Cameroon, Chad etc. This is because Nigeria is a highly multi-lingual and multicultural society made up of people who come from diverse linguistic backgrounds with over four hundred and fifty (450) ethnic groups and languages. In a typical school classroom, the students are usually from diverse ethnic groups and have different languages. Hence, the adoption of a common language as a medium of teaching the various subjects offered in the school. This language of popular choice is the Hausa language. Teaching Hausa Language through e-learning is a fairly new innovation in the country as the traditional method of Face-to-Face has been the only way of teaching where both the teacher and the learners (students) are physically present in a physical classroom setting. Online resources for the learning of Hausa language are replete in the Internet with the availability of online dictionaries, encyclopaedia and various e-textbooks in different aspects of Hausa language like syntax, phonetics/phonology, morphology, Hausa varieties and Hausa composition. These aid the students in their independent study. Also, there are various Hausa Language websites for students who intend to expand their knowledge and improve their competence in the study and use of Hausa language. However, it should be noted that e-learning in teaching Hausa Language in Nigeria is at its infancy stage. Organizations like the British Council help teachers and students in their bid to attain an appreciable level of competence in online Hausa Language teaching and learning.

Challenges of Teaching Hausa Language through E-Learning

There is no doubt that proper implementation of e-learning in education improves the efficiency of the educational process by making learning easily accessible. In spite of this benefit, studies carried out by researchers indicate some of the challenges of e-learning faced by teachers in using ICT in Nigeria particularly.

1. Inadequate access to technology: Internet access in Nigeria is not steady and readily available. There is always network problem in most parts of the country. Internet services are not available in some rural areas and this makes it impossible for teachers to embrace e-learning.
2. Inadequate and epileptic power supply: Electricity supply in Nigeria is grossly inadequate and is one of the major problems facing the country. The electricity supply is not stable. Even the English language teachers in the cities and towns are faced with the problem of epileptic power supply as electricity supply is not constant and reliable.
3. Electronic equipment like computer, television set, radio, etc. are always damaged due to poor supply of electricity. All these problems combine to hinder the effective use of e-learning in teaching Hausa language course in schools. Kadiri (2008) opined that it is difficult to keep high technology equipment such as the computer when electricity supply is not constant and stable.
4. High cost of installation of ICT: In Nigeria, poverty level is relatively high and most lecturers (Hausa language teachers inclusive) cannot still acquire their personal computers which is very expensive and above the reach of the average Nigerian. Even the few teachers who have their computers cannot connect to the Internet because of data subscription charges which are very high. Most of the time, lecturers and students make use of computer cybercafé for their online studies. Obanya (2002) observed that prices of computer hardware and software continue to drop in most developed countries, but in developing countries such as Nigeria, computers are still very expensive. However, Singh (2016) states that there is need for adequate availability of technology in schools which includes huge costs incurred on acquiring installing, operating, maintaining and replacing ICTs.

Qualitative Study on Hausa Language Teaching Using ... Goma, B. B. & Gèle, N. D. (2026)

5. Lack of ICT skills: Most Hausa language teachers lack sufficient knowledge of computer and its usage in the teaching process. They are not ICT literate and cannot handle effectively ICT tools for teaching and learning Hausa language. According to Barret (2007) teachers need effective tools, techniques and assistance that can help them develop computer-based projects and activities especially designed to raise the level of teaching in required subjects and improve students' learning.
6. Maintenance and technical support: Lack of maintenance and technical support is a problem in ICT as there is the likelihood that the computer system may break down during lesson. Most of the time, there are very few technical staff who can handle such emergency repairs when it occurs. Even when Hausa language lecturers and few students have their personal computers, when a technical problem occurs, repairs and maintenance is not easy and reachable.
7. Resistance to change: Most Hausa Language lecturers and students are not ready to embrace e-learning in teaching and learning the subject as there are no additional benefits attached to it. Also, most of them are not computer literate and would prefer to continue with their traditional chalk and board method of teaching. In addition, Ajadi, Salawu and Adeoye (2008) are of the opinion that since ICT encourages independent learning, most students are reluctant to take responsibility for their own learning but prefer to be spoon-fed at all times.
8. Remoteness or lack of interaction: Students generally see e-learning as uninteresting and boring because learners are not able to interact or relate with their teachers when they do not understand any aspect of the lesson. This is because e-learning as a method of education makes the learner undergo contemplation, remoteness, as well as lack of interaction or relation. It therefore requires a very strong inspiration as well as skills in order to reduce such effects on the learners. E-learning is seen as less effective in respect to clarifications, offer of explanations and interpretations which can easily be accessed in traditional face-to-face teaching method.

Prospects of Teaching Hausa Language through E-Learning

E-learning despite its overwhelming disadvantages in its effective use in developing countries like Nigeria has a lot of advantages that may lead to its eventual success and full adoption in teaching various subjects in schools especially in institutions of higher learning. The teaching of Hausa Language through e-learning, like in any other course, will require proper planning and designing of e-language material. Also, the delivery and usage of these materials should be systematic depending on the e-learning tool used. E-learning media include audio/video cassettes, CDs/DVDs, radio and television broadcasts, computers and the internet (Tinio, 2003). Although the design of e-learning material will vary in relation to the e-learning medium used, a general approach is used as follows;

Step I: Planning E-Learning Material

For effective planning of e-learning material the course content should be broken down into bits. A content aggregation model was developed by Altenhofen & Schaper (2002) in which the course content is divided into four distinct structural levels namely: Knowledge items; Learning units; Sub courses and Course

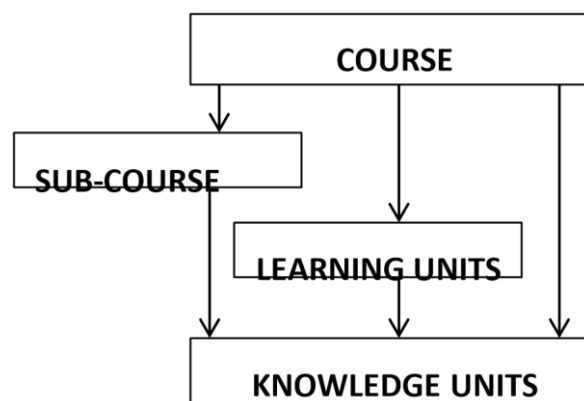


Figure 1: Altenhofen & Schaper's Content Aggregation Model

The above model helps in the planning of course content for e-learning purposes into levels that will be designed appropriately to suit the e-learning medium intended to be used.



Qualitative Study on Hausa Language Teaching Using ... Goma, B. B. & Gèle, N. D. (2026)

Step II: Designing E-Learning Material

Designing the e-learning material should be done with utmost care because it will determine the efficiency of the material in achieving its instructional objectives when it is used. The e-learning material should be logical and systematic following the model above. The items in the material should be properly linked together to form a cohesive whole. The e-learning material especially the visual ones should include the following; Animated graphics; Clear text: The text format should be attractive and should suit the idea intended to be passed; Easy navigations: It should be easy for the users of the e-material to move from one page, slide or screen (as the case may be) to another; Games: Existing educational games should be included to help retain students' motivation where necessary; The audio should be clear and easily understandable; Related videos of each topic or lesson should be included. Apart from planning and designing the e-learning material, the teacher should deliver the materials to the students at the appropriate time. Not too many e-learning materials should be given at once in order to ensure students understand what is expected from them in the use of these materials. It is the teacher's duty to organize these materials to suit the objectives of the course.

Conclusion

The study examined the challenges and way forward of teaching Hausa Language through elearning in tertiary institutions in Nigeria. The study discovered that e-learning involves the use of digital tools for teaching and learning. Also, e-learning has come to be a more effective method of imparting knowledge to students. The method is flexible in terms of place and time for the delivery of lectures. Despite the challenges discussed, the literatures have sought to explain the role of e-learning and how e-learning has made a strong impact in the teaching and learning process. I strongly believe that if e-learning is properly implemented and encouraged in various institutions in Nigeria, it will go a long way to improve effective and efficient learning not only in English language but also in other subjects (courses) in the school curriculum.

Recommendations

Based on the challenges identified in this study as hindering effective teaching and learning of Hausa Language through e-learning in Nigeria, the following recommendations are proffered.

1. The government authorities and school management in particular should provide adequate e-learning facilities in institutions of higher learning. Nwokolo and Anyachebelu (2012) assert that the level of e-learning facilities would be improved if quality Internet facilities are provided and accessible. However, the school management and government should brace up to those challenges through acquisition and installation of modern e-learning infrastructures and instruct active involvement of e-learning in all school curricula.
2. There should be constant electricity supply in the institutions to enhance students' and lecturers' access to e-learning activities.
3. periodical computer training should be organized for lecturers. This will enable them acquire relevant skills and knowledge on the usage of e-learning facilities (Evoh, 2007).
4. ELearning facilities should be upgraded from time to time in order to improve lecturers' performance.
5. Provision of Adequate ICT Infrastructure Universities and colleges should invest in stable internet connectivity, computer laboratories, multimedia classrooms, and digital language laboratories to support effective Hausa language e-learning.
6. Training and Retraining of Lecturers Hausa language lecturers should receive continuous professional development on digital pedagogy, Learning Management Systems (LMS), and online instructional design to enhance teaching effectiveness.
7. Development of Hausa Digital Learning Materials. There is a need for the creation of standardized Hausa e-books, audio-visual lessons, podcasts, and interactive applications that reflect linguistic and cultural realities.
8. Government and Institutional Funding Support The Federal Government, through the National Universities Commission (NUC) and TETFund, should provide special grants for the digitization of Nigerian indigenous language education.
9. Integration of Blended Learning Approaches Institutions should combine face-to-face teaching with online learning platforms to overcome technological limitations while maximizing learning outcomes.
10. Promotion of Hausa Language Software and Applications Educational technology developers should be encouraged to design Hausa spell-checkers, speech recognition tools, dictionaries, and language learning mobile apps.



Qualitative Study on Hausa Language Teaching Using ... Goma, B. B. & Gélé, N. D. (2026)

11. Improved Digital Literacy among Students should be trained in basic ICT skills, online research methods, and digital communication to enable active participation in e-learning environments.
12. Localization of Learning Management Systems University LMS platforms should incorporate Hausa language interfaces and culturally relevant content to promote accessibility and inclusivity Strengthening Collaboration and Research
13. Departments of Nigerian Languages should collaborate with ICT experts, linguists, and educational technologists to research innovative e-learning strategies for Hausa language instruction.
14. Policy Formulation and Implementation Clear national policies supporting indigenous language digitization and online education should be developed to ensure sustainability and long-term advancement of Hausa language teaching through e-learning

References

- Ajadi, T. O, Salawu, I. O. & Adeoye, F. A. (2008) E-Learning and Distance Education in Nigeria. *The Turkish Online Journal of Education Technology*. TOJET 7(4)7.
- Algahtani, A. F. (2011) *Evaluating the Effectiveness of the E-learning Experience in Some Universities in Saudi Arabia from Male Students Perceptions*. Durham Thesis, Durham University.
- Almosa, A. (2002) *Use of Computer in Education* (2nd ed.) Riyadh: Future Education Library
- Altenhofen, M. & Schaper, J. (2002) Flexible Instructional Strategies for E-Learning. Proceedings for the 35th Hawaii International Conference on System Sciences.
- Barret, W. (2007) Making the necessary changes for the educational system to meet the changing needs of the 21st Century. Retrieved October 2, 2020 from <http://www.mcesgor.jm/new/ICT2006>.
- Evoh, C. I. (2007) Policy networks and the transformation of secondary education through ICTs in Africa: The Prospects and Challenges of the NEPAD e-schools initiative. *International Journal of Education and Development* 3(1) 24-30.
- Hedge, N. & Hayward, L. (2004) Redefining roles, university e-learning contributing to lifelong learning in networked world. *E-Learning* 128-145.
- Jimoh-Kadiri, S. O. (2008) Rationale for Integrating ICT into Business Education Curriculum in Nigeria. *Nigerian Journal of Citizenship Education* 7(1).
- Mortimore, P. (1999) *Understanding Pedagogy and Its Impact on Learning*. London: Paul Chapman Publishing Ltd.
- Obanya, P. (2002) *Revitalizing Education in Africa*. Lagos: Stiring Horden Publishers (Nig.) Ltd.
- Rodinadze, S. & Zarbaoia, K. (2012) The Advantages of Information Technology in Teaching English Language. *Frontiers of Language and Teaching* Vol. 3 pp. 271-275.
- Rosenberg, M. J. (2001) *E-Learning: Strategies for Delivering Knowledge in the Digital Age*. New York: McGraw Hill Publishers.
- Saluwadeen, O. S. (2006) *E-Learning Technology: The Nigeria Experience*. xxiii FIG Congress Munich, Germany. The Economic Times. Definitions of E-Learning www.economictimes.indiatimes.com.
- Tinio, I. V. (2003) ICT in education e-primers for the information economy, society and polity. Manila: E-ASEAN Task Force/UNDPAPDIP. Retrieved December 3, 2020 from <http://www.apdipi.net/publications/iespprimers/ICTinEducation.pdf>.
- Tomei, A. (2003) Challenges of teaching with technology across the curriculum: Issues and solutions. *Information Science Publishing*.
- Zeitoun, H. (2008) *E-Learning: Concept, Issues, Applications, Evaluation*. Riyadh: Dar Alsolateah Publication.



Teachers' Perceived Impact of Continuous Quality Assurance Practices on ... Gbadamosi, I. A., Et. al. (2026)

Teachers' Perceived Impact of Continuous Quality Assurance Practices on Standard of Public Primary Schools in Ilorin Metropolis, Kwara State, Nigeria

GBADAMOSI, Islamiat Ayomide¹

Gislamiat41@gmail.com

09069721213

ABDULWAHAB, Rafiu¹

KURANGA, Yunus Adebayo¹

¹Department of Adult and Primary Education, University of Ilorin, Ilorin Kwara State, Nigeria.

Abstract

This study examined teachers' perceived impact of Continuous Quality Assurance (CQA) on the standard of public primary education in Ilorin Metropolis, Kwara State, against persistent concerns regarding the quality of school management, educational provision, and pupils' learning outcomes in public primary schools. Despite the implementation of quality assurance mechanisms, questions persist regarding their effectiveness in improving educational standards. The study therefore examined teachers' perceptions of the impact of Continuous Quality Assurance and determined whether such perceptions differ based on years of teaching experience and school location. A descriptive survey research design was adopted, with a target population of approximately 3,400 public primary school teachers across Ilorin East, Ilorin West, and Ilorin South Local Government Areas, from which a sample of 150 teachers was selected using stratified random sampling technique. Data were collected using a validated researcher-designed questionnaire with a reliability coefficient of 0.70. Descriptive statistics (mean and standard deviation) and Analysis of Variance (ANOVA) were used to analyse the data and test the hypotheses at the 0.05 level of significance. Findings revealed that teachers generally perceived Continuous Quality Assurance as having a positive impact on the standard of public primary education (average mean = 3.67). However, no significant differences were found based on years of teaching experience ($F = 1.308, p = .274$) and school location ($F = 1.710, p = .184$). The study concluded that Continuous Quality Assurance is perceived to contribute positively to pupils' learning outcomes, educational provision, and school management. It was therefore recommended that efforts be intensified to strengthen the consistency of supervision, provide adequate support for continuous quality assurance officers, and ensure effective implementation of feedback to sustain improvements in educational standards.

Keywords: Continuous quality assurance, teachers' perceived impact, public primary education, educational standard

Introduction

Primary education represents the foundation of any nation's education system, as it is at this level that children acquire basic literacy, numeracy, and social skills necessary for lifelong learning. The quality of education provided at the primary school level is crucial, as it determines learners' readiness for further education and their ability to contribute meaningfully to society. When the standard of primary education is high, pupils are more likely to develop essential competencies that support academic progression and personal development. Conversely, weaknesses at this level may have long-term consequences on learners' achievement and the broader educational system. The standard of primary education refers to the overall level of educational quality reflected in pupils' learning outcomes, the effectiveness of educational provision, and the efficiency of school leadership and management. UNESCO and UNICEF emphasize that quality primary education goes beyond school enrolment to include meaningful learning outcomes, effective teaching practices, safe and inclusive learning environments, and accountable leadership (UNESCO, 2020; UNICEF, 2021). These perspectives highlight the need for continuous monitoring and evaluation to ensure that educational standards are maintained. To ensure that these standards are achieved and sustained, quality assurance has been established as a central mechanism within education systems globally and in Nigeria. In the Nigerian context, the Federal Ministry of Education introduced policies such as the National Education Quality Assurance Policy (NEQAP) and the National Education Quality Assurance Handbook, which provide structured guidelines for monitoring learning outcomes, teaching practices, school environment, and leadership performance (FME, 2016). The NEQAP identifies three core focus areas of quality assurance at the basic education level: quality of outcomes for learners, quality of educational provision, and quality of leadership and management (FME, 2016). Within this framework, State Universal Basic Education Boards (SUBEBs) implement Continuous Quality Assurance (CQA) to maintain and improve educational standards in public primary schools. Continuous Quality Assurance (CQA) involves periodic school visits, classroom observations, assessment of teaching and learning processes, and provision of professional feedback to teachers and school administrators (FME, 2016). Empirical studies provide evidence on the



Teachers' Perceived Impact of Continuous Quality Assurance Practices on ... Gbadamosi, I. A., Et. al. (2026)

potential benefits of quality assurance practices in education. For instance, Olaleye and Oyewole (2013) reported that consistent supervision enhances teaching effectiveness and helps maintain educational standards in basic education. Similarly, Bukola-Ojumu et al. (2024) found that supervision improves teachers' instructional delivery, classroom management, and use of teaching materials, while Oshiomu and Effiom (2025) emphasized the importance of continuous monitoring and professional support in improving school performance. Adeyemi (2020) also emphasized the importance of supervision in ensuring schools' daily programme is implemented in consonance with the curriculum. These studies suggest that when properly implemented, quality assurance practices can positively influence both teaching and learning processes. However, despite these expectations, the extent to which Continuous Quality Assurance activities in Nigeria translate into measurable improvements in the overall standard of public primary education remains a subject of concern. Empirical evidence indicates that the standard of primary education is still faced with significant challenges. A large-scale assessment by Osere (2025) revealed widespread deficiencies in infrastructure, teacher quality, and pupils' learning outcomes, with about 68% of schools lacking adequate facilities, 45% of teachers being underqualified, and over half of pupils performing below national benchmarks. Evidence from other Nigerian studies suggests that the implementation of quality assurance is often constrained by challenges such as inadequate funding, shortage of qualified teachers, weak supervision, and poor implementation of educational policies (Olutola et al., 2022). The situation in Ilorin Metropolis reflects these broader national concerns. Although Continuous Quality Assurance units under the State Universal Basic Education Board are actively engaged in monitoring public primary schools, challenges related to teaching effectiveness, pupils' academic performance, and school management still persist. This suggests that the existence of quality assurance structures alone may not be sufficient to guarantee improvements in educational standards, thereby necessitating further investigation into their actual impact. Furthermore, a critical review of existing literature shows that most studies on quality assurance in Nigeria have focused largely on policy implementation, supervision practices, and institutional challenges, with limited attention given to teachers' perspectives. The lack of empirical studies focusing specifically on teachers' perceptions, particularly within Ilorin Metropolis, represents a significant gap in the literature. It is within this context that the present study examines teachers' perceived impact of Continuous Quality Assurance on the standard of public primary education in Ilorin Metropolis, Kwara State. By generating empirical evidence from teachers who directly experience these supervisory activities, the study seeks to bridge the existing gap in the literature and contribute to ongoing efforts to improve the quality of public primary education in Ilorin Metropolis.

Statement of the Problem

The standard of public primary education in Nigeria has remained a persistent concern for policymakers, educators, and stakeholders, despite the introduction of various quality assurance mechanisms aimed at improving educational standard. Continuous Quality Assurance (CQA) was institutionalized to ensure regular monitoring of school activities, enhance teachers' instructional practices, and promote effective school management. However, evidence from existing studies suggests that the anticipated improvements in educational standards have not been fully realized across many public primary schools. Empirical literature indicates that challenges such as inadequate funding, shortage of qualified teachers, weak supervision, and poor implementation of quality assurance recommendations continue to undermine the effectiveness of CQA practices in Nigeria. While these studies provide valuable insights into structural and systemic limitations, they largely focus on policy implementation, supervision practices, and institutional constraints, with limited attention given to how these quality assurance activities are perceived by teachers who directly experience CQA activities.

In Ilorin Metropolis, Continuous Quality Assurance units under the State Universal Basic Education Board are actively engaged in monitoring and evaluating public primary schools. Despite these efforts, concerns regarding teaching effectiveness, school leadership, and pupils' learning outcomes still persist. This raises critical questions about whether CQA activities are producing meaningful improvements in the standard of public primary education or merely functioning as routine administrative exercises without substantial impact. More importantly, there are limited studies that capture teachers' perceptions on the effectiveness of these quality assurance mechanisms. Given that teachers directly experience quality assurance activities, their perceptions are critical for understanding the actual impact of Continuous Quality Assurance on the standard of public primary education. The study aims to bridge the existing gap in literature and provide context-specific evidence that can inform improvements in quality assurance practices and educational standards.



Teachers' Perceived Impact of Continuous Quality Assurance Practices on ... Gbadamosi, I. A., Et. al. (2026)

Purpose of the Study

The main purpose of this study is to examine teachers' perceived impact of Continuous Quality Assurance on the standard of public primary education in Ilorin Metropolis. Specifically, the study seeks to:

1. Identify teachers' perceived impact of Continuous Quality Assurance in Ilorin Metropolis.
2. Examine whether teachers' perceived impact of Continuous Quality Assurance differs based on their years of teaching experience and school location.

Research Questions

The study is guided by the following research question:

1. What is teachers' perceived impact of Continuous Quality Assurance on the standard of public primary education in Ilorin Metropolis?

Research Hypotheses

The following null hypotheses were tested in this study:

- H₀₁:** There is no significant difference in teachers' perceived impact of Continuous Quality Assurance on the standard of public primary education in Ilorin Metropolis based on years of teaching experience.
- H₀₂:** There is no significant difference in teachers' perceived impact of Continuous Quality Assurance on the standard of public primary education in Ilorin Metropolis based on school location.

Methodology

The study adopted a descriptive survey research design to examine teachers' perceived impact of Continuous Quality Assurance (CQA) on the standard of public primary education in Ilorin Metropolis, Kwara State. This design was considered appropriate as it enabled the systematic collection of data from teachers who directly experience quality assurance practices within their schools. The study population comprised approximately 3,400 public primary school teachers across Ilorin East, Ilorin West, and Ilorin South Local Government Areas, which together constitute Ilorin Metropolis. A sample size of 150 teachers was selected using a stratified random sampling technique. The sample was proportionally allocated across the three Local Government Areas based on their teacher population to ensure adequate representation, Ilorin East (1,250 teachers) contributed 55 respondents, Ilorin West (1,100 teachers) contributed 49 respondents, and Ilorin South (1,050 teachers) contributed 46 respondents. Data were collected using a researcher-designed questionnaire titled "Questionnaire on the Impact of Continuous Quality Assurance on the Standard of Public Primary Education." The instrument consisted of two sections: Section A captured demographic information of respondents, while Section B contained items measuring teachers' perceived impact of CQA in relation to learners' outcomes, educational provision, and school leadership and management. The items were structured on a four-point Likert scale of Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1), with a criterion mean of 2.50 used for decision-making. The instrument was validated by experts in Primary Education and Educational Management to ensure content validity. A pilot study was conducted to determine the reliability of the instrument using Cronbach's alpha, which yielded a reliability coefficient of 0.70, which was considered acceptable. Ethical approval was obtained from relevant educational authorities, participants were informed of the purpose of the study and their responses were treated with confidentiality. Data collected were analysed using descriptive and inferential statistics. Mean and standard deviation were used to answer the research question, while Analysis of Variance (ANOVA) was employed to test the hypotheses at the 0.05 level of significance.

Presentation of Results

Research Question One: What is teachers' perceived impact of Continuous Quality Assurance on the standard of public primary education in Ilorin Metropolis?

Table 1: Mean and Standard deviation showing teachers' perceived impact of Continuous Quality Assurance on the standard of public primary education in Ilorin Metropolis

S/N	Items	Mean	SD
2	CQA supervision encourages active participation of learners during lessons.	3.79	.438066
5	CQA visits encourage teachers to make better use of instructional materials during teaching.	3.73	.443698
3	CQA monitoring ensures effective implementation of the approved primary school curriculum.	3.72	.506601

Teachers' Perceived Impact of Continuous Quality Assurance Practices on ... Gbadamosi, I. A., Et. al. (2026)

1	Regular Continuous Quality Assurance (CQA) visits lead to improvement in pupils' academic performance.	3.72	.503633
9	Implementation of recommendations from CQA visits improves school management practices.	3.70	.498947
8	CQA supervision strengthens school leadership practices.	3.70	.501675
10	CQA supervision encourages school to carry out self-evaluation and improvement planning.	3.65	.530754
7	CQA monitoring improves the safety and conduciveness of the learning environment.	3.60	.565567
4	CQA supervision promotes pupils' participation in extra curricular activities.	3.59	.519378
6	Professional support provided by CQA officers contributes to improved teaching practices.	3.50	.663021
Average Mean		3.67	

Key; SA = Strongly Agree, A = Agree, D = Disagree, SD = Strongly Disagree.

Table 1 presents teachers' perceptions of the impact of Continuous Quality Assurance (CQA) on the standard of public primary education in Ilorin Metropolis. The average mean score of 3.67 indicates a high level of agreement among respondents. The item with the highest mean score ($M = 3.79$, $SD = 0.438$) indicates that teachers generally agree that CQA supervision encourages active participation of learners during lessons. This is closely followed by the view that CQA visits encourage teachers to make better use of instructional materials during teaching ($M = 3.73$, $SD = 0.444$). Teachers also highly agreed that CQA monitoring ensures effective implementation of the approved primary school curriculum ($M = 3.72$, $SD = 0.507$), as well as the perception that regular CQA visits lead to improvement in pupils' academic performance ($M = 3.72$, $SD = 0.504$). Other highly rated items include the belief that implementation of recommendations from CQA visits improves school management practices ($M = 3.70$, $SD = 0.499$) and that CQA supervision strengthens school leadership practices ($M = 3.70$, $SD = 0.502$). Additionally, teachers perceived that CQA supervision encourages schools to carry out self-evaluation and improvement planning ($M = 3.65$, $SD = 0.531$), while CQA monitoring improves the safety and conduciveness of the learning environment ($M = 3.60$, $SD = 0.566$). Items with slightly lower mean scores include the perception that CQA supervision promotes pupils' participation in extracurricular activities ($M = 3.59$, $SD = 0.519$), and the perception that professional support provided by CQA officers contributes to improved teaching practices ($M = 3.50$, $SD = 0.663$).

H₀₁: There is no significant difference in teachers' perceived impact of Continuous Quality Assurance on the standard of public primary education in Ilorin Metropolis based on years of teaching experience.

Table 2: ANOVA Results of difference in teachers' perceived impact of Continuous Quality Assurance based on years of teaching experience.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	31.239	3	10.413	1.308	.274
Within Groups	1161.934	146	7.958		
Total	1193.173	149			

Table 2 presents the Analysis of Variance (ANOVA) showing that there is no significant difference in teachers' perceived impact of Continuous Quality Assurance based on years of teaching experience ($F = 1.308$, $p = 0.274 > 0.05$). Therefore, the null hypothesis is not rejected, indicating that teachers' perceptions do not differ based on their years of teaching experience.

H₀₂: There is no significant difference in teachers' perceived impact of Continuous Quality Assurance on the standard of public primary education in Ilorin Metropolis based on school location.

Table 3: ANOVA Results of difference in teachers' perceived impact of Continuous Quality Assurance based on school location.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	27.129	2	13.565	1.710	.184
Within Groups	1166.044	147	7.932		
Total	1193.173	149			

Teachers' Perceived Impact of Continuous Quality Assurance Practices on ... Gbadamosi, I. A., Et. al. (2026)

Table 3 presents the Analysis of Variance (ANOVA) showing that there is no significant difference in teachers' perceived impact of Continuous Quality Assurance based on school location ($F = 1.710$, $p = 0.184 > 0.05$). Therefore, the null hypothesis is not rejected, indicating that teachers' perceptions do not differ based on their school location.

Discussion of Findings

The findings of this study revealed that teachers generally hold positive perceptions regarding the impact of Continuous Quality Assurance (CQA) on the standard of public primary education in Ilorin Metropolis. The average mean score of 3.67, which is above the criterion mean of 2.50, indicates a high level of agreement among respondents that CQA practices contribute meaningfully to the educational standard. Specifically, teachers perceived that CQA enhances classroom practices, promotes effective use of instructional materials, supports curriculum implementation, and improves school management processes. This finding aligns with the position of the Federal Ministry of Education (2016), which emphasizes that quality assurance mechanisms are essential for maintaining educational standards through systematic monitoring, supervision, and professional support. It also supports the findings of Adeyemi (2020) who emphasized the importance of supervision in ensuring schools' daily programme is implemented in consonance with the curriculum. Furthermore, the study revealed that teachers perceive CQA as promoting active learner participation and encouraging effective utilization of instructional materials. This finding is consistent with the work of Oshiomu and Effiom (2025), who emphasized that continuous supervision and professional guidance are critical for improving classroom practices and overall school performance. In addition, the findings showed that Continuous Quality Assurance contributes to improved school leadership and management practices. Teachers reported that the implementation of recommendations from CQA visits enhances school administration and encourages self-evaluation and continuous improvement. This aligns with previous studies which highlight that quality assurance strengthens institutional effectiveness, accountability, and school improvement processes (Olagbende et al., 2019). This finding also aligns with the view of UNESCO (2017) which noted that quality assurance plays a vital role in strengthening institutional leadership, accountability and continuous school improvement. Finally, the hypotheses tested in the study found no significant difference in teachers' perceived impact of Continuous Quality Assurance based on years of teaching experience and school location. This indicates that teachers, regardless of their level of experience or the location of their schools, share relatively similar views about the impact of CQA practices. This uniformity suggests that quality assurance activities are implemented in a fairly consistent manner across public primary schools in Ilorin Metropolis. Nevertheless, existing literature indicates that the effectiveness of quality assurance in Nigeria may still be constrained by systemic challenges such as inconsistent monitoring, inadequate resources, and limited capacity for implementation (Olagbende et al., 2019). This suggests that while teachers perceive CQA positively, there is a need to strengthen its implementation to ensure sustained improvements in the standard of public primary education.

Conclusion

This study examined teachers' perceived impact of Continuous Quality Assurance (CQA) on the standard of public primary education in Ilorin Metropolis. The findings showed that teachers generally perceive CQA as having a positive influence on teaching practices, learner participation, curriculum implementation, and school management. The results also revealed no significant difference in teachers' perceptions based on years of teaching experience and school location, suggesting that similar experiences of CQA exist across schools. While these findings affirm the importance of Continuous Quality Assurance in improving school quality, strengthening the implementation of CQA practices is essential to ensure sustained improvement in the standard of public primary education in Ilorin Metropolis.

Recommendations

Based on the findings of this study, the following recommendations are made:

1. CQA visits should be carried out more regularly and consistently so that teachers can receive continuous support and feedback to improve teaching effectiveness.
2. Government and education authorities should provide adequate training, support, and necessary resources to CQA officers to enable them carry out their duties effectively and consistently.
3. Government should also provide enough teaching materials, facilities, and funding to schools to support the effective implementation of quality assurance recommendations.
4. School heads should be trained and supported to properly implement the recommendations given during quality assurance visits, especially in areas of school management and leadership.

Teachers' Perceived Impact of Continuous Quality Assurance Practices on ... Gbadamosi, I. A., Et. al. (2026)

References

- Adeyemi, B. A. (2020). *The state of primary education in Nigeria: A critical review*. South Asian Research Journal of Arts, Language and Literature, 2(3), 47–52. <https://doi.org/10.36346/sarjall.2020.v02i03.004>
- Bukola-Ojumu, E. O., Fadare, A. O., & Ogbaini, C. A. (2024). An evaluation of educational supervision in improving teaching quality in Akure South LGA, Ondo State, Nigeria. *Jurnal Saintifik (Multi Science Journal)*, 22(3), 111–122. <https://www.jurnal.faperta-unras.ac.id/index.php/JS/article/view/346>
- Federal Ministry of Education. (2016). *National school quality assurance policy*. Abuja, Nigeria: Author.
- Federal Ministry of Education. (2016). *National education quality assurance handbook*. Abuja, Nigeria: Author.
- Olagbende, E. K., Olusegun, A. A., & Alabi, A. T. (2019). Ensuring quality assurance in basic education in Nigeria. <https://hoedson.org/wp-content/uploads/2021/08/jorn-8.pdf>
- Olaleye, F. O., & Oyewole, B. K. (2013). Supervision for quality assurance in universal basic education programme in Nigeria. *Mediterranean Journal of Social Sciences*, 4(6), 447–452. <https://doi.org/10.5901/mjss.2013.v4n6p447>
- Olutola, A. T., Galadanchi, N. Y., Olatoye, R. A., & Ihechu, K. J. P. (2022). *Practical procedures in ensuring quality primary education in Nigeria*. Indonesian Journal of Multidisciplinary Research, 2(2), 429–436.
- Osere, C. (2025). *An assessment of the standard of primary education in Nigeria*. International Journal of Innovative Education Research, 13(4), 498–506. <https://www.seahipublications.org/wp-content/uploads/2025/10/IJIER-D-52-2025.pdf>
- Oshiomu, A. O., & Effiom, B. E. (2025). Instructional supervision as a quality assurance mechanism in primary schools in Cross River State, Nigeria. *World Journal of Advanced Research and Reviews*, 25(2), 368–377.
- Oyewole, B. K., & Alonge, H. O. (2013). Principals' instructional supervisory role performance and teachers' motivation in Ekiti State, Nigeria. *Journal of Educational and Social Research*, 3(2), 295–303. <https://doi.org/10.5901/jesr.2013.v3n2p295>
- Oyewole, B. K. (2013). Repositioning secondary school administration for quality assurance in Ekiti State, Nigeria. *Journal of Management and Sustainability*, 3(3), 173–178. <https://doi.org/10.5539/jms.v3n3p173>
- UNESCO. (2017). *Education for sustainable development goals: Learning objectives*. Paris, France: UNESCO.
- UNESCO. (2020). *Global education monitoring report: Inclusion and education*. Paris, France: UNESCO.
- UNICEF. (2020). *Quality education and learning outcomes*. New York, NY: United Nations Children's Fund.
- UNICEF. (2021). *Nigeria education fact sheet*. Abuja, Nigeria: UNICEF.
- Universal Basic Education Commission. (2014). *UBE programme implementation guidelines*. Abuja, Nigeria: UBEC.
- Universal Basic Education Commission. (2018). *National school quality assurance handbook*. Abuja, Nigeria: UBEC.
- Universal Basic Education Commission. (2018). *Quality assurance guidelines for basic education in Nigeria*. Abuja, Nigeria: Author.



Effects of Science-Text-Cards and Crossword Puzzle Instructional Materials On Academic Performance in Biology among Secondary School Students in Oron LGA, Akwa Ibom State, Nigeria

OBOHO, Daniel E.¹

obohodan@gmail.com

0803 883 7845

ATABANG, Atim A.¹

atimitighise@aksu.edu.ng

0701 687 6272

AKPAN, Anyanime O.¹

yaniokop@yahoo.com

0802 331 9141

¹Department of Science Education, Akwa Ibom State University, Akwa Ibom State, Nigeria

Abstract

The study investigated the effect of Science Text Cards and Crossword Puzzle Instructional Material on Biology Students' Academic Performance in Oron Local Government Area, Akwa Ibom State, Nigeria.. To achieve the purpose of the study, three research questions and three hypotheses were formulated to guide the study. Quasi experimental research design was adopted and the study was conducted in Oron Local Government Area of Akwa Ibom State. The Population of the study consisted of all the 1423 Senior Secondary Three (SSIII) Biology students in the six public secondary schools in Oron Local Government Area of Akwa Ibom State, Nigeria during the 2024/2025 academic session. The sample size for the study was One Hundred and Fifty (150) Senior Secondary Three (SS3) Biology students selected from their intact classes. Criterion and simple random sampling technique was used for the selection of schools for the study. Biology Performance Test (BPT) was used as instrument for data collection. The instruments was duly validated and subjected to reliability analysis using Kuder Richardson 20 (K-R20). The result showed a reliability coefficient of 0.85 and was deemed appropriate for the main study. Descriptive statistics of mean and standard deviation were used in answering the research questions while analysis of covariance was used in testing the hypotheses at 0.05 alpha level. Result findings of the analyses, showed that there was a significant difference in students' academic performance when taught the concept of genetics based on science text cards, and crossword puzzles as students in the experimental groups performed better than their control group counterparts in Biology and that male and female students in the experimental groups achieved better than their counterparts in the control groups. it was concluded that students exposed to science text cards performed better than those exposed to crossword puzzle followed by the expository group. Based on the findings, it was recommended, among other, that Government should support policies that promote innovative teaching approach, including the use of interactive and visual instructional materials in science education. This can help improve overall educational quality in Biology.

Keywords: Science text card, crossword puzzle, gender, performance and Biology

Introduction

Biology has contributed to the improvement and development of new and better drugs and vaccines against many human and animal diseases and has also contributed towards the conservation of the environment and endangered species. Biology is a subject which students must pass if their overall success is to have any value. A credit pass in Biology is a compulsory requirement for any student seeking admission into all the institutions of higher learning in Nigeria. The knowledge of Biology is needed for National development and global competitiveness in the area of medicine, education, agriculture, physical and health education, especially in sports and environmental studies amongst others (Atabang, 2025; Gega et al., 2017). It will also help to perpetuate desired favorable traits in the production of high breeds of crops and animals through hybridization and cloning respectively, it can also help in the conservation of natural resources and checkmating population explosion. (Atabang, Edikpo & Akpan, 2024). It is central to many science related courses including medicine, biochemistry, pharmacy, nursing science and agriculture. Being a science of life, Biology is one of the core science subjects taught in the senior secondary schools. Hence, it occupies a very important position in the secondary school curriculum. In Nigeria, the secondary school Biology curriculum is designed and developed to prepare students to acquire adequate laboratory and field skills, meaningful and relevant knowledge in Biology and also to enable students apply scientific knowledge to everyday life in matters of personal, community, health and agriculture among others. According to Adam, Lameed and Adelabu (2023), Biology is introduced to students at the senior secondary school level as a preparatory ground



Effects of Science-Text-Cards and Crossword Puzzle Instructional materials on ... Obolio, D. E., Et. al. (2026)

for human development, where career abilities are groomed, potentials and talents are discovered and energized. Today, Biology pervades literally every field of human endeavors and plays a fundamental role in educational advancement (Atabang, Edikpo & Akpan, 2024). Duru (2025), highlights the importance of Biology to include helping individuals to understand the parts of his/her body and their functions; enabling one to question superstitions due to sustained interest arising from comprehension of the cause of events; understanding and appreciating life; bringing into focus the need to maintain good health; inculcating the individual scientific skills and attitudes in his approach to personal and societal problem; imparting factual knowledge and stimulating scientific reflective thinking so as to produce a better informed individual; promoting the individual for career choice. The study of Biology in senior secondary schools is expected to equip students with useful concepts, principles and theories that will enable them face the challenges before and after graduation. The subject aims at equipping the learner with knowledge, skills and attitudes that are necessary for controlling and preserving the environment; enabling the learner to appreciate humans as the broader community of living organisms (Duru, Uko, & Utibe 2024; Umoke & Nwafor, 2014). Some of the topics taught in Biology that students perceive as abstract are genetics, evolution, physiology, micro-organisms, skeletal system among others (Fasasi & Oladejo, 2022; Akpan, 2022). Research studies have shown that a number of concepts in Biology which include Genetics posed difficulty for students to understand and grasped (Atabang, Edikpo & Akpan, 2024; Esiobu & Soyibo, 2018). Also, some students have the notion that the concept of genetics in Biology is abstract and extremely technical and require only rote memorization to pass (Ogunbanwo, 2019). However, many teachers and students regard the topic of Genetics as very difficult, both to teach and to learn (Okebukola, Ige, Oyeyemi, Olusesi, Owolabi, Okebukola & Osun, 2016). Fasasi and Oladejo (2022), referring to these difficulties, argued that as the revolution in the field of Genetics continues, the web of abstract concepts becomes increasing complex. According to Akintola (2019), students' understanding of fundamental of genetics concepts suggest that current instruction in genetics leaves students with insufficient understanding of the technological advances in genetics that they may encounter in their everyday lives, such as genetics counseling and screening. Nor are students informed enough to understand and participate in current debates involving genetic issues such as genetically modified foods, cloning and gene therapy. Conversely, teachers neglect from teaching this topic because of its complexity; students find it difficult because it is perceived as being difficult, abstract and boring hence; students may perform low in academic success in examinations (NERDC, 2015; Akpan & Akpan, 2017). Furthermore, the West African Examination Council (WAEC) Chief Examiners, report 2021, 2022, 2023, 2024, 2025 confirm that students performance in Biology is poor (WAEC, 2025). According to the report, the poor academic performance of students in Biology is attributed to difficulty in interpreting data and graphs, particularly in the objectives test section, lack of understanding of key biological concepts such as genetics, photosynthesis and respiration, poor laboratory skills including difficulties with measurement and observation and above all poor teaching methods adopted by teachers. According to reports, teachers should adopt more interactive and engaging teaching methods to help students better understand key concepts, teachers should place greater emphasis on innovative instructional approaches to help students develop practical skills, and that students should practice more objective tests to improve their interpretation and analytical skills. Also, the high rates of failure recorded by Biology students in schools and colleges in Nigeria have been a major concern to researchers. Consequently, the low performance in Biology in external examinations had been traced to the use of conventional teaching approach and other factors that does not put into consideration the students' activities in teaching and learning processes (Oluwaseun, Onovroghene & Avodele, 2018). It has been shown that Biology concepts such as heredity among others pose strong resistance to the conventional teaching approach used by teachers and this hinders the realization of Biology objectives and as well as lesson objectives. This is because, conventional approach may lack student to student help, interaction and cooperation needed for effective teaching and learning of difficult concept (Oladejo & Ebisin, 2021). The use of appropriate instructional materials in teaching heredity could help to assuage this poor academic performance. Instructional materials are those materials used in the classroom and science laboratory for instructions and purposes of demonstration by teachers and students. The term instructional materials is used to denote resource materials/methods, anything which can help to transmit learning experiences through any of the senses of touch, sight, smell, taste and hearing (Umanah & Atabang, 2025; Atabang, 2024; Akpan, 2022). They are adopted by teachers in classroom to aid in the attainment of specific learning objectives set out in classroom plans (Umoetuk & Akpan, 2023; Etop, Iboro & Obogo, 2023; Moses, 2020). Studies have shown that the use of instructional resources has improved performance (Itighise, 2024; Okori & Jerry, 2017). The teaching of Biology without appropriate instructional materials may certainly result in poor academic performance. According to



Effects of Science-Text-Cards and Crossword Puzzle Instructional materials on ... Obolio, D. E., Et. al. (2026)

Duru (2025) the teaching of Biology cannot be done effectively without interaction between the teacher, students and the environmental resources. The Biology curriculum is planned and designed to enable the teacher use activity oriented, student-centered approach to teach (Oluwaseun, et al., 2018). However, evidence from research has shown that most teachers in Nigeria use verbal exposition of scientific principles, facts and concepts thus, academic performance of Nigerian students in ordinary level Biology is persistently poor over the years (Adam, et al., 2023). This has been a major source of concern for researchers, the school administrators, parents and the government at large. In an attempt to facilitate the teaching of such content, teachers must adopt resources, analogies, contextualization, multimedia resources (slides), games and physical models (cards or plastic models to represent elements). The combination of these approaches/resources can make learning concepts more significant, easy and meaningful to students and increasing the interest of the students in Biology. Utilizing appropriate teaching resources has proven over time to improve students' academic performance and how they retain what was taught. However, research suggests that students face challenges in comprehending complex biological concepts, leading to lower academic performance rates in the subject (Uko, et a 2025; Duru, 2025). To address these issues, educators have been exploring innovative instructional materials to enhance students learning experiences in Biology. One instructional material considered germane for this study that may improve students' academic performance in Biology is the use of science text cards instructional material. Science text card is a paper containing a picture and name of the picture." Science text card" is small cards that have picture, word, text or symbol for individual to study a particular topic or describe something (Brady & Fisher, 2016). Science text cards are potable, concise resources that contain key information, definitions, and explanations of Biology concepts. Research has suggested that the use of science text cards instructional material can help students reinforce their understanding of important concepts and enhance performance of crucial information (Wordu & Atabang, 2024; Jones & Peterson, 2018). By presenting information in a structured and organized format, science text cards serve as valuable study aids that can help students reinforce their knowledge and review essential concepts in Biology (Montgomery & Richards, 2018). The researcher further maintains that science text cards are widely used as a learning drill to aid memorization by way of spaced repetition. Science text cards are useful for drilling new letters, syllables, words, and other information. Itighise (2016) comment that it is an innovative teaching resources that are normally used in a classroom, but can also be used more informally. Science text cards can bear vocabulary, historical dates, formulas or any subject matter that can be learned via a question-and-answer format. In addition to science text cards, another instructional material that have been shown may impact on student' academic performance in Biology is the use of crossword puzzle instructional material.

Crossword puzzle is an interactive resource material that challenges students to apply their knowledge of Biology terms and concepts in a problem-solving format. Wordu and Atabang (2024) opined that among many resources, crossword puzzle instructional material seems to be more attractive than others. In order to finish a crossword puzzle instructional material, the learner has to accurately fill in all the blank squares with letters that form words. The words are based on the clues provided, which can be complete sentences, phrases, or words (Ukah, Atabang & Eden, 2025). Apart from motivating student learning, these puzzles can help students to extend their understanding of concepts and terminological knowledge. Crossword puzzle instructional material can be used to teach terminology, definitions, as well as pairing key concepts in Biology. Since students need to spell items correctly to complete the puzzle, they gain greater performance and development of positive attitude towards learning as this makes the concept taught more simple than complex. Gender has attracted the attention of many researchers. For this reason, gender and academic performance were investigated in this study. Gender is a socially constructed definition of male and female. Gender is the range of characteristics pertaining to and differentiating between, masculinity and femininity (Atabang & Umanah, 2025; The issue of gender and gender stereotyping permeate all aspects of human endeavors (Umanah & Sunday, 2022). Akpan, (2024), defined gender as the amount of masculinity and femininity found in a person and obviously while there are mixtures of both in most human beings, the normal male has a preponderance of masculinity and the normal female has a preponderance of femininity. However, in other studies carried out by Oyakhirone and Akpan (2024); Akpan, (2022); revealed that female students are academically superior in Biology and the sciences. They showed that despite the discrimination that the female child faced, they were able to navigate successfully academically through maintaining a positive definition of themselves. Depending on this context, the discriminating characteristics vary from sex to social role to gender identity. Gender differences in Biology performance ability has remained a source of concern as scientists seek to address the under-representation of women at



Effects of Science-Text-Cards and Crossword Puzzle Instructional materials on ... Obolio, D. E., Et. al. (2026)

the highest levels of mathematics, physical sciences and engineering (Atabang, et al., 2024). Academic performance in Biology encompasses the mastery of biological concepts, skills, and competencies as demonstrated through assessments and evaluations (Uko, Duru, Babayemi, & Atabang, 2025). Wilson (2020) conducted a study on the effectiveness of innovative instructional approach, including the use of science text cards and crossword puzzle instructional materials, in enhancing academic performance in Biology. The research findings highlighted that incorporating these tools into classroom practice resulted in improved student success and comprehension of Biology content, leading to enhanced academic performance. The cognitive load theory by John Sweller in (2011) was used for this study. The theory states that learners have limited cognitive resources available for processing information, and the way instructional materials are employed can either facilitate or hinder learning. The theory distinguishes between three types of cognitive load: intrinsic (related to the complexity of the material being learned), extraneous (related to ineffective instructional design), and germane (related to the construction of schema and long-term learning). In the context of the study on the use of science text cards and crossword puzzle in Biology education, cognitive load theory is relevant as it highlights the importance of presenting information in a way that minimizes extraneous cognitive load, allowing students to allocate their cognitive resources effectively towards understanding and achievement of Biology concepts. Despite the growing interest in using science text cards and crossword puzzle instructional materials in Biology education, there is limited research on the specific impact of these instructional materials on students' academic performance in Biology. Therefore, this study seeks to investigate the effect of science text cards, crossword puzzle instructional materials on students' academic performance in Biology in Oron Local Government Area, Akwa Ibom State, Nigeria.

Objectives of the Study

1. Determine the mean performance scores of Biology students' taught the concept of heredity using science text cards, crossword puzzle instructional materials and those taught using expository method.
2. Compare the mean performance scores of male and female Biology students taught the concept of heredity using science text cards, crossword puzzle instructional materials and those taught using expository method.
3. Find out the interaction effect of treatments and gender on the mean performance scores of Biology students' taught the concept of genetics (heredity).

Research Questions

The following research questions raised and answered in the course of the study.

1. What difference exist in the mean performance scores of Biology students' taught the concept of heredity using science text cards, crossword puzzle instructional materials and those taught using expository method?
2. What is the difference in the mean performance scores of male and female Biology students taught the concept of heredity using science text cards, crossword puzzle instructional materials and those taught using expository method?
3. What is the interaction effect of treatments and gender on the mean performance scores of Biology students' taught the concept of heredity?

Hypotheses

The following hypotheses were formulated to guide the study.

1. There is no significant difference in the mean performance scores of Biology students' taught the concept of heredity using science text cards, crossword puzzle instructional materials and those taught using expository method.
2. There is no significant difference in the mean performance scores of male and female Biology students taught the concept of heredity using science text cards, crossword puzzle instructional materials and those taught using expository method.
3. There is no significant interaction effect of treatments and gender on the mean performance scores of Biology students' taught the concept of heredity.

Methodology

This study employed quasi-experimental pretest posttest nonequivalent control group design. This design is chosen because the participants were not randomized hence intact classes was used for data gathering. This study in the context of this design employed two experimental groups and a control group. The study was carried out in Oron Local Government Area of Akwa Ibom State located at approximately 4.75° North latitude and 8.20° East longitude situated in the southern part of Nigeria, along the coastline of the Atlantic Ocean, Akwa Ibom State, Nigeria. Population of the study consisted of all the



Effects of Science-Text-Cards and Crossword Puzzle Instructional materials on ... Obolio, D. E., Et. al. (2026)

1,423 students with males accounting for 724 and females 699 of Senior Secondary Three (SSIII) Biology students during the 2024/2025 academic session. A sample size of One Hundred and Fifty (150) senior secondary III Biology students drawn from three schools in their intact classes through criterion and simple random sampling techniques was used for the study. Biology Performance Test (BPT) was used to gather data for the study. The items are expected to test students' academic performance. The instrument was duly validated and subjected to reliability analysis using Kuder Richardson 20 (K – R 20) formula. The result showed reliability coefficient of 0.85 and was deemed appropriate for the main study. Descriptive statistics of mean and standard deviation were used in answering the research questions while analysis of covariance (ANCOVA) was used in testing the hypotheses at 0.05 Alpha level. The BPT was administered to students as pretest and posttest. The Biology teachers were recruited and instructed to serve as research assistants on the use of the lesson packages for the experimental groups I and II and the control group. The lesson package for the experimental group I was designed using science text cards instructional material, experimental group II lesson package was based on crossword puzzle instructional material and the control group taught using expository method. Pretest was administered to students' in the three groups before treatment started. The treatment lasted for two weeks after which the BPT was administered as posttest to students in the three groups. Pretest and Posttest scripts from the three groups were collected, scored and used for data analysis. The research questions were answered using descriptive statistics while Analysis of Covariance (ANCOVA) was used to test the formulated null hypotheses at .05 level significance.

Presentation of Results

Testing the Hypotheses

Hypothesis One

There is no significant difference in the mean performance scores of Biology students' taught the concept of heredity using science text cards, crossword puzzle instructional materials and those taught using expository method.

In order to test hypothesis one, analysis of covariance was employed and the result is shown in Table 1.

Table 1: Summary of analysis of variance of the difference in the mean performance scores of Biology students' taught the concept of heredity using science text cards, crossword puzzle instructional materials and those taught with expository method

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	17526.870 ^a	3	5842.290	450.073	.000
Intercept	2990.819	1	2990.819	230.404	.002
Pretest	130.110	1	130.110	10.023	.702
Instructional materials	13337.632	2	6668.816	513.746	.000
Error	1895.190	146	12.981		
Total	127641.000	150			
Corrected Total	19422.060	149			

The result in Table 1 indicates that the F-value of 513.746 with 2 and 146 degrees of freedom at .05 alpha level is significant since the p-value of .000 is lower than the alpha value of .05. The null hypothesis is rejected, which means that there is significant difference in the mean performance scores of Biology students' taught the concept of heredity using science text cards, crossword puzzle instructional materials and those taught with expository method.

Hypothesis Two

There is no significant difference in the mean performance scores of male and female Biology students taught the concept of heredity using science text cards, crossword puzzle instructional materials and those taught with expository method.

In order to test hypothesis three, analysis of covariance was employed and the result is shown in Table 2.

Table 2: Summary of analysis of variance of the difference in the mean performance scores of male and female Biology students' taught the concept of heredity using science text cards, crossword puzzle instructional materials and those taught with expository method

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	17913.429 ^a	6	2985.572	282.996	.000
Intercept	3001.750	1	3001.750	284.530	.000
Pretest	5.557	1	5.557	.527	.469
Instructional materials	13444.881	2	6722.440	637.206	.000
Gender	106.779	1	106.779	10.121	.002



Effects of Science-Text-Cards and Crossword Puzzle Instructional materials on ... Obolio, D. E., Et. al. (2026)

Instructional materials *	308.744	2	154.372	14.633	.000
Gender					
Error	1508.631	143	10.550		
Total	127641.000	150			
Corrected Total	19422.060	149			

The result in Table 2 indicates that the F-value of 14.633 with 2 and 143 degrees of freedom at .05 alpha level is significant since the p-value of .000 is lower than the alpha value of .05. The null hypothesis is rejected, which means that there is significant difference in the mean performance scores of male and female Biology students taught the concept of heredity using science text cards, crossword puzzle instructional materials and those taught using expository method.

Hypothesis Three

There is no significant interaction effect of treatments and gender on the mean performance scores of Biology students' taught the concept of heredity.

In order to test hypothesis five, analysis of covariance was employed and the result is shown in Table 3.

Table 6: Summary of analysis of variance of interaction effect of treatments and gender on the mean performance scores of Biology students' taught the concept of heredity.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	17913.429 ^a	6	2985.572	282.996	.000
Intercept	3001.750	1	3001.750	284.530	.000
Pretest	5.557	1	5.557	.527	.469
Instructional materials	13444.881	2	6722.440	637.206	.000
Gender	106.779	1	106.779	10.121	.002
Instructional materials * Gender	308.744	2	154.372	14.633	.000
Error	1508.631	143	10.550		
Total	127641.000	150			
Corrected Total	19422.060	149			

The result in Table 3 indicates that the F-value of 14.633 with 2 and 143 degrees of freedom at .05 alpha level is significant since the p-value of .000 is lower than the alpha value of .05. The null hypothesis is rejected, which means that there is significant interaction effect of treatments and gender on the mean performance scores of Biology students' taught the concept of heredity.

Discussion of Findings

The result of hypothesis one indicated that science text card, crossword puzzle significantly influence students' academic performance than those taught with expository method in the concept of heredity in Biology. Research has consistently shown that the use of instructional materials, such as science text cards and crossword puzzle, significantly enhances students' academic performance in subjects like Biology. For instance, this study is supported by the work of Smith et al. (2017) found that students exposed to interactive learning materials like science text cards and crossword puzzle, performed higher scores in Biology assessments compared to those who received expository instruction without such materials. This aligns with the cognitive theory of multimedia learning, which posits that students learn better when information is presented in multiple formats (Mayor, 2020; Smith et al., 2020). Moreover, this study is in line with the work conducted by Johnson and Lee (2021) reviewed various studies and concluded that the integration of science text cards in teaching practices improved students' understanding of complex biological concepts. The visual representation of information aids in improving academic achievement which is crucial for academic success. In contrast, students who were not provided with these instructional materials often struggled with comprehension and performance of key concepts leading to lower academic performance. The result of analysis two indicated that male and female students' in the experimental groups taught the concept of heredity based on science text card, crossword puzzle significantly influence students' academic performance than those taught using expository method in the concept of performance in Biology. Research has demonstrated that gender can significantly influence how students interact with various instructional materials, impacting their academic performance. This study is in consonance with the works of Turner and Smith (2018) found that male students tended to perform better when using interactive materials such as crossword puzzles, while female students showed greater improvement with science text cards. This suggests that instructional materials may not have a uniform effect on all students, indicating the need for differentiated teaching approaches based on gender.



Effects of Science-Text-Cards and Crossword Puzzle Instructional materials on ... Obolio, D. E., Et. al. (2026)

Furthermore, this study is supported by the works of Olagunju, and Babayemi (2014); Johnson and Patel (2021) analyzed the academic performance of male and female students using instructional materials and indicated that males scored higher in assessments that utilized crossword puzzles, likely due to their engagement with competitive and game-like elements of the puzzles. Conversely, females demonstrated higher academic performance with science text cards, which provided structured and visual learning that catered to their preferences for organization and clarity. These findings highlight the necessity of considering gender differences when implementing instructional materials in Biology education. Tailoring teaching strategies to accommodate these differences can enhance overall academic performance, fostering a more inclusive learning environment. The result of the analysis three indicated that the interaction effect of treatment and gender significantly influence students' academic performance in the concept of heredity in Biology. Research has explored how the interaction between different instructional treatments and gender influence students' academic performance in Biology. This study is supported by the works of Davis and Thompson (2020) investigated the effects of science text cards and crossword puzzles on male and female students' performance. The findings revealed a significant interaction effect, indicating that type of instructional material used interacted with the students' gender to influence academic outcome. The study found that male students showed greater academic performance when using crossword puzzles, likely due to their preference for competitive and engaging activities that stimulate critical thinking and problem-solving skills. Conversely, female students performed better with science text cards, which allowed for structured and organized learning, facilitating a deeper understanding of complex biological concepts. This interaction suggests that tailored instructional strategies based on gender can optimize learning outcomes in terms of performance in Biology. Furthermore, this study is in line by the works of Martinez and Green (2023); Duru, Uko, and Utibe (2024) supported these findings, emphasizing the necessity of integrating both types of instructional materials in the curriculum. Their study indicated that providing a balanced approach not only improved overall academic performance but also bridged the gender gap in performance, allowing both male and female students to thrive.

Conclusion

From the findings, it can be concluded that students' taught using instructional material based on science text cards and crossword puzzle lead to better academic performance on the part of the students. Also, from the study, female students' taught science text cards performed better than their male counterparts followed by crossword puzzle. The interaction effects of gender and treatment have a significant effect on students' academic performance.

Recommendations

1. Government should support policies that promote innovative instructional materials, including the use of interactive and visual instructional materials in science education. This can help improve overall educational quality in Biology.
2. Researchers should continue to investigate the effectiveness of various instructional materials and strategies in enhancing student learning outcomes, This can lead to deeper understanding of how different tools impact academic performance.
3. The society at large should be engaged in discussions about the importance of effective teaching practices in science education. Community support for educational initiatives can foster a culture of learning and improvement in local schools.

Reference

- Adam, U. A., Lameed, S. N. & Adelabu (2023). Beyond the confines of performance in secondary school Biology: Higher-order thinking in focus. *Journal of Educational Sciences*, 7(1), 12-26.
- Akpan, A. O. (2022). Inforgraphics as instructional resource for teaching basic science and technology in junior secondary schools in Akwa Ibom State. *Journal of Basic Education in Nigeria*, 8, 197-218.
- Akpan, A. O. (2024). Knowledge, utilization and perception of emergent digital technologies in pedagogy by pre-service science teachers in Nigeria. *Journal of Institutional Research, Big Data Analytics and Innovation*, 1(1), 44-55.
- Akpan, A. O. & Akpan, I.F. (2017). Facilitation-activity strategy and pre-service teachers' achievement in Basic science and technology. *Journal of Research and Development in Education (JORDE)*, 7(1), 38-47.
- Akintola, A. (2019). Impact of culturo-tec0hno-contextual approach on students' achievement on perceived difficult topics in Biology. Unpublished Research Project Report for the degree of Bachelor of Science Education, Lagos State University, Nigeria.
- Atabang, A. A. (2024). Dropbox phototext instructional strategy and academic performance of teacher trainees in universities in south-south Nigeria. *Modern Journal of Social Sciences and Humanities*, 3(2), 42-47.



Effects of Science-Text-Cards and Crossword Puzzle Instructional materials on ... Obolio, D. E., Et. al. (2026)

- Atabang, A. A. & Umanah, F. I. (2025). Effect of computer animation on students' academic achievement and retention in Basic Science and Technology in Ukanafun Local Government Area, Akwa Ibom State. *Inter-disciplinary Journal of Science Education*, 5(2), 35-43.
- Atabang, A. A., Edikpo, L. V. & Akpan, A. O. (2024). Effect of improvised DNA model and flipchart on students' performance and retention in Biology in Eket Local Government, Akwa Ibom State. *Inter-Disciplinary Journal of Science Education (IJ-SED)*, 6(1), 113-123.
- Brady, E., & Fisher, M. (2016). The impact of science text cards on student learning in Biology. *International Journal of Science Education*, 30(4), 567-580.
- Davis, K., & Thompson, R. (2020). The interaction of instructional materials and gender on academic performance in Biology: A comprehensive study. *Journal of Educational Research*, 113(4), 423-435.
- Duru, C. M. (2025). Teachers competency in utilization of digital technologies in instructional delivery of Biology concepts in secondary schools in Akwa Ibom State. *International Journal of Developmental Research in Education (IJDRE)*, 6(1), 96-106.
- Duru, C. M., Uko, P. J & Utibe, U. J. (2024). Application of DNA animation, improvised model and realia in teaching and students' performance based on gender in Biology in Akwa Ibom State, Nigeria. *African Journal of Educational Foundations*, 5(1), 75- 92.
- Duru, C. M., Uko, P. J & Utibe, U. J. (2023). Effect of DNA animation, improvised model and realia on teaching and students' performance based on school location in Biology in Akwa Ibom State, Nigeria. *Interdisciplinary Journal of Science Education (IJ-SED)*, 5(1), 11-25.
- Edikpo, L. V., Akpan, I. F. & Atabang, A. A. (2024). Teaching methods and Biology students academic achievement in Eket federal constituency of Akwa Ibom State. *Inter-disciplinary Journal of Science Education*, 5(2), 24-34.
- Esiobu, O. G. & Soyibo, K (2018). Effects of concept and vee mappings under three learning modes on students' cognitive achievement in ecology and genetics. *Journal of Research in Science Teaching*, 32(9), 101-121.
- Etop, E. E, Iboru, S. G., & Obogo, A. I. (2023). Influence of locally available instructional materials on Biology students' academic performance in Abak Local Government Area of Akwa Ibom State, Nigeria. *Global Journal of Educational Research*, 22, 81-87.
- Fasasi, R. & Oladejo, A. I. (2022). Genetics as a difficult concept: exploring the efficacy of culturo-techno-conceptual approach (ctca) in improving secondary school students in Lagos State, pp. 1-10.
- Gega, P., Smith L., & Johnson, M. (2017). Challenges in biology education: A review of the literature. *Journal of Research in Science Teaching*, 49(3), 301-318.
- Itighise, A. E. (2024). Dropbox file sharing strategy and academic performance of teacher trainees in universities in south-south Nigeria. *Ibadan Journal of Educational Studies*, 21(1), 191-206
- Itighise, A. E. (2016). Innovation in higher teacher education: An imperative for achievement and sustainable national development. *Journal of National Association for Educational Media and Technology*, 21(1), 265-274.
- Johnson, R., & Lee, M. (2021). The impact of interactive learning on academic performance: a meta-analysis. *Journal of Educational Psychology*, 113(2), 305-320.
- Johnson, R., & Patel, S. (2021). Gender difference in academic performance: The role of instructional materials in science education. *Journal of Education Research and Practice*, 11(3), 45-58.
- Jones, A., & Peterson, K. (2018). The impact of science text cards on student understanding in Biology class. *International Journal of Science Education*, 25(3), 409-422.
- Martinez, L., & Green, S. (2023). Bridging the gender gap: The impact of diverse instructional materials on academic performance. *Biology Education Research*, 18(1), 34-50.
- Mayor, R. E. (2020). *Integrating multimedia and learning: evidence-based guidelines for designing effective instruction*. Routledge
- Montgomery, E., & Richards, A. (2018). The impact of science text cards on student learning outcomes in Biology. *International Journal of Education Research*, 35(2), 167-182.
- Moses, V. (2020). Influence of instructional materials on students' academic performance in Biology in Calabar South Local Government Area, Cross River State. P.51
- Nigeria Educational Research and Development Council (NERDC). (2015). *Workshop on difficult concepts: Biology group report*, (seventh edition) NERDC.
- Ogunbanwo, G. (2019). Relative effectiveness of the culturo-techno-conceptual approach on students' performance in genetics and evolution. Unpublished research project report for the degree of Bachelor of Science Education, Lagos State University, Ojo, Lagos Nigeria.
- Okebukola, P.A.O., Ige, K, Oyeyemi, A. Olusesi, O., Owolabi, O, Okebukola, F, & Osun, G. (2016). Exploring the impact of culturo-techno-contextual approach (CTCA) in tackling under-achievement in difficult concepts in Biology.



- Effects of Science-Text-Cards and Crossword Puzzle Instructional materials on ... Obolio, D. E., Et. al. (2026)*
Proceedings of the Conference of the National Association of Research in Science Teaching (NARST), Baltimore, USA.
- Okori, O. A. & Jerry, O. (2017). Improvisation and utilization of resources in the teaching and learning of science and mathematics in secondary schools in Cross River State. *Global Journal of Educational Research*, 16(1), 21 -28
- Oladejo, A. I., & Ebisin, A. F. (2021). Virtual laboratory: An alternative laboratory for science teaching and learning. *Federal Polytechnic Ilaro Journal of Pure and Applied Science*, 3(1), 82- 90.
- Olagunju, A.M. & Babayemi, J.O. (2014). Effects of crossword-picture puzzle teaching strategy and gender on students' performance in Basic science. *Journal. of Education and Leadership Development*, 6(1), 43-54.
- Oluwaseun, K. A., Onovroghene, S. M. & Avodele, O. (2018). Examination of the availability and adequacy of Biology education resources in the curricula of open and conventional universities in southern Nigeria. *Journal of Emerging Trends in Educational Research and Policy Studies*, 9(6), 282-292.
- Osinubi, O. & Okebukola, F. O. (2014). *Road aloud: An innovation approach to science learning in difficulty circumstances*. Proceeding of Ajumogobia Memorial Conference in Commemoration of the 40th Anniversary of STAN, Kano, Nigeria, 7(4), 337-340.
- Oyakhrome, A.H. & Akpan, A. O. (2024). Effect of experimentation on Chemistry students' conceptualization of acid, bases and salts. *Inter-Disciplinary Journal of Science Education*, 5(2), 15-23.
- Smith, A., & Johnson, B. (2017). The effectiveness of science text cards in enhancing student learning in Biology. *Journal of Science Education*, 12(3), 245-260.
- Smith, J. Brown, A., & White, L. (2017). The effect of instructional materials on students' performance in Biology. *Biology Education Research*, 15(4), 45-58.
- Smith, J., Brown, S., & Lee, C. (2020). Enhancing Biology vocabulary through crossword puzzles: A meta-analysis. *Journal of Science Education and Technology*, 42(2), 567-580.
- Sweller, J. (2011). *Cognitive Load Theory*. Springer.
- Turner, J., & Smith, K. (2018). Engaging males and females in science learning: The impact of instructional materials. *Biology Education Research*, 16(1), 22-34.
- Ukah, J. U., Atabang, A. A. & Eden, M. I. (2025). Gamification of learning in Ofoegbu, T. O. Johnson, I. E. (eds). *Digitalization of education: Novel dimension in educational technology. A Festschrift for Professor Inyang Abia, M. E. Calabar: University of Calabar Press.*
- Uko, P. J., Duru, C. M., Babayemi, J. O., & Atabang, A. A. (2025). Frame quadrat and belt transect techniques on students' academic achievement in Biology in Akwa Ibom State, Nigeria. *International Journal of Education Humanities and Social Science*, 8(5), 185-200.
- Umanah, F. I., & Atabang, A. A. (2025). Effect opf animated and static infographic instructional materials on students' academic performance in isomerism. *International Journal of Research and Innovation in Social Science*, 9(1115), 1515-1524.
- Umanah, F. I. & Sunday, E. S. (2022). Crosswords Puzzle, Flashcards Teaching Strategies and Senior Secondary School Students' Academic Performance in Chemistry. *International Journal of Educational Benchmark (IJEB)*, 22 (2), p.12
- Umoetuk, E. & Akpan, A. O. (2023). Computer graphics, flipped classroom instructional strategies and students' performance in Basic science and technology in Akwa Ibom State. *Inter-Disciplinary Journal of Science Education*, 5(1), 34-41.
- Umoke, J. C. & Nwafor, C. C. (2014). Student Understanding of Purpose, of Model in Life Biological Context. *International Journals of Biology Education*; 2(2), 187-198.
- WAEC (2025). West Africa Examination Council Chief Examiner Reports For 2021-2025 May/June Senior Secondary School Certificate Examinations. *O Level Paper, Lagos: WAEC Press.*
- Wilson, M. (2020). Innovative instructional strategies for improving academic achievement in Biology. *Educational Research Review*, 30, 112-125.
- Wordu, N. C. & Atabang, A. A. (2024). Game-based learning and academic performance of pupils in private primary school in Obio/Akpes. *Web of Universal Journal on Semantic Innovation Education*, 3(4), 46-55.



Effect of Continuous Assessment Feedback on Performance in ... Ringim, A. S., Et. al. (2026)

Effect of Continuous Assessment Feedback on Performance in Letter Writing Concept among Junior Secondary School Students in Jigawa State, Nigeria

RINGIM, Auwalu Sabo¹

auwalusaborringim@gmail.com

07061547035

LAWAL, Halima Mohammed¹

lawalhalima02@gmail.com

08057750399

DAURA, Ramlat Jibir¹

rjdaura@abu.edu.ng

08188359685

¹Department of Arts & Social Science Education, Faculty of Education, Ahmadu Bello University, Zaria.

Abstract

This study was on the “Effect of Continuous Assessment Feedback on the performance of Junior Secondary School Students’ Letter Writing in Jigawa State, Nigeria. ”The study adopted quasi-experimental design in which 161 JSS II students were randomly selected from two schools from the target population of this study. 77 students from GJSS Galadanci were assigned as experimental group while 86 students from GJSS S/Yaya were assigned as control group. The two groups were given a pre-test in order to ascertain their entrance level. Experimental group was then taught letter writing for six weeks using C.A. feedback, while control group was taught the same topic without exposing them to C.A. feedback. At the end of the treatment, post-test was given to the two groups. English Essay writing test was used as instrument for this study and the data collected at the end of the treatment was analysed using SPSS package. Descriptive statistics was also employed to answer two research questions of the study and independent t-test employed to test the null-hypotheses at $\alpha \leq 0.05$ level of significance. At the end of the study, findings showed that the English Letter writing mean performance score of experimental group was significantly higher than that of control group after being exposed to C.A feedback treatment. This showed that C.A feedback improved the students’ English letter writing performance in the aspect of content and organization. The study therefore recommends that continuous assessment should be employed in teaching English language in order to enhance students writing skills and to improve their performance in letter writing and other aspects of English Language.

Keywords: Continuous Assessment, feedback, Formative assessment, Letter writing, Performance.

Introduction

The top priority of any educational institution is academic growth. Thus, this cannot be achieved without optimizing continuous assessment and regular feedback in our schools. Continuous assessment is a part of transformation in education that the government has introduced in order to replace the traditional approach that mainly focused on examination system. The Federal Government of Nigeria (FGN) declared continuous assessment (C.A) for primary, secondary and tertiary schools in 1979 so as to determine students’ performance as clearly stated in the Nigerian National Policy on Education (2004, p9) Section Item 9 stated that “educational assessment and evaluation shall be liberalized by being based in whole or in part of continuous assessment on the progress of individual learner.” Advancement from one class to another shall be based on continuous assessment (p.16). Also, it was further stated that “the primary school leaving certificate shall be based only on continuous assessment which shall be issued locally by the head teacher of the school (p16). The Federal Ministry of Education also came up with uniform guidelines standard for transition from Junior Secondary school using continuous assessment. Thus, the aim was meant to promote more comprehensive evaluation of students’ progress and abilities. Continuous assessment helps to liberalize evaluation method rather than the traditional exams for better assessment of students’ development. Continuous assessment feedback is an important strategy in the field of education which helps students to identify their areas of strengths and weaknesses, for possible adjustment and for better academic achievement. Cloud Assess (2025) stated that continuous assessment feedback is crucial in promoting students’ learning, reduces test anxiety, identifies and corrects misunderstandings early and provides a means of improvement in students’ performance. C.A. fosters a habit of consistent effort which can lead to a more engaging learning process with regular study and practice for better performance. C.A. enables a teacher to identify students’ level of understanding and provide targeted support on time rather than doing it at the last minute. C.A. feedback also promotes strong relationship between the teacher and the students thereby offering support and guidance to help individual student to attain their full potentials. (Tefl Online, 2018).



Effect of Continuous Assessment Feedback on Performance in ... Ringim, A. S., Et. al. (2026)

However, among all the language skills, writing is often used to assess students because it is a productive skill. Writing is a complex language activity that incorporates thought, processes, feelings and social interactions. Thus, it is expected that students possess a considerable level of writing skills that will help them express their thoughts/ ideas and in understanding critical information (Ruiz Funes, 2015). Writing is a conventional system of symbols or sign that represents the utterances of languages and it involves the ability to tell or re-tell pieces of information. According to Klein (2013), writing is the ability to put pen on paper in order to express ideas through signs and symbols. This means that when we write, we produce meaning with words. Also, Troika in Lauri (2011) state that writing is a way of communicating messages which is rendered for many purposes; to express one self, to provide information, to persuade, to create a literature work, and so on. According to Britannica (2025), writing is a conventional system of marks or signs that represent language thereby, making it visible and related to structural level of language. The importance of writing as a means of expressing ideas or information serve as an inspiration for this study to examine the effect of continuous assessment feedback in the letter writing performance of students in the Junior Secondary School with the aim of enhancing their writing skills.

Statement of the Problem

Based on experience as a classroom teacher for more than 10 years, it is very clear that some junior secondary school students in Jigawa State who are learning English as second language are faced with writing difficulties especially in the aspects of words and sentences formation. Some students find it challenging to generate relevant ideas for content development and to organize their ideas in correct paragraphs. The JSCE Chief Examiner's Report (2024) stated that students encounter some problems in writing especially in the areas of content, organization, expression and mechanical accuracy as required by the examiners in essay writing. Arnelia and Syahrul (2021) affirm that some students find it difficult to develop their ideas when writing because of the difficulties they have in grammar, verbs tenses, vocabulary usage and sentence structure which hinder clarity and coherence. Also, some students struggle to develop their ideas fluently (poor ideation), some cannot keep track of their thoughts while writing and some struggle to organize their ideas logically thereby making it difficult to convey meaning (Uyen 1999). All these problems can be attributed to insufficient CA exercises and prompt Feedback on the students' performance by the teachers. This has prompted the present study to find out whether continuous assessment can improve students' performance in writing or not especially in the aspects of content development and organization of ideas.

Objectives of the Study

The research main aim is to find out the effect of continuous assessment feedback in the performance of junior secondary school students' letter writing in Jigawa State. However, the objectives of the study sought to:

1. Find out the extent to which C.A feedback contributes to the content development in letter writing of (JSS II) students in Jigawa State.
2. To investigate the effect of C.A feedback on the letter writing performance of (JSS II) students in organizing ideas effectively.

Research Question

1. How does Continuous Assessment Feedback contribute to the content development of (JSS II) students in letter writing?
2. What is the effect of Continuous Assessment Feedback on the writing performance of (JSS II) students in organizing ideas effectively?

Hypotheses

The following null hypotheses were formulated for the study:

H₀₁: There is no significant difference between the content developments of (JSS II) students exposed to CA feedback and those not exposed to CA feedback in letter writing.

H₀₂: There is no significant difference between the performance of (JSS II) students exposed to CA feedback and those not exposed to CA feedback in organizing ideas effectively.

Literature Review

Concept of Continuous Assessment

According to Owoyele, Adeoye and Ajayi (2013), Continuous Assessment is the appraisal technique which systematically covers all of the students' performance in class tests, home assignments' project and other school activities during a given



Effect of Continuous Assessment Feedback on Performance in ... Ringim, A. S., Et. al. (2026)

school period such as term, semester, year or the entire duration of the course. Tontus (2020) asserts that assessment is a process of collecting and discussing information that draws from a variety of source and activities to develop a better understanding of what students know, what students comprehend, and the application of knowledge based on their educational experience. C.A. is very important in teaching and learning process and the feedback can be provided to both students and teachers. Rusconi (2025) further explains that unlike one-time assessment, C.A. is conducted regularly so as to provide real-time feedback to motivate learners towards immediate improvement; it fosters a culture of continuous learning and improvement for learners.

Importance of Continuous Assessment

Rusconi (2025) highlights that Continuous Assessment helps to:

1. **Encourage Growth** – C.A encourages growth for both learners and their teacher because it allows students to expand their knowledge and skills and it also help the teachers to tailor their teaching in order to meet the individual needs of the learners. Teachers refine their constructive feedback while students learn to internalize suggestions to keep moving through the employment of C.A.
2. **Evaluate Individual's Progress** – the regular and structured nature of C.A. enable teachers to measure academic progress of students. It also makes it easier for the identification of specific gaps in knowledge or skills that need to addressed throughout the learning process.
3. **Align with Evolving Goals** – The flexibility of C.A. gives teachers the opportunity to adapt training programmes in order to meet new requirement. It encourages students to be equipped with skills and knowledge that are more important in real-time.
4. **Inform Decision-Making** - Continuous Assessment helps educators to make well-informed decisions from the stream of data gathered through the assessment of students. The data gathered can guide decisions around training programmes curriculum adjustment or development plans.
5. **Foster Proactive Problem-Solving** – C.A. helps to notice areas where students need additional support and it support the idea problem solving and critical thinking as students and teachers tackle challenge for better performance.

Thus, it is pertinent to note that the importance of C.A. align with the present study.

Types of Continuous Assessment

According to Prodigy (2024), Continuous Assessments are classified into six types:

1. **Diagnostic Assessment:** This is conducted before a learning period to identify the students' prior knowledge, skills and potentials. This helps the teacher to tailor instruction accordingly.
2. **Formative Assessment:** This is the type of C.A. which takes place during the teaching process in order to provide on-going feedback and monitor understanding for teaching to be adjusted according to the students' need. Examples of formative assessment include weekly quizzes, class discussions, test or assignment.
3. **Summative Assessment:** This is administered at the end of a unit, course, or programme so as to evaluate the overall learning for final grade. Final Examinations and projects are examples of Summative assessment.
4. **Criterion-referenced Assessment:** This is an assessment where a student' performance is compared with a predetermined set of criteria or standard rather than against other students' performance.
5. **Norm-referenced Assessment:** It used to compare the performance of a students to the performance of a larger group of students.
6. **Ipsative Assessment:** This type of assessment focuses on an individual performance and progress by comparing their current performance with their previous results and achievements. This can be done by creating portfolio to show growth or progress over time.

However, other types of assessments identified by AI Question Answerer (2024) are:

7. **Performance assessment-** It requires the students to demonstrate their knowledge and skills through real-world tasks and activities.
8. **Self-Assessment** which helps students to reflect on their own learning and progress areas.
9. **Peer Assessment** which enable students to provide feedback and evaluation of their peer's work and performance.

From the above explanations of the different types of assessments, the present study's main objective aligns with formative assessment because of its potentials in continuously monitoring students' progress. The progress of monitoring is expected



Effect of Continuous Assessment Feedback on Performance in ... Ringim, A. S., Et. al. (2026)

to reveal the students' performance from time to time through different classroom activities. Thus, constant feedback which is an effective strategy for assessment is expected to help unlock the potentials of the students.

Concept of Formative Assessment

Longe (2025) explains that formative assessment helps to evaluate students' progress in real time and also improves the course content and delivery during the learning process. Formative assessment is described as a "quick-fire" method of monitoring the learners' progress. This is because it provides exercises to aid teachers in monitoring learners' progress during a course. The aim of Formative assessment is to gather actionable feedback that will help to improve the teaching and learning processes. Gregory and Siki (2023) also affirm that Formative assessment yield information that helps teachers in their instructional planning and it can help students deepen their understandings, improve their performance, make them take responsibility for, and self-regulate their learning. Vibhakumari, Derek & Lesley (2023) further explain that Formative assessment helps to provide instant feedback for teachers to see how their students have grasped class materials so as to adjust their teaching styles accordingly. Formative assessment can be used in any subject and should be used at least once in a given lesson.

Benefits of Formative Assessment in Teaching Writing:

Stiggins (2005) highlights the following benefits of formative assessment in teaching writing:

1. **Improves students writing;** Formative assessment helps students refine their writing skills for better organization, coherence and overall quality of writing. It encourages students to take active roles in their learning thereby promoting engagement and motivation.
2. **More effective instruction:** Formative assessment provides teachers with data to inform instruction ensuring that teaching meets the changing needs of students and teachers can adjust instruction based on formative assessment data providing additional support or challenges as needed.
3. **Teacher-students relationship:** Formative assessment can help provide better understanding of students' needs and it also provides the teachers with valuable insights into the strengths, weaknesses and learning styles of their students. Teachers can offer targeted support and feedback fostering a more supportive and inclusive learning environment.
4. **Enhances collaboration and peer review:** Formative assessment encourages students to provide constructive feedback to peers thereby promoting collaboration and team work. More so, regular peer review and feedback foster a supportive learning environment where students feel encouraged to share their works and learn from others.
5. **Increases students autonomy:** through self-directed learning formative assessment encourages students to take ownership of their writing by developing self-directed learning skills and a growing mind set that promotes student's reflection and self-assessment for improvement in identified areas and to set realistic goals during the teaching process.

Based on the aforementioned benefits of formative assessment, the present study strongly believes that it is an effective means of encouraging peer review and feedback, promoting collaboration and enhancing communication among students. It can also help teachers to create a supportive and effective learning environment that promotes students growth, engagement and success.

Concept of Letter Writing

Letter writing is a form of writing, which is different from ordinary writing, it has a special format that differs according to the type of letter being written. A letter is a written message that can be handwritten or printed on paper. It is usually sent to the recipient via mail or post in an envelope. A letter is a written message conveyed from one person (or group of people) to another through a medium. According to Richard (2019) letter writing is the exchange of written or printed messages. However, distinctions are commonly drawn between personal letter (sent between family members, friends or acquaintances and business letters (formal exchanges with businesses or government organizations. Latilo, (2020) defines letter writing as an act of communicating information, feedings ideas or opinions to somebody who is absent or resides in a distant area. A letter should contain full details of the issue one is writing about in order to bring about the same reactions that would have occurred if the message contained in it had been in a spoken form.

Types of letter writing

Sasha and Charlie (2023) stated that, there are three types of letters. They are: Informal letter or personal letter, formal letter or business letter and semi-formal letter

1. Informal Letter



Effect of Continuous Assessment Feedback on Performance in ... Ringim, A. S., Et. al. (2026)

The informal letter also called friendly or personal letter is a letter written to one's friends, relatives, parents, and room/class mates. The features of informal letter are; the address, the informal letter contains only the address of the writer and the date, placed at the right hand corner of the paper. The salutation comes immediately after the writer's address and it is placed at the left hand corner of the paper. The salutation depends on the intimacy or level of relationship that exists between the writer and the person whom the letter is written to. The following are examples of salutations in informal letters: Dear Mr. Ali, Dear Mrs. Fatima, Dear Father. The salutation is flushed to the margin and marked off by a comma then like all essays, the body consists of the introduction, the main text, and the conclusion. The introduction usually contains exchange of pleasantries, familiar remarks, and greetings, issues of interest to both writer and recipient as well as a statement of the purpose of the letter. The main text can contain as many paragraphs depending on the issues to be discussed. The tone of a friendly letter is relaxed; it can go with personal remarks, slangs, and special expressions. The friendly letter can also contain contracted forms of words, abbreviations, and other forms of friendliness or informality. Finally, the Complimentary Close comes at the bottom right corner, and it normally ends with a degree of intimacy between the writer and receiver for example; Your friend, Your love, Your forever, Yours sister, etc. The complimentary close is then followed by the first name of the writer.

2. Semi-Formal Letter:

This type of letter has formal and informal features. It is written between people who are not close to each other but are acquainted in one form or the other. These include letters to friends of one's parents, adult neighbour, former headmistress, principal, porter, or an adult not known to the writer. Semi-Formal Letter contains only the writer's address and date, placed at the right hand corner of the paper (same as an informal letter). The Salutation comes with a slightly cordial tone used in the salutation. Hence, instead of the "Dear Sir," or "Dear Madam" used in formal letters, the salutation "Dear Mr. Sani", "Dear Professor Umar", "My dear Mr. John", is used in semi-formal letters. The body of the semi-formal letter is organised in paragraphs logically related to one another. The semi-formal letter goes straight to the point and does not contain pleasantries or chitchat. There should be a tone of respectful and avoidance of personal statements such as contractions in the use of language, abbreviations, slangs, etc. Also, semi-formal letters usually close with "Yours sincerely" followed by the full name of the writer. Appending signatures to such letters is optional.

3. Formal Letter:

A formal letter on the other hand is usually called Business or official letter. It has the following format or layout; the address of the sender, the address of the receiver, opening salutation, heading, the main body of the letter and closing salutation or subscription. All the rules of writing address in an informal letter also applies to formal letters. The address of the Receiver (Inside Address) should be written at the left hand margin, beneath (below), the address of the sender. Thus, the Opening Salutation should be written in line with the margin below the receiver's address. The most common and formal forms of salutations used are "Dear sir". "Dear Madam". "Sir", "Madam" and "Sirs" then, followed by comma. Below the opening salutation comes the title of the letter (heading of the letter). All headings must be written briefly, concisely and accurately. Long and clumsy titles should be avoided. Some common titles of official and Business letters; "Application for the post of/employment ", "Inquiry letter", "Request letter....", etc. The style in a formal letter is usually formal; the use simple language with tone of respect and seriousness. The language should be Straightforward, direct and concise with detailed information on the topic of discussion. Finally, the closing Salutation always ends with "Yours faithfully" followed by signature and full name of the writer.

Features that are Essential for a Good Letter Writing

Eto and Eyisi (2020) stated that features that are essential for a good letter writing are;

- 1. Content:** The points or ideas you use in writing the essay must be relevant to the topic. You are most likely to lose a lot of marks if the content is not relevant to the topic.
- 2. Organization of facts/Ideas:** There should be orderly and logical presentation of materials through the use of good paragraphing; sentences in the paragraphs should not be too long; each paragraph should discuss a specific idea; ideas should flow smoothly from one paragraph to another in a logical sequence.
- 3. Expressions:** This aspect includes correct expressions, language and grammar. For these to be effectively achieved, the following should be seriously considered: correct/relevant words, expressions and idioms; appropriate language and expressions for the audience; correct and sophisticated use of punctuation marks; different varieties of sentences.



Effect of Continuous Assessment Feedback on Performance in ... Ringim, A. S., Et. al. (2026)

4. Mechanical accuracy: This is another aspect which must be seriously considered in writing good essays. This involves the use of correct tenses; correct spelling; correct punctuation marks; legible handwriting; correct grammar and structure.

It is pertinent to note that all the four features of writing are very essential for developing good writing skills. However, the present study specifically focused on the content development and organization of ideas of students' letter writing.

The Steps for Using Formative Assessment in Teaching Writing

Hattler & Timper (2007) states the steps for using formative assessment in teaching writing. Step I is to set clear learning objectives by identifying what students should be able to do by the end of the writing lesson or unit. Step II is to design formative assessments. That is, choosing assessment methods such as writing conferences, peer review, self-assessment checklists, exit ticket, observation, etc. Step III is to implement formative assessment; using formative assessment regularly by incorporating it into daily or weekly writing instruction and Collecting and analyzing data in order to identify areas where students need extra support. Step IV provides feedback which is offered timely and actionable by focusing on the writing process rather than just the product. Also, the feedback is intended to inform instruction and to make changes to lesson or activities to better meet students' needs. Also, Step V encourages self-assessment: The students are made to reflect on their own writing goals and identify areas of improvement and implement peer review in order to promote collaboration and critical thinking. Finally, Step VI is to monitor progress and adjust instruction as needed. Thus, teachers expected to work towards the changing needs of students. The present study believes that if teachers effectively use formative assessment steps in teaching writing skills especially in the aspects of content development and organisation of ideas to students, it will greatly improve their performance.

Methodology

The research design adopted for this study was the quasi-experimental design pre-test and post-test, control and experimental group design. However, JSS II students are the target population of the study and two schools were randomly selected. The subjects of the study were grouped into two: experimental and control groups: experimental group and control group. Thus, the instrument for data collection was letter writing test. It was employed to measure the students' performance in letter writing based on content development and organisation of ideas. In order to have a proper analysis of the data in this research, a descriptive statistics showing the mean and standard deviation was use while the statistical tool employed for testing each of the hypotheses was independent sample T-test.

Data Presentation

Answering of the Research Questions

The two research questions asked in section one were answered in this section. The research questions were shown using mean and standard deviations.

Research Question One: How does C.A feedback contribute to the content development of JSS II students in letter writing?

In order to answer this research question, mean and standard deviation was employed and the summary of the result is presented in the Table below;

Table 1: Mean score of experimental and control group on content development of letter writing after treatment.

Groups	N	X	SD	Mean difference
Experimental group	75	9.26	1.46	3.17
Control group	86	6.09	1.41	

Table 1 shows the mean score on the content of experimental and control group letter writing after treatment. The table shows that experimental group has the mean score of 9.26, while control group has the mean score of 6.09. Therefore, the mean difference was 3.17 which is in favour of the experimental group. Therefore, the answer of research question one is that C.A feedback contributed to the content development of JSS II experimental group in letter writing.

Research Question Two: What is the effect of C.A on the writing performance of (JSS II) students in organizing ideas for effective letter writing?

Descriptive statistics of mean and standard deviation used to answer this research question in Table 2.

Table 2: Mean score for experimental and control groups in the organization of essay writing after treatment.

Groups	N	X	SD	Mean difference



Effect of Continuous Assessment Feedback on Performance in ... Ringim, A. S., Et. al. (2026)

Experimental group	75	8.32	0.77

2.15

Control group	86	6.16	1.22

Table 2 shows the mean score for experimental and control groups in organizing ideas for effective letter writing after treatment. It indicates that the experimental group has the mean score of 8.32, while control group has the mean score of 6.32. The mean difference below the mean of the two groups is 2.15 and this in favour of experimental group. Therefore, the answer of question three of this research is that the C.A has a significant effect on the writing performance of (JSS II) students in organizing ideas for effective letter writing.

Test of Null Hypotheses

Independent t test at probability of 0.05 was employed to test the two null hypotheses formulated for this study.

Ho₁: There is no significant difference between the content development of (JSS II) students exposed to CA feedback and those not exposed to the strategy in letter writing.

To test this hypothesis, post test data were collected through written test and were subjected to t-test statistic to determine the significant difference between the group of students exposed to treatment and those not exposed. The summary of the analysis was shown below

Table 3: Independent sample t-test for difference between the performance of control and experimental groups on content of letter writing.

GROUPS	N	X	SD	DF	t- value	p-value
Experimental group	75	9.26	1.46	159	13.98	0.00
Control group	86	6.09	1.41			

Table 3 reveals that the P value was 0.00, since 0.00 P value is less than the alpha value $\alpha < 0.05$ level of significance. There is a significant difference in the content of letter writing mean scores of students taught essay writing, using C.A feedback and those not exposed to C.A feedback. Therefore, based on this result, the hypothesis which states that there is no significant difference between the content development of (JSS II) students exposed to CA and those not exposed to it in letter writing was rejected.

Hypothesis Two: Ho₂: There is no significant difference between the (JSS II) students' performance towards organizing ideas for effective letter writing.

In order to test this hypothesis, independent t-test was administered. The result of the test is summarized in the Table 4.

Table 4: Independent sample t-test of difference in the performance of control and experimental group on organization of ideas for effective letter writing.

Group	N	X	SD	Df	t-value	p-value
Experimental group	75	8.32	0.77	159	13.12	0.00
Control group	86	6.16	1.22			

Table 4 reveals that, the p-value was 0.00, the P value is less than the alpha value $\alpha < 0.05$ level of significance. Therefore, the hypothesis which states that there is no significant difference between the (JSS II) students' performance towards organizing ideas for effective letter writing was rejected.

Summary of the Findings

The following is the summary of the findings of this study.

1. In the aspect of content development of in letter writing, the performance of the students exposed to CA Formative Feedback was rated higher than those students who were not exposed to C.A. as the students in the experimental group were able to generate relevant ideas that helped in the content development in their letter writing.
2. The students in the experimental group who were exposed to CA Formative Feedback in organizing ideas for effective letter writing performed better than the control group when their overall scores were compared in letter writing. The students in the experimental group organized their ideas in paragraph form with relevant linking words in appropriate paragraphs than those students in the control group.



Effect of Continuous Assessment Feedback on Performance in ... Ringim, A. S., Et. al. (2026)

Conclusion

This study was carried out to find out the effect of Continuous Assessment Feedback on the letter writing performance among the JSS 2 students in Jigawa state. The focus of the study was specifically on the use of Formative assessment being one of the most effective CA feedback used in monitoring students' performance in schools. The study found that the experimental group performed better than the control group in developing good content in writing and organisation of ideas for effective letter writing because of the different continuous assessments given to them and prompt feedback based on these achievements, it is therefore important to note that C.A feedback helps to enhance effective teaching and learning of letter writing.

Recommendation

Based on the findings of this study the following recommendations are hereby made:

1. English language teachers should adopt the Formative Assessment strategy which encourages prompt feedback as an alternative to the conventional Continuous Assessment strategies in teaching of content development of ideas in letter writing in the secondary schools since it has been proved to improve and accelerate students' academic growth through constant monitoring of performance.
2. Teachers should be encouraged to implement the Formative method of assessment for students to improve in the aspect of organising ideas in letter writing. Adequate knowledge of students' continuous assessment from time to time may be useful in the enhancement of students writing skills and to improve their performance in other aspects of letter writing.

References

- AI Question Answerer (2024). Types of Continuous Assessment Uploaded on 6 November, 2024 from AI Question Answerer . www.classace.io/answers/types-of-continuous-assessment
- Arnelia M.R & Syahrul L. (2021). An Analysis of Students' Problem in Writing a Personal Letter at 11th Grade of MAN 4 Agam. Retrieved April 2021 from FOSTER Journal of English Language . <https://www.researchgate.net/journal/Foster-Journal-of-English-Language-Teaching-2723-4126?>
- Britannica (2025). Writing, History, Styles, Types, Importance & Facts. Uploaded 5 Sept 2025 from <https://www.britannica.com>
- Eto, J.T. and Eyisi, J. (2020). New Concept English for Junior Secondary School Book 3 page 13-14, published Learn Africa Plc Felix Iwerebon house Ikeja Lagos State.
- Gregory, J.C & Siki, N.L. (2023). Assessment, Evaluation and Accountability. International Encyclopedia of Education (Fourth Edition)
- Hattler, J. & Timperley, H. (2007). The power of feedback. Review of Educational Research, 77 (1), 81-112.
- Klein (2013). Writing Definition Descriptive Text, Online, <http://en.writing-definition-descriptive-text>. Access on May 18, 2013.
- Longe, B. (2025). Formative Assessment: Meaning, Types, & Examples Updated 12 January, 2025 from www.formpl.us/blog/formative-assessment.
- Prodigy (2024). 6 Types of Assessment (and how to use them). Uploaded on 23 July 2024 from Prodigy.
- Richards R.G. (1999). Understanding why students avoid writing. www.adlit.org/topic/writing/understanding-why-students-avoid-writing.
- Rusconi G. (2025), Importance of Continuous Assessment, Benefits & Implementation. updated: 9 February, 2025 from <https://.com/blog/importance-continuous-assessment/>
- Sasha B. & Charlie K.J. (2023). Letter Writing, Formats, Types & Examples. Updated 21 November, 2023 from study.com/academy/lesson/lesson/types-of-letter-writing.html
- Stiggins R.J. (2005) From formative assessment to assessment for learning: A Path forward Ph, Delta Kappan, 87 (4), 324-328.
- Tefl.online (2018). Continuous Assessment and Feedback. International TEFL and TESOL Training. www.teflonline.net/pillars/tesol-best-practice
- Uyem, P. (nd). Common Problems in the ESL writing class and How to Solve them. Uploaded 14 May, from inspire-td.com
- Vibhakumari, S, Derek, H & Lesley C. (2023). Formative Assessment, Definition, Types & Examples. Updated 21 November, 2023 from Study.com <https://study.com/learn/lesson/formative-assessment>.



Assessment on Integration of Indigenous Education in Nigeria Secondary School Curriculum and Student's Self-Reliance in Kwara State, Nigeria

ALABI, Jimoh Adeniyi¹

alabi.aj@unilorin.edu.ng

+2348137455721

ONIYE, Masud Ibrahim¹

oniymasud@unilorin.edu.ng

+2348033850768

ZUBAIR, Oladimeji Mansur²

zubair.om@unilorin.edu.ng

+2347031082695

¹Department of Arts Education, Faculty of Education, University of Ilorin, Ilorin, Kwara State, Nigeria.

²Department of Educational Management, Faculty of Education, University of Ilorin, Ilorin, Kwara State, Nigeria.

Abstract

Education in Nigeria is expected to equip learners with relevant knowledge, practical skills and values that promote creativity, cultural identity and self-reliance. However, despite the recognition of indigenous education within the Nigerian National Curriculum, its practical integration in formal schooling is not encouraging. Hence, this study examined inclusion of indigenous education in national curriculum and its role in promoting students' self-reliance in Kwara State. Descriptive research of correlation type was adopted for the study. The population comprised all 12,512 public secondary school teachers in Kwara State. Proportionate sampling technique was used to select 180 teachers across 15 selected secondary schools in three Senatorial Districts, Kwara State. A researcher's designed questionnaire was employed to collect data. The instrument was validated by two experts and one in the field of Test and Measurement, Faculty of Education, University of Ilorin, Nigeria. To ascertain the reliability of instrument, test-retest method was used. Mean and standard deviation was used to answer research question 1 while research questions 2 and 3 which had corresponding hypotheses were tested using Pearson Product-moment Correlation Statistics at 0.05 significance level. Findings revealed that the practical aspect of indigenous education were taught very low, there was significant relationship between indigenous educational components in the national curriculum and students' acquisition of practical and vocational skills and students' self-reliance. It was concluded that meaningful integration of indigenous education was not effective. The study recommended that government should pay proper attention to the practical dimensions of indigenous knowledge in formal schooling to promote students' economic self-reliance.

Keywords: Indigenous Education, National Curriculum and Students' Self-Reliance

Introduction

Education plays a critical role in the social, economic and cultural development of any society. In many African societies, indigenous education existed long before the introduction of Western formal education. Indigenous education refers to the traditional system through which knowledge, skills, values, norms and cultural practices are transmitted from one generation to another within a community. Adeyinka and Paulley (2016) asserted that indigenous education is an education of the people, by the people and for the people in a particular society which satisfies the needs of the people. In this educational system, all adult members of the society were involved in the process of transmitting the culture, values, religious and occupational activities of people to the younger generations. Thus, it is a process of learning which enables every individual in the African societies to teach her younger generations the life patterns of the society. Furthermore, indigenous education is a vehicle for the maintenance or preservation of cultural heritage, with the aim of producing a useful individual who is honest, respectable, skilled and cooperative in conformity with the social order of the society. It is believed that African indigenous education is the locally developed native form of education for bringing up young people by the older and more experienced members of the society. Adedokun (2024) explained that indigenous education emphasises practical learning, community participation, moral development and vocational competence that prepare individuals to become productive and self-reliant members of society. In Nigeria, indigenous education historically focused on skills such as farming, hunting, craftsmanship, trading, leadership and social responsibility. These forms of education enabled individuals to contribute meaningfully to their communities and sustain their livelihoods. According to Fafunwa (1974), traditional African education was functional, community-oriented and designed to equip individuals with the practical abilities necessary for survival and social responsibility. However, the introduction of colonial education systems



Assessment on Integration of Indigenous Education in ... Alabi, J. A., Et. al. (2026)

shifted the focus of learning toward literacy, clerical work and theoretical knowledge, often neglecting indigenous knowledge systems that previously promoted practical skills and self-reliance. Recognising this gap, the Nigerian government introduced educational reforms aimed at integrating indigenous knowledge and vocational skills into the national curriculum. The Nigeria National Policy on Education emphasises that education should promote the acquisition of appropriate skills, abilities and competencies necessary for self-reliance and national development (Federal Republic of Nigeria, 2014). In addition, initiatives such as the Universal Basic Education (UBE) Programme and curriculum revisions carried out by the Nigeria Educational Research and Development Council introduced subjects such as Cultural and Creative Arts, Agricultural Science, Basic Technology and Entrepreneurship Education. These reforms are intended to equip students with practical knowledge, innovative capacity and entrepreneurial skills required for self-employment and sustainable development (NERDC, 2013; Olorundare & Kayode, 2014). Despite these policy efforts, several scholars argue that the practical implementation of indigenous education within the formal school system remains inadequate. Several studies indicate that many schools continue to prioritise theoretical instruction and examination performance rather than practical skill acquisition or experiential and skill-based learning. Consequently, graduates often leave school without the vocational and entrepreneurial competencies required for self-reliance (Okoye & Arimonu, 2016; Usman, Rong & Saine, 2025). This situation has contributed to increasing youth unemployment in Nigeria and has raised concerns about the effectiveness of the national curriculum in promoting functional and skill-based education. Kwara State, for instance, is culturally diverse and endowed with rich indigenous knowledge systems, including traditional crafts, agriculture, local entrepreneurship and cultural practices. Integrating these indigenous knowledge systems into the school curriculum could significantly contribute to equipping students with practical competencies and livelihood skills, otherwise known as self-reliance. Self-reliance is an important educational objective that involves the ability of individuals to depend on their knowledge, skills, creativity and initiative to solve problems, create opportunities and generate sustainable livelihoods. According to (Nyerere, 1968; and Adeyinka 2013), education should prepare individuals to become productive members of society who can rely on their own abilities rather than depend solely on external employment. When students acquire indigenous knowledge and practical skills through education, they are more likely to develop entrepreneurial abilities, self-confidence and independence. In the same vein, it plays a significant role in developing students' self-reliance by equipping them with practical skills, cultural knowledge and problem-solving abilities rooted in their local environment and community. In contemporary educational discourse, integrating indigenous knowledge systems into formal curricula is increasingly recognised as an effective approach for empowering learners to become independent, innovative and productive members of society (Blackle, 2024). Thus, when learners study local production systems, indigenous technologies and traditional occupations, they become more capable of creating employment opportunities for themselves rather than relying solely on formal jobs. Research on decolonising education in Africa shows that integrating indigenous knowledge and local values into curricula helps nurture entrepreneurial mindsets and economic self-reliance among students (Omodan, Manquma & Mafunda, 2024). Therefore, integrating indigenous educational practices into the national curriculum may provide an effective strategy for empowering students and reducing dependence on white-collar job. This study therefore seeks to examine the role of indigenous education in the Nigerian national curriculum and its influence on promoting students' self-reliance in Kwara State. By exploring the extent of integration, implementation strategies and outcomes of indigenous education in secondary schools, the study aims to provide insights that may guide policymakers, educators and curriculum developers in strengthening educational practices that foster self-reliant graduates.

Statement of the Problem

Indigenous education has historically played a significant role in preparing individuals to become productive and self-reliant members of the society. However, despite its recognition in Nigerian National Curriculum, the practical aspects of indigenous education in formal schooling are not encouraging. Many schools continue to rely heavily on Western-oriented content and theoretical teaching approaches that often overlook local knowledge systems and practical skills embedded in indigenous practices. This situation has raised concerns about the ability of the current curriculum to effectively promote self-reliance among students. In Kwara State, specifically, there is growing concern that students graduate from school with limited practical competencies and entrepreneurial abilities needed for self-sustenance and community development. The increasing rate of youth unemployment and dependence on white-collar job opportunities further highlights the gap between the objectives of the curriculum and the actual outcomes of schooling. Although indigenous education has the potential to foster practical skills, innovation and cultural identity that support self-reliance, its role within the formal



Assessment on Integration of Indigenous Education in ... Alabi, J. A., Et. al. (2026)

curriculum and its actual impact on students have not been sufficiently examined. Therefore, the problem of this study is the apparent disconnect between the intended inclusion of indigenous education in the Nigerian national curriculum and the level to which it contributes to promoting students' self-reliance. Most especially, there is a need to investigate how indigenous education is integrated and implemented in secondary schools in Kwara State and to determine whether it effectively enhances students' capacity for self-reliance. Hence, this study seeks to address this gap by examining the role of indigenous education in the Nigerian national curriculum and its influence on promoting self-reliant skills among students in the State.

Purpose of the Study

The general purpose of this study is to investigate the inclusion of indigenous education in the national curriculum and its role in promoting students' self-reliance in Kwara State. Specifically, the study examines;

1. The extent to which indigenous education is integrated into the Nigerian national curriculum in secondary schools in Kwara State.
2. The relationship between indigenous educational components present in the national curriculum and students' acquisition of practical and vocational skills.
3. The relationship between students' exposure to indigenous educational practices and their level of self-reliance.

Research Questions

1. To what extent is indigenous education integrated into the Nigerian national curriculum in secondary schools in Kwara State?
2. Is there any significant relationship between indigenous educational components present in the national curriculum and students' acquisition of practical and vocational skills in Kwara State?
3. Is there any significant relationship between students' exposure to indigenous educational practices and students' level of self-reliance in Kwara State?

Research Hypotheses

H₀₁: There is no significant relationship between indigenous educational components in the national curriculum and students' acquisition of practical and vocational skills in Kwara State.

H₀₂: There is no significant relationship between students' exposure to indigenous educational practices and their level of self-reliance in Kwara State.

Methodology

This study adopted descriptive research of correlational design. The population comprised all 12,512 public secondary school teachers in Kwara State. Stratified sampling technique was employed to select 5 schools from each of the Kwara State senatorial district (Kwara Central, North and South) which equal to 15 schools. Proportional sampling technique was used to select 13 teachers from each of the selected schools in Kwara-Central, 11 teachers each from Kwara-North and 12 teachers each from Kwara-South to make a total number of 180 teachers as sample for the study. This was adopted because of different number of teachers in the three districts. The questionnaire titled, "Inclusion of Indigenous Education in the Nigerian National Curriculum and Its Role in Promoting Students' Self-Reliance" was designed as instrument to collect data from the respondents. The questionnaire comprised 20 items from section A to D. Section A contains demographic data of respondents on the number of teachers' in three districts. Section B contains 10 items on the extent to which indigenous education integrated into the secondary school Curriculum. Section C contains 5 items on the relationship between indigenous educational and students acquisition of practical and vocational skills while Section C contains 5 items on the relationship between students' exposure to indigenous educational practices and their level of self-reliance and all were used to answer the research questions and test the hypotheses. In order to validate the research instrument, the draft was presented to two lecturers in the Department of Arts Education and one expert in the field of Test and Measurement, Faculty of Education, University of Ilorin for vetting. All corrections were effected, before the final questionnaire was drafted. To ascertain the reliability of the instrument, test-retest method was used. Research question 1 was answer through Mean and Standard Deviation while research questions 2 to 3 which had corresponding hypotheses were tested using Pearson Product-moment Correlation Statistics at 0.05 level of significance.



Assessment on Integration of Indigenous Education in ... Alabi, J. A., Et. al. (2026)

Presentation of Results

The percentage was used to describe demographic data of the respondents based on the three districts. Research question 1 had ten (10) items which were structured in a four response type and was answered using mean rating and any item with a mean greater than 2.50 was considered as agreement with stated research question and vice-visa. Research questions 2 and 3 which had corresponding hypotheses were tested using Pearson Product-moment Correlation Statistics at the 0.05 level of significance. Table 1 shows the demographic data of the respondents.

Table 1: Demographic Data of Respondents

Teacher	Number	Percentage
Kwara Central	65	34.5%
Kwara North	55	32.2%
Kwara South	60	33.3%
Total	180	100%

Source: Fieldwork, 2026

Table 1 showed the demographic data of the respondents on the basis of teachers' selected in the three senatorial district of Kwara State. Out of 180 (100%) teachers, 65 (34.5%) of the respondents were from Kwara-Central, 55 (32.2%) from Kwara-North, while 60 (33.3%) of the respondents were from the Kwara-South.

Research Question 1: *To what extent is indigenous education integrated into the Nigerian national curriculum in secondary schools in Kwara State?*

Table 2: Extent to which Indigenous Education Integrated into Secondary School Curriculum in Kwara State

S/N	Items	Mean	SD.	Decision
1.	Indigenous cultural values are incorporated into subjects taught in schools.	3.35	.821	High Extent
2.	Local languages are used as part of teaching and learning activities.	2.34	.760	Low Extent
3.	The curriculum includes lessons related to indigenous tradition and practices.	3.30	.999	Very High Extent
4.	Indigenous knowledge is integrated into subjects such as Agriculture, Social Studies, History and Cultural Studies.	3.48	.835	Very High Extent
5.	Teachers relate classroom lessons to local community experiences and practices.	2.28	.690	Low Extent
6.	Students are exposed to traditional skills such as crafts, farming and local trades through school activities.	2.15	.654	Low Extent
7.	Practical indigenous skills are taught alongside theoretical knowledge.	1.42	.570	Very Low Extent
8.	Indigenous history and heritage are included in classroom instruction.	3.13	.732	High Extent
9.	Teaching materials reflect local culture and indigenous knowledge systems.	3.23	.832	High Extent
10.	School collaborate with community members to support indigenous learning experiences.	2.42	.460	Low Extent

Source: Fieldwork, 2026

As shown in table 2, it is clear from the findings that the respondents agreed that indigenous cultural values are incorporated into subjects taught in schools in a high extent, but local languages are in low extent in used as part of teaching and learning activities. The curriculum includes lessons related to indigenous tradition and practices very high extent and indigenous knowledge is integrated into subjects such as Agriculture, Social Studies, History and Cultural Studies. A majority of the respondents were of the opinion that teachers relate classroom lessons to local community experiences and practices are low extent; students' exposure to traditional skills such as crafts, farming and local trades through school activities are low and most especially, practical indigenous skills taught alongside theoretical knowledge are very low in extent. Indigenous history and heritage are included high extent in the classroom instruction and teaching materials reflect local culture and indigenous knowledge systems, but school collaborate with community members to support indigenous learning



Assessment on Integration of Indigenous Education in ... Alabi, J. A., Et. al. (2026)

experiences are low in extent. Therefore, it can be affirmed that Indigenous Education was integrated into the secondary school curriculum but practical indigenous skills taught alongside theoretical knowledge are very low.

Research Hypotheses

H₀₁: There is no significant relationship between indigenous educational components in the national curriculum and students' acquisition of practical and vocational skills in Kwara State.

Table 3: Indigenous Educational Components in the National Curriculum and Students' Acquisition of Practical and Vocational Skills in Secondary Schools

Variable	N	X	SD	Df	Cal	r-value	P-value	Decision
Indigenous Educational Components in the National Curriculum	180	1.58	.49					
				178	.714	.000		H ₀₁ Rejected
Students' Acquisition of Practical and Vocational Skills	180	1.41	.42					

***Significant $p < .05$**

Table 3 showed the calculated r-value of .714 while p-value (0.000) is less than the significance level (0.05) for 178 degrees of freedom. Therefore, the hypothesis which stated that there is no significant relationship between indigenous educational components in the national curriculum and students' acquisition of practical and vocational skills in Kwara State was rejected. The finding revealed that, there was significant relationship between indigenous educational components in the national curriculum and students' acquisition of practical and vocational skills in Kwara State.

H₀₂: There is no significant relationship between students' exposure to indigenous educational practices and their level of self-reliance in Kwara State.

Table 4: Exposure to Indigenous Educational Practices and Students Level of Self-Reliance in Kwara State

Variable	N	X	SD	Df	Cal	r-value	P-value	Decision
Students' exposure to Indigenous Educational Practices	180	1.58	.49					
				178	.527	.000		H ₀₂ Rejected
Students' Level of Self-reliance	180	1.31	.46					

***Significant $p < .05$**

Table 4 showed the calculated r-value of .527 while p-value (0.000) is less than the significance level (0.05) for 178 degrees of freedom. Therefore, the hypothesis which stated that there is no significant relationship between students' exposure to indigenous educational practices and their level of self-reliance in Kwara State was rejected. The finding indicated that there was significant relationship between students' exposure to indigenous educational practices and their level of self-reliance in Kwara State.

Discussion of the Findings

The findings showed that Indigenous Education was integrated into the secondary school curriculum in high extent but practical indigenous skills taught alongside theoretical knowledge are very low. Students are not exposed to practical traditional skills or knowledge such as crafts, farming and local trades through school activities that can ensure economic self-reliance. This leads to maximum numbers of unemployment in the society. This finding is in line with the findings of Usman, Rong and Saine (2025) which stated that many schools continue to prioritise theoretical instruction and examination performance rather than practical skill acquisition or experiential and skill-based learning. Consequently, graduates often leave school without the vocational and entrepreneurial competencies required for self-reliance and as such,



Assessment on Integration of Indigenous Education in ... Alabi, J. A., Et. al. (2026)

the introduction of colonial education systems shifted the focus of learning toward literacy, clerical work and theoretical knowledge, often neglecting indigenous knowledge systems that previously promoted practical skills and self-reliance. Findings from research hypothesis one showed that there was significant relationship between indigenous educational components in the national curriculum and students' acquisition of practical and vocational skills in Kwara State. This is because indigenous knowledge is incorporated into school subjects in the curriculum. This finding corroborates the finding of Olorundare and Kayode (2014) which specified that indigenous education is integrated into school subjects such as Agriculture, Social Studies, History, Cultural and Creative Arts, Basic Technology and Entrepreneurship Education which are intended to equip students with practical knowledge, innovative capacity and entrepreneurial skills required for self-employment and sustainable development. In addition, the results from research hypothesis two indicated that there was significant relationship between students' exposure to indigenous educational practices and students' level of self-reliance in Kwara State. This implies that when students' are exposed and acquired indigenous knowledge with practical skills through education, they are more likely to develop entrepreneurial abilities, self-confidence and independence. This finding is similar to the assertion of Adeyinka (2013) which stated that when students' learn local production systems, indigenous technologies and traditional occupations, they become more capable of creating employment opportunities for themselves rather than relying solely on white-collar jobs.

Conclusions

Based on the findings of the study, it can be concluded that Indigenous Education has been incorporated into the national curriculum but its practical aspect of knowledge which are essential for fostering students' economic self-reliance are not adequately implemented in schools. As a result, the integration of indigenous education has remained largely theoretical, limiting its potential to cultivate entrepreneurial mindsets and promote self-sufficiency among students. Moreover, indigenous knowledge incorporated into subjects such as Agriculture, Social Studies, History, Cultural and Creative Arts, Basic Technology and Entrepreneurship Education are not effectively practicalised in formal school settings. Consequently, students do not acquire the hands-on skills necessary to apply this knowledge in real-life contexts. This gap contributes to the rising rate of youth unemployment in Kwara State and Nigeria at large and raises concerns about the effectiveness of the national curriculum in promoting functional and skill-based education.

Recommendations

Based on the findings, the following recommendations are made;

1. Government should pay proper attention to the practical dimensions of indigenous knowledge in formal schooling to promote students' economic self-reliance. Also, there is a critical need for the government to strengthen these practical components by promoting the use of local languages in instruction and enhancing teachers' ability to connect lessons to community practices, thereby promoting indigenous education.
2. Schools should increase students' exposure to hands on traditional skills, collaborate with local artisans and foster stronger collaboration with community members to support a more holistic and experiential approach to indigenous learning in order to reduce youth unemployment in the society.
3. Parents and guardians should actively encourage their children and wards to engage in indigenous education to enhance their capacity for self-reliance after graduation.

References

- Adedokun, T. R. (2024). Indigenous knowledge systems and the quest for sustainable development in Nigeria. *International Journal Innovation Research and Advanced Studies*, 4 (2), 191 – 202. <https://harvardpublications.com/hijiras/article/view/144/141>.
- Adeyinka, A. A. & Paulley, F. G. (2016). Interfacing ethical issues in African indigenous education with modern education in global context. *African Journal of Education and Behavioural Sciences (AJEBS)*, 1 (1), 32 - 39.
- Adeyinka, A. A. (2013). Pre-colonial education in Africa and the impact of western culture. In A. A. Adeyinka, E. E. Osuji, T. T. Asuka, A. O. Orubu & A. A. Allen (Eds.). *Integrated foundations of education*. Port Harcourt: University of Port Harcourt Press.
- Blackle, M. A. L. (2024). Indigenous knowledge systems and science education. *South African Journal of Science*, 120, 2 – 6. <https://doi.org/10.17159/sajs.2024/16860>.
- Fafunwa, A. B. (1974). *History of education in Nigeria*. London: George Allen & Unwin.
- Federal Republic of Nigeria. (2014). *National policy on education* (6th ed.). Abuja: NERDC Press.
- National Bureau of Statistics. (2023). *Labour force statistics report*. Abuja: NBS.



Assessment on Integration of Indigenous Education in ... Alabi, J. A., Et. al. (2026)

NERDC. (2013). *The Nigerian national curriculum for basic education*. Abuja: Nigerian Educational Research and Development Council.

Nyerere, J. K. (1968). *Education for self-reliance*. Dar es Salaam: Government Printer.

Okoye, K. R. E., & Arimonu, M. O. (2016). Technical and vocational education in Nigeria: Issues, challenges and a way forward. *Journal of Education and Practice*, 7 (3), 113–118.

Olorundare, A. S., & Kayode, D. J. (2014). Entrepreneurship education in Nigerian universities: A tool for national transformation. *Asia Pacific Journal of Educators and Education*, 29, 155 – 175.
<https://eprints.usm.my/34762/1/Art10%28155-176%29.pdf>

Omodan, B. I., Manquma, N & Mafunda, A. (2024). Decolonising minds, empowering future: Rethinking Entrepreneurial Education for University students in Africa. *Journal of Curriculum Studies Research*, 6 (2), 1 – 19.
<https://doi.org/10.46303/jcsr.2024.8>.

Usman, A., Rong, P & Saine, E. (2025). Examining the challenges of technical and vocational education in secondary school in Nigeria. *International Journal of Research and Innovation in Social Science*, 19 (13), 584 – 594.
<https://dx.doi.org/10.47772/IJRISS.2025.913COM0051>.



Assessment of Tech-Infused Pedagogical Innovation on ... Akpan, A. O. (2026)

Assessment of Tech-Infused Pedagogical Innovations on Integrated Science Teaching and Learning among Tertiary Institution Pre-Service Teachers in Akwa Ibom State, Nigeria

AKPAN, Anyanime Okopide

anyanimeakpan@aksu.edu.ng

+2348023319141

Department of Science Education, Akwa Ibom State University, Ikot Akpaden, Akwa Ibom State, Nigeria

Abstract

Education in the 21st century has changed, likewise the pattern of teaching and learning due to emergence of digital technology-based innovations in pedagogy; hence the academic landscape is evolving to embrace these innovative teaching and learning methods. The study examined revolutionizing STEM education: tech-infused pedagogical innovations for integrated science teaching and learning in Akwa Ibom State, Nigeria. The study used the descriptive survey design. A sample size of 180 respondents was selected from 752 pre-service Integrated science teachers in the government-owned tertiary institutions using a simple random sampling technique. The instrument, a 32 item-questionnaire on 'Knowledge, Proficiency and Utilization of Tech-Infused Pedagogical Innovations in Revolutionizing STEM Education Questionnaire (KPUTPIRSEQ) was used for data collection. The instrument underwent a series of validations by experts in Test and Measurement, and Science Education to ascertain its validity. A reliability coefficient of 0.77 was obtained for the instrument using Cronbach Alpha statistics. Mean and standard deviation scores were used to answer the research questions. The findings of the study showed a moderate extent of pre-service Integrated Science teachers' knowledge, proficiency and utilization of tech-infused pedagogical innovations for revolutionizing STEM education. Based on the findings, it was recommended among others that pedagogical practices should be made to embrace the use of tech-infused innovations so that teacher trainees have the appropriate knowledge and skills to meet with increasing needs of society. Also, tertiary education and teachers' education curricula be restructured to focus on contextualized and digital abilities for effective teaching and learning.

Keywords: Revolutionizing, STEM Education, Tech-infused, Pedagogical, Innovations

Introduction

STEM an acronym for science, technology, engineering, and mathematics, four areas often integrated into interdisciplinary learning, drives innovations, emphasizes analytical thinking and provide creative solutions to real world problems. It also prepares students for future jobs and global competitiveness. STEM education is the key foundation for any country's economic success, progress and growth, fostering skills essential for technological and economic development (Etiubon, et al, 2018). In teaching practices, integrating modern technology into teaching has transformed how learners construct knowledge and teachers deliver lessons. The Covid-19 pandemic acted as a catalyst for the rapid acceleration and adoption of online learning technologies and the advent of new technologies has revolutionized the educational landscape, making technology assisted education a necessity rather than an option (Akpan, et al 2025a). Revolutionizing education means shifting from rote memorization to student-centred, experiential learning by infusing modern technologies into pedagogies for teaching and learning. It aims to transform traditional educational methods by leveraging technology to improve the quality of education, making learning more engaging, interactive, providing access to a broader range of resources and information (Akpan, et al., 2024). The utilization of these technologies allows for personalized learning experiences, promote student-centred learning approaches, and facilitate the development of critical thinking, problem-solving, digital literacy and other 21st century skills essential for success today (Kokkinos, 2024). In the context of this study, revolutionizing education refers to the infusion of various technological tools, devices, applications and resources in pedagogy to enhance teaching, learning, and educational management (Mishra et al., 2023).

Techn-infused pedagogical innovations are simply new and improved teaching methods that use technology to make learning more effective, engaging, interactive and accessible to students. These innovations in pedagogy have revolutionize education since the onset of covid-19. Ebony et al (2026) note that tech-infused teaching is the use of technology to support and enhance teaching and learning. Here, technologies are selected that align with their pedagogical goals. Akpan (2024) stress that effective tech infusion must prioritize pedagogical use rather than merely adopting new gadgets for sake of novelty. Tech-infused innovations are the infusion of various forms of technology such as software apps, digital devices, online platforms (zoom, google meet), online assessment, podcast, AI, cloud storage, web, emails, online courses,



Assessment of Tech-Infused Pedagogical Innovation on ... Akpan, A. O. (2026)

educational videos (Itighise et al. 2023). They also include other technologies, such as mobile devices (computers, laptops, tablets, smartphones for extended learning opportunities beyond the walls of the traditional classrooms (Tanrisevdi et al., 2025). Interactive whiteboards -revolutionized the dynamics of teaching and learning, infusing classrooms with a new found sense of interactivity and engagement (Vasilopoulos et al., 2023). Educational software, internet resources, online learning platforms and learning management systems (moodle, multimedia contents, and communication tools (Akpan et al., 2025a). These support asynchronous learning where students could access course materials, lectures, and assignment at their own pace and convenience (Suryadi, 2025; Kokkinos, 2024). Others are adaptive learning technologies propelled by strides in artificial intelligence (AI) which personalize educational experiences, while augmented reality (AR), and virtual reality (VR) create immersive simulations, bringing abstract concepts to life enabling experiential learning (Mishra et al., 2023, Akpan & Udo, 2025). Virtual classrooms became common using videoconferencing platforms like Zoom, Microsoft Teams and Google meet. These platforms facilitate seamless group projects, discussions, and document sharing among students and teachers (Akpan et al., 2025b), transcending geographical boundaries, enabling synchronous or asynchronous collaborations, as well as teaching approaches like blended, simulation, flipped classroom (Umoetuk & Akpan, 2023). In Nigeria, STEM education faces challenges such as inadequate infrastructure, lack of resources for teaching, poor methods of teaching, outdated curricula, lack of qualified teachers (Kangiwa et al., 2024) and recently, technology integrated challenges such teachers' insufficient digital competence, inadequate technological infrastructure, resistance to pedagogical change and limited professional development support (Suryadi, 2025). Since teachers are the driving force in the realization of academic and national goals, they must brace up to the challenges and explore means and ways of being relevant in the face of knowledge explosion (Udo & Akpan, 2016) by revolutionizing STEM teaching and learning.

Integrated science, formerly Basic Science, and Basic Science and Technology, now Intermediate Science encapsulates inter-alia development of learning contents that will lead to the acquisition of functional knowledge, skills and competencies (FME, 2025). Teachers are expected to use technological tools and digital resources to support students learning, therefore their knowledge and competence regarding these resources are of vital importance (Akpan, et al., 2022). It was argued that technology infusion requires teachers to develop new competencies in digital literacy and pedagogical design, these abilities should align with the learning objectives and outcome, ensuring that technology enhances rather than distract students from learning (Suryadi, 2025). Tech-infused innovations in teaching and learning is multifaceted involving various components such as teachers' knowledge, attitude, perception, competences and utilization, therefore the knowledge of tech-infused innovations has become increasingly relevant in the modern-day teaching context. Samuel & Salisu (2025) noted that teachers who posed adequate knowledge in technology integration are more confident and capable in using these innovations to teach. Tanrisevdi, et al (2025) investigating the level of technological pedagogical content knowledge (TPACK) among science teachers found that they possessed low technology-based knowledge, as well as limited technologically related pedagogical knowledge and content awareness. Additionally, several studies Itighise et al., (2023); Samuel & Salihu (2025); Akpan et al., (2025a) have reported teachers' favourable perception towards technology and its integration into teaching and learning, but that do not necessarily translate into strong instructional technology practice. Adebayo (2015) study on awareness and utilization of ICT tools by mathematics lecturers, and students found that 80% of the lecturers knew ICT tools but did not use them due to inadequate skills in how to use the tools. Bashir and Muslim (2022) found that students' knowledge of Zoom technology was moderate and independent of students' gender. Okuonghae, et al (2019) revealed that undergraduates' knowledge and utilization of web 2.0 technologies for collaborative learning in universities is high, while Itighise et al (2023) found no significant difference in the perception of male and female science teacher trainees on their awareness and utilization of web 2.0 technology. Woonhee-Sung, et al (2023); Samuel & Salihu (2025) exploring college students' awareness of AI and ChatGPT observed that students had good knowledge of ChatGPT, and that lecturers were not utilizing the capabilities of AI and ChatGPT to the fullest potentials. According to Kangiwa et al, (2024) academic perception towards the use of Zoom technologies, found that students' usage of Zoom technology was low compared to instructional videos because instructional videos provided a flexible learning environment, unlike Zoom which needed real-time participation during learning. Teachers' perception of the use of YouTube for teaching and learning activities in Nigerian Schools was high, as it enhances effectiveness in finding relevant information about concepts and increases their productivity in the classroom within the shortest time frame (Ogirima, et



Assessment of Tech-Infused Pedagogical Innovation on ... Akpan, A. O. (2026)

al., 2021). As observed by Olumorin, et al (2022), students' perception of the use of Google Search and Google Classroom. was moderate. Akpan et al (2025c) noted that virtual technology had a positive effect on students' academic performance. Proficiency, refers to the level of competence and skills possess by teachers and students in using the various online technologies for effective academic, social and personal purposes. Albi-Oparaocha et al (2018) note that using global standards for effective learning and teaching in the 21st century to measure the competence of teachers in Nigeria especially in terms of technological skills showed that a significant number of teachers are not vast in knowledge and competence. (Akpan et al., 2024) observe that most teachers cannot effectively deploy the use of technology to achieve the objectives of education, and therefore lack the competence necessary in the present age. Etiubon et al (2018) study on socioeconomic empowerment senior secondary science students in Nigeria and teachers' competence to impart skills to learners as an indicator, the study showed that STEM teachers lacked the competencies and skills to empower students. DeVe et al (2020) and Akpan and Udo (2022) also confirmed that teachers lack competencies related to online instructional preparation, online platforms, interactive content and lack of competence in the critical skills of digital innovation. Akpan et al (2023), showed that science teachers had moderate awareness, but lacked the competence needed in innovation and digital technology, hence their utilization in science teaching is low. Atabang and Babayemi (2024) and Akpan et al (2025c) reported moderate levels of competence in integration of zoom and virtual technology in pedagogy for teaching Postgraduate students.

Statement of the Problem

The Nigerian classrooms have primarily followed a lecture-based model where teachers dominate knowledge delivery. Over the past decades, education systems have increasingly shifted towards technology-driven practices that emphasize flexibility, personalized and collaborative learning. The rapid advancement in digital technologies has greatly re-shaped global educational landscapes, compelling schools, teachers and policy makers to rethink traditional models. This transformation is further accelerated by the fourth industrial revolution which demand digital literacy, critical thinking and problem-solving skills as core competencies for learners. Consequently, tech-infused innovations in teaching and learning is no longer seen as optional. With the revolution in STEM classrooms, the question is, what is the assurance that these innovative technologies are pedagogically infused into Integrated Science lessons? Therefore, this study sought to investigate tech-infused pedagogical innovations and integrated science teaching and learning.

Purpose of the study

The study aims at investigating revolutionizing STEM education: Tech-infused pedagogical innovations for integrated science teaching and learning. Specifically, the study sought to;

1. Assess the extent of Integrated Science Pre-Service teachers' knowledge of tech-infused pedagogical innovations for revolutionizing STEM education.
2. Assess the extent of proficiency possessed by Integrated Science Pre-Service teachers in tech-infused pedagogical innovations for revolutionizing STEM education.
3. Find out the extent of Integrated Science Pre-Service teachers' utilization of tech-infused pedagogical innovations for revolutionizing STEM education.

Research Questions

1. What is the extent of Integrated Science Pre-Service teachers' knowledge of tech-infused pedagogical innovations for revolutionizing STEM education?
2. To what extent do Integrated Science Pre-Service teachers possess proficiency in tech-infused pedagogical innovations for revolutionizing STEM education?
3. What is the extent of Integrated Science Pre-Service teachers' utilization of tech-infused pedagogical innovation for revolutionizing STEM education?

Methodology

A descriptive survey design was used for the study to understand the opinion of respondents on the subject matter. The population of the study comprised 752 pre-service Integrated Science teachers from government-owned tertiary institutions in Akwa Ibom State offering the course. University of Uyo, Akwa Ibom State University, Akwa Ibom State College of Education and Federal College of Education met the condition. One hundred and eighty (180) pre-service Integrated Science teachers were selected for the study using a simple random sampling technique. The instrument for the study was



Assessment of Tech-Infused Pedagogical Innovation on ... Akpan, A. O. (2026)

a 32 item-questionnaire on 'Knowledge, Proficiency and Utilization of Tech-Infused Pedagogical Innovations in Revolutionizing STEM Education Questionnaire (KPUTPIRSEQ), used for data collection. The instrument was developed on a four-point Likert scale of Very High Extent (VHE), High Extent (HE), Moderate Extent (ME) and Low Extent (LE). The instrument underwent a series of validations by experts in Test and Measurement, and Science Education to ascertain the face, content, and construct validation. The instrument was trial tested on 25 respondents who were not used in the study, and a reliability coefficient of 0.77 was obtained using Cronbach Alpha coefficient. Soft or electronic copies, a Google form was developed, and the link was sent to the respondents during Zoom classes and WhatsApp class platforms, while hard copies of the instrument were distributed physically to respondents. The responses obtained were analysed using mean and standard deviation. To make decisions as regards research questions, whenever the cluster mean score falls between: 1.00-1.49, 1.50-2.49, 2.50-3.49 and 3.50-4.00, it was taken to indicate: Low Extent (LE), Moderate Extent (ME), High Extent (HE), Very High Extent (VHE).

Presentation of Results

The results of the analysis carried out on data collected for the study are presented in this section. The presentation was done in line with the research questions guiding the study.

Research Question One

What is the extent of Integrated Science Pre-Service teachers' knowledge of tech-infused pedagogical innovations for revolutionizing STEM education?

Table 1: Mean and standard deviation of the extent of integrated science pre-service science teachers' knowledge of tech-infused pedagogical innovations (n=180)

S/N	Knowledge of Tech-infused Pedagogical innovations	$\bar{x}$	SD	Remarks
1	Flipped classroom	1.96	0.71	ME
2	Blended learning	1.92	0.74	ME
3	Online Course/Materials			
a	Khan Academy	1.80	0.52	ME
b	U-lesson	1.72	0.77	ME
c	Coursera	1.28	0.68	LE
4	AI Tutor			
a	ChatGPT	3.09	0.72	HE
b	Khamingo	1.88	0.57	ME
c	Duolingo	1.38	0.88	LE
5	Virtual Laboratory Demonstration	1.40	0.72	LE
6	Augmented Reality (AR)			
	AR glasses for virtual field trip	1.17	0.59	LE
7	Collaborative Platforms			
a	zoom	2.70	0.97	HE
b	telegram	1.37	0.88	LE
Cluster Mean		1.81	0.74	ME

The result in Table 1 showed the mean range of response of pre-service Integrated Science teachers on their knowledge of tech-infused pedagogical innovations for items 3c, 4c, 5, 6a, 7b fall within 1.00 -1.49. This means there is a low extent of teachers' knowledge of Coursera online material, Duolingo AI instructor, virtual laboratory demonstration, Augmented Reality glasses for fieldtrip and telegram collaborative platform as tech-infused pedagogical innovations for revolutionizing STEM education. The result also showed that the mean range on the responses for items 1, 2, 3a, 3b and 4b fall within 1.50 – 2.49, meaning that there is a moderate extent of pre-service teachers' knowledge of flipped classroom, blended learning, Khan academy-online material, U-lesson online material, and khamingo – AI tutor tech-infused pedagogical innovation, while items 4a and 7a fall within 2.50 – 3.49, meaning there is a high extent of pre-service Integrated Science teachers' knowledge on the use of ChatGPT -AI tutor and zoom as a collaborative platform. The result in Table 1 also showed the standard deviation scores of the respondents ranged from 0.52 to 0.97, since the standard deviation scores are small, it means that the spread of the scores is not far apart. However, the cluster mean of 1.81 for all the items indicates



Assessment of Tech-Infused Pedagogical Innovation on ... Akpan, A. O. (2026)

that there is a moderate extent of pre-service Integrated Science teachers' knowledge of tech-infused pedagogical innovations for revolutionizing STEM education.

Research Question Two

What is the extent of Integrated Science Pre-Service teachers' proficiency in tech-infused pedagogical innovations for revolutionizing STEM education?

Table 2: Mean and standard deviation of the extent of integrated science pre-service teachers' proficiency in tech-infused pedagogical innovations (n=180)

S/N	Proficiency of tech-infused Pedagogical Innovations	$\bar{x}$	SD	Remarks
8.	I can access pre-recorded lecture before class session.	1.48	0.68	LE
9.	I learn STEM concepts independently using flipped classroom resources.	1.69	0.82	ME
10.	I have the proficiency to use digital platforms that support flipped classroom learning	1.46	0.56	LE
11.	I have the competence to participate in both virtual and physical class activities	1.38	0.88	LE
12.	I have the ability to navigate systems used in blended learning.	1.29	0.68	LE
13.	I have the competence to use online learning resources to improve STEM knowledge	1.72	0.77	ME
14.	I have the proficiency in using AI tools to explain different STEM concepts.	2.28	0.56	ME
15.	I possess the skills to apply AI tools in research and assignments	3.01	0.97	HE
16.	I can formulate effective prompts when interacting with AI tutor.	2.70	1.04	HE
17.	I have the competence to perform virtual experiments using virtual lab software.	1.40	0.72	LE
18.	I can interpret results generated from virtual lab activities.	1.17	0.59	LE
19.	I can follow laboratory procedure in a virtual environment	1.21	0.64	LE
20.	I have the skills to use AR glasses for virtual field trip	1.03	0.67	LE
21.	I can explain STEM related issues in environment using AR.	1.23	0.62	LE
22.	I have abilities to effectively participate in zoom-based classes	2.74	1.07	HE
23.	I can share educational resources using zoom and telegram	2.12	0.87	ME
24.	I have the capacity to collaborate with peers and teachers using online platforms.	2.84	0.79	HE
25.	I communicate effectively during virtual group discussions.	1.96	0.90	ME
Cluster Mean		1.82	0.77	ME

The result in Table 2 showed the mean range for the response of the pre-service Integrated Science teachers on the extent of their proficiency of tech-infused pedagogical innovations for revolutionizing STEM education for items 8,10, 11, 12, 17, 18,19, 20 and 21 fall within 1.00 – 1.49. This means that to a low extent, pre-service teachers have proficiency: to access pre-recorded lecture, use digital platform that support flipped classroom, to participate in both virtual and physical activities, to navigate systems in blended learning, to perform virtual experiment, interpret results from virtual lab activities, to use AR glasses for virtual field trip, to use AR to explain STEM related issues in the environment. The result also showed that the mean range for responses of the pre-service Integrated Science teachers' on items 9, 13, 14, 23 and 25 falls within 1.50 – 2.49, meaning that to a moderate extent pre-serve Integrated Science teachers have proficiency to: learn STEM concepts independently using flipped classroom, use online learning resources to improve STEM knowledge, in using AI



Assessment of Tech-Infused Pedagogical Innovation on ... Akpan, A. O. (2026)

tutor to explain STEM concepts, share educational resources using zoom and telegram and communicate effectively during group discussions. While results showed items 15, 16, 22 and 24 fall within the range of 2.50 – 3.49, meaning to a high extent, apply AI tools in research and assignments, formulate effective prompts when interacting with AI tutor, effectively participate in zoom-based classes and collaborate with peers and teachers using online platforms. The result in Table 3 also showed the standard deviation scores of the respondents which ranged from 0.56 to 1.04 and since the standard deviation scores are small, it means that the spread of the scores is not far apart. However, the cluster mean of 1.82 for all the items indicates that there is a moderate extent of pre-service science Integrated Science teachers' proficiency in tech-infused pedagogical innovations in revolutionizing STEM education.

Research Question Three

What is the extent of Integrated Science Pre-Service teachers' utilization of tech-infused pedagogical innovation for revolutionizing STEM education?

Table 3: Mean and standard deviation of the extent of Integrated Science Pre-Service teachers' utilization of tech-infused pedagogical innovations in revolutionizing STEM Education (n=180)

S/N	Utilization of tech-infused pedagogical innovations	$\bar{x}$	SD	Remarks
26	Flipped classroom	2.12	0.87	ME
27.	Blended learning	1.88	0.86	ME
28.	Online Courses/ Materials	1.95	0.85	ME
29	AI-Tutor	3.10	0.90	HE
30	Virtual Lab. Demonstrations	1.48	0.68	LE
31.	Augmented Reality	1.69	0.82	ME
32.	Collaborative Platforms	3.05	0.79	HE
	Cluster Mean	2.18	0.82	ME

The result in Table 3 showed the mean range for the response of pre-service Integrated Science teachers on the extent of their utilization of tech-infused pedagogical innovations in revolutionizing STEM education, item 30 falls within 1.00 - 1.49. This means that there is a low extent of pre-service Integrated science teachers' utilization of virtual laboratory demonstrations as tech-infused pedagogical innovation. The result also showed that the mean range for the responses of teachers for items 26, 27, 28, 31, which falls within 1.50 - 2.49 means that there is a moderate extent of pre-service Integrated Science teachers' utilization of flipped classroom, blended learning, online courses/material and augmented reality (AR)., while the responses for item 29 and 32 fall within 2.50 – 3.49, meaning that there is a high extent of Integrated Science pre-service teachers utilization of AI-tutor and collaborative platforms as tech-infused pedagogical innovations for revolutionizing STEM education.

Discussion of Findings

The findings of the extent of pre-service Integrated Science teachers' knowledge of tech-infused pedagogical innovations in revolutionizing STEM education revealed a moderate extent of teachers' knowledge of tech-infused pedagogical innovations in teaching and learning. This can be attributed to the fact that many students today are considered digital natives, meaning they grow up in a world where digital and internet resources are already established. The finding is contrary to the observation of Tanrisevdi et al (2025) and Kangiwa et al (2024), who noted that science teachers had low technological pedagogical-based knowledge of using ICT tools for teaching, in that case, how then can technology knowledge be imparted to the students? The finding lends credence to that of Woonhee-Sung, et al (2023); Bashir and Muslim (2022); Akpan et al (2025a) who observed that students had good knowledge of chatGPT, zoom technology and online platforms. This result can be attributed to the fact that students are considered. The findings of the extent of pre-service Integrated Science teachers' proficiency in tech-infused pedagogical innovations for revolutionizing STEM education revealed that there is a moderate extent of pre-service Integrated science teachers' proficiency in tech-infused innovation. The finding is contrary to the observation of Albi-Oparaocha (2018) who reported that teachers are not vast in competence and knowledge, as well as lack competence in innovations and digital technology (DeVera et al., 2020; Akpan et al., 2023), how then will the STEM classrooms be revolutionized? The finding lends credence to that of Atabang & Babayemi (2024) and Akpan et al (2025c) who observed that teachers in training had a moderate level of competence in integration of zoom and virtual technology in pedagogy for teaching.



Assessment of Tech-Infused Pedagogical Innovation on ... Akpan, A. O. (2026)

The findings on the extent of Integrated Science pre-service teachers' utilization of tech-infused pedagogical innovations for revolutionizing STEM education revealed a moderate extent of pre-service Integrated Science teachers' utilization of tech-infused pedagogical innovations. The finding is contrary to the observation of Adebayo (2015) who reported that despite the benefits derived from the use of ICTs in teaching and learning, their usage is still low as they are not yet embraced and utilize them for instructional purpose. The finding aligns with that of Okuonghae et al (2019); Ogirima et al (2021) whose findings revealed the level of undergraduates 'utilization of technologies for collaborative learning in universities are high and they have positive perceptions towards the use of the technology. This could be attributed to early exposure to digital resources, which translates to a natural familiarity and ease with using technology for various aspects of learning.

Conclusion

It took Covid-19 and lockdown to catalyze the rapid adoption of remote online technologies and new instructional approaches for teaching and learning. In conclusion, the study showed that Integrated Science Pre-service teachers exhibit a moderate extent of knowledge, proficiency and utilization of tech-infused pedagogical innovations for revolutionizing STEM education. Students view online learning resources as valuable assets in their educational pursuits and the integration of tech-based pedagogical innovation enrich learning experiences. It could be seen from the results that Integrated Science pre-service teachers are ready to embrace tech-infused pedagogical innovations, but face serious challenges in acquiring relevant skills because their teachers need more knowledge and proficiency on the use of digital technologies for teaching and learning.

Recommendations

Based on the findings and conclusion of the study, the following recommendations were made:

1. Institutions should provide necessary digital facilities and should encourage the lecturers to work remotely, using tech-based resources.
2. professional development programmes for lecturers (workshops, conferences,) should be encouraged and financially supported.
3. the government should fund tertiary institutions sufficiently, and non-governmental organizations and stakeholders should partner to provide interventions in tech-based resources in the classrooms for teachers and students to use practically.
4. The teacher education curriculum should be restructured such that pedagogical practices embrace the use of digital technologies, and provide opportunities for teachers to have appropriate knowledge and skills to meet the needs of their students.

References

- Adebayo, O. (2015). The awareness and use of ICT tools in teaching and learning mathematics at colleges of Education in Nigeria. *EDULEARN Proceedings*, 3184-3189.
- Akpan, A O., Akpan, I. F & Umoh, E. B. (2023). Science Teachers' awareness and competencies needed in the utilization of 21st century skills in teaching in Akwa Ibom State, Nigeria. *International Journal of Educational Research and Human Development*, 4(1), 13 – 31.
- Akpan, A. O. (2024). Knowledge, utilization and perception of emergent digital technologies In pedagogy by pre-service science teachers in Nigeria. *Journal of Institutional Research, Big Data Analytic and Innovation*, 1(1), 44 – 55.
- Akpan, A. O., Oyakhirome, A.H. & Udoh, A. P., (2024). Harnessing artificial intelligence for 21st century skills acquisition and undergraduate students 'preparation for sustainable lifelong learning in Nigeria," *International Journal of Research and Innovation in Social Science (IJRISS)*, VIII(IIIS), 1069-1083.
- Akpan, A. O., Atabang, A. A., & Udofia, S. E. (2025a). Online learning platforms and bridging of digital knowledge gap among postgraduate students in Akwa Ibom State. *International Journal of Education Framework, University of Uyo*, 5(1), 43-56.
- Akpan, A. O. & Udo, H. I. (2025). Effect of AI-ChatGPT on students' academic performance in Physical and Health in Universities in Akwa Ibom State. *FUDMA Journal of Education*, 8(2), 139-147.
- Akpan, A. O., Umanah, F. I. & Abasi, A. U. (2025b). Effects of virtual-field-trip and field-experience strategies on performance in air pollution among College of Education Students in Akwa Ibom State, Nigeria. *Zamfara International Journal of Education*, 5 (3), 110-117



Assessment of Tech-Infused Pedagogical Innovation on ... Akpan, A. O. (2026)

- Albi-Oparaocha, F.C. Ekechukwu, L. E. & Okorie, G.O (2018). Maintaining competence and relevance of teachers in today's economic, technological, political and social environs in the country. *Journal of Education* 4(1), 70-79.
- DeVera, J. L., Andrada, M. D., Bello, A. G. & DeVera, M. D. (2021). Teachers' competencies in educational technology integration on instructional methodologies in the new normal. *Lukad Journal of Pedagogy*, 1(1), 61-80.
- Ebony, J. I., Oche, I. O., Kingsley, E. (2026). Effective strategies for integrating technology in teacher education: A systematic review. *International Journal of Forensic Science and Research* 3(3): 79-94.
- Etiubon, R. U., Akpan, A. O. & Udosen, I. N. (2018). Socio-economic empowerment of senior secondary science students in Nigeria and STEM teachers' preparedness. *Research Journal of Education*, 4(11), 204-211.
- Federal Ministry of Education- FME (2025). *New revised basic education curriculum: Intermediate Science*. Nigerian Educational Research and Development Council (NERDC).Press.
- Itighise, A. E., Akpan, A. O. & Babayemi, J. O. (2023). Awareness and utilization of Web 2.0 technology for learning among science teacher trainees in Akwa Ibom State. *Zamfara International Journal of Education*, 3(6), 104 -111.
- Kangiwa, H. A., Alhassan, S. & Noma, S. U. (2024). Academic perception towards the use of zoom technology and instructional videos for teaching and learning in tertiary institutions. *International Research Journal of Modernization in Engineering Technology and Science*, 6(1), 1908 -1916.
- Kokkinos, L. (2024). Revolutionizing Education: the dynamic intersection of technology and learning. *International Journal of Multidisciplinary and Current Educational Research (IJMCER)*, 6(1), 26-32.
- Mishra, P. , Warr, M., & Islam, R. (2023). TPack in the age of chatGPT and generative AI. *Journal of Digital Learning in Teacher Education*, 39(4), 235-251.
- Nuradeen, Y. A. & Nura, G. (2024). Revolutionizing STEM education: integrating technology and innovation in mathematics and physics. 1st International Conference of mathematics 12-15 November, Federal University, Lokoja, Kogi State.
- Ogirima, O. A., Tolulope, J. J. & Tenilope, S. A. (2021). Future teacher perception towards the use of YouTube for teaching-learning activities in Nigerian Basic Schools. *Wimbar Sekolah Dasar* 8 (1), 81 – 95.
- Okuonghae, O. Ijeh, C. I. Olorunyomi, T. G. (2019). Awareness and perception of the use of web 2.0 technologies for collaborative learning in universities: A study of library and information science undergraduate students in Edo State, Nigeria. *Nigerian School Library Journal*, 18, 47 – 58.
- Olumorin, C. O., Babalola, E. O., Ashaolu, S., & Omolafe, E. V. (2022). Students' attitudes towards the utilization of google classroom for learning. *Indonesian Journal of Educational Research and Technology*, 2(3), 213 – 222.
- Samuel, I. R. & Salisu, A. D. (2025). Shaping the future of STEM through education in Nigeria through artificial intelligence. *Journal of African Innovation and Advanced Studies*, 7(2), 97 -110.
- Suryadi, A. (2025). Integrating educational technology and teacher competence: A pathway to sustainable digital transformation. *Edutransform Multidisciplinary International Journal*, 1(2), 16 – 19.
- Tanrisevdi, M., Cakiroghu, J., Canbazoghu-Bilici, S. (2025). Science teachers' technological pedagogical content knowledge: an explanatory sequel design. *International Journal of Education in Mathematics, Science and Technology*, 13(2), 291-307.
- Udo, M. E. & Akpan, A. O. (2016). Teacher-variables and implementation of the universal basic education programme in public primary schools in Uyo Local Government Area, Akwa Ibom State, Nigeria. *Global Journal of Educational Research*, 15, 95-102.
- Umoetuk, E. & Akpan, A. O. (2023). Computer graphics, flipped classroom instructional strategies and students' performance in Basic Science and Technology in Akwa Ibom State. *Inter-Disciplinary Journal of Science Education (IJ-SED)*, 5(1), 34-41.
- Vasilopoulos, C., Theodorakopoulos, L. & Giotopoulos, K. (2023). The promise and peril of big data in driving consumer engagement. *Technium Social Science Journal* 45, 489-494.
- Woonhee-Sung, J. D., Mokhtari, K. & Giuseppe, T. D. (2023). Exploring college students' awareness of AI and chatGPT. Unveiling perceived benefits and risks. *Journal of Inclusive Methodology and Technology in Learning and Teaching* 1 – 25.



Effects of Experiential Learning Models on ... Bako, L. S. P. (2026)

Effects of Experiential Learning Models on Academic Performance and Science Process Skills in Plant Physiology Among Secondary School Biology Students in Zaria, Kaduna State, Nigeria

BAKO, Lois Sunday Paul

wagwamany@gmail.com

08035876399

Department of Science Education, Faculty of Education, Federal University of Education, Zaria, Kaduna State, Nigeria

Abstract

This study evaluated the effects of experiential learning models on academic performance and science process skills in plant physiology among Senior Secondary II (SS II) biology students in Zaria, Kaduna State. The persistent underperformance in certificate examinations and a systemic deficit in practical competencies among secondary graduates are attributed to a reliance on passive, teacher-centered conventional lecture methods. Using a pre-test, post-test, non-equivalent control group, quasi-experimental research design, a sample of 312 students (142 males, 170 females) was selected from an active target population of 1,384 students across 18 schools using a multi-stage sampling procedure. The experimental group was exposed to a six-week intervention structured around David Kolb's four-stage experiential learning cycle, while the control group was taught using conventional lecture methods. Data were collected using the validated Biology Academic Performance Test (BAPT, $r = 0.86$) and the Science Process Skills Performance Scale (SPSPS, $r = 0.83$). Two-way Analysis of Covariance (ANCOVA) revealed a highly significant main effect of the experiential learning treatment on students' post-test academic performance [$F(1, 307) = 958.04, p < .001, \text{Partial } \eta^2 = .758$] and science process skills scores [$F(1, 307) = 2286.32, p < .001, \text{Partial } \eta^2 = .881$] in favor of the experimental group. No significant interaction effect was found between teaching methodology and gender, establishing the model as an equitable, gender-inclusive strategy. It is recommended that the Kaduna State Ministry of Education mandates active experiential learning strategies and organizes state-wide capacity-building workshops to equip science teachers with low-cost practical instruction methodologies, among others.

Keywords: Experiential Learning, Academic Performance, Science Process Skills, Plant Physiology, Gender Inclusivity

Introduction

Science education serves as the bedrock for technological advancement and sustainable economic growth within any modern society. Among the core natural science disciplines offered at the senior secondary level in Nigeria, biology experiences the highest student enrollment because it bridges the natural environment with health, agriculture, and fundamental life processes. Despite its popularity and central role in fostering scientific literacy, student achievement in both internal and external evaluations administered by bodies such as the West African Examinations Council (WAEC) and the National Examinations Council (NECO) remains consistently discouraging. Educational researchers in Nigeria have long identified that this systemic underperformance is deeply rooted in the persistence of passive, teacher-centered instructional approaches, particularly the conventional lecture method, which minimizes student engagement and reduces complex biochemical phenomena to abstract memorization (Awolere, 2019; Ozoarize, 2018).

Plant physiology encompassing intricate mechanisms such as photosynthesis, cellular respiration, transpiration, mineral nutrition, and translocation stands out as one of the most conceptually challenging and abstract components of the secondary school biology curriculum. Secondary school students often view plants as passive, non-living, or static background entities because they lack obvious, animal-like locomotion (Pany et al., 2022). This lack of visual animation makes it difficult for learners to conceptualise the dynamic, invisible metabolic and physiological pathways occurring within plant tissues, such as the vital energy distributions mediated by core minerals (Sinha & Tandon, 2020). When these processes are taught strictly through verbal exposition or passive textbook readings, students fail to connect isolated facts into a coherent biological understanding. Instead, they develop deep-seated misconceptions, frequently confusing the gaseous exchange of photosynthesis with that of respiration, or viewing root absorption as a simple mechanical intake of water rather than an active biochemical process (Svandova, 2014). To dismantle these misconceptions and foster deep conceptual clarity, the instructional delivery must transition from passive transmission to active exploration. David Kolb's Experiential Learning Theory provides a robust pedagogical framework to address these curricular challenges, positing that knowledge is continuously created through the transformation of experience by moving sequentially through four



Effects of Experiential Learning Models on ... Bako, L. S. P. (2026)

distinct stages. These stages begin with Concrete Experience, which involves hands-on engagement with material, followed by Reflective Observation, where learners watch and think deeply about the experience. Subsequently, students enter Abstract Conceptualization to formulate rules, theories, and concepts, before ultimately engaging in Active Experimentation to apply these newly formed concepts to new practical situations. In a classroom structured around experiential learning, biology students do not merely listen to a description of stomatal transpirational pull; they set up potometers, design localized experimental setups using clear polythene enclosures on live school-garden crops, measure real-time fluid displacements, collect empirical data, and actively reflect on their physical findings. This student-centered methodology aligns perfectly with the development of basic and integrated science process skills such as observing, measuring, classifying, formulating hypotheses, controlling variables, experimenting, and interpreting data which are indispensable for scientific inquiry and long-term cognitive retention (Chengere, 2025). Furthermore, gender equity in science, technology, engineering, and mathematics (STEM) fields remains a major concern for educational policy makers across Northern Nigeria, including Kaduna State. Historical sociocultural patterns and classroom dynamics have sometimes inadvertently sidelined female students in practical science tasks, leading to disparate spatial, analytical, and experimental confidence levels between genders. Evaluating whether an innovative active-learning intervention benefits male and female students equally, or helps bridge performance gaps, is essential for designing inclusive educational frameworks. While regional studies across Nigeria have begun to explore active learning strategies, there is a critical shortage of localized empirical research focusing specifically on how experiential learning models affect the academic performance and science process skills of secondary school students grappling with plant physiology in Zaria (Nwuba & Osuafor, 2021; Nwuba, 2024). This study addresses this gap by executing a large-scale, multi-school quasi-experimental investigation within the distinct educational landscape of Zaria, Kaduna State.

Statement of the Problem

The traditional method of teaching biology in Zaria's senior secondary schools relies heavily on passive, teacher-centered lectures and rote memorisation. This practice is driven by massive overpopulation in urban classrooms, an acute shortage of fully functional laboratory infrastructure, and rigid, time-constrained lesson blocks. Consequently, complex and abstract concepts within plant physiology such as transpirational mechanics, stomatal movements, photosynthetic light reactions, and mineral assimilation pathways are presented almost entirely as theoretical concepts. This expository approach forces students to memorise terms and structures without ever observing their functional, real-world biological mechanisms, leading to persistent underperformance in certificate examinations, a deficit in critical science process skills, and profound misconceptions regarding plant functions. While previous researchers have suggested that student-centered methods like experiential learning could improve general biology outcomes, there is very little empirical data on its specific effectiveness for teaching abstract plant physiology to large populations in Zaria. Additionally, it remains unclear how this active method interacts with student gender in an environment where closing the STEM equity gap is a high priority. Without localized, rigorous intervention studies, biology education in the region will likely remain bound to ineffective lecture methods, leaving secondary graduates ill-prepared for higher education or careers in modern scientific fields.

Objectives of the Study

Specifically, the study sought to achieve the following objectives:

1. To determine the difference in the mean scores of academic performances between SS II biology students taught plant physiology using the experiential learning model and those taught using the conventional lecture method.
2. To assess the difference in the mean scores of science process skills between SS II biology students exposed to the experiential learning model and those exposed to the conventional lecture method.
3. To examine the interaction effect of teaching methodology and gender on the difference in the mean scores of both academic performance and science process skills among the students.

Research Questions

The following research questions were formulated to guide the execution of this study:

1. What is the difference in the mean pre-test and post-test academic performance scores of SS II biology students taught plant physiology using the experiential learning model compared to those taught using the conventional lecture method?



Effects of Experiential Learning Models on ... Bako, L. S. P. (2026)

2. What is the difference in the mean pre-test and post-test science process skills scores of SS II biology students exposed to the experiential learning model compared to those exposed to the conventional lecture method?
3. What is the interactive influence of teaching methodology and gender on the difference in the mean post-test scores of academic performance and science process skills among SS II biology students in Zaria?

Research Hypotheses

The following null hypotheses were formulated and tested at a 0.05 level of significance:

- H0₁: There is no significant difference in the mean academic performance scores of SS II biology students taught plant physiology using the experiential learning model and those taught using the conventional lecture method.
- H0₂: There is no significant difference in the mean science process skills scores of SS II biology students exposed to the experiential learning model and those exposed to the conventional lecture method.
- H0₃: There is no significant interaction effect of teaching methodology and gender on the difference in the mean post-test academic performance and science process skills scores of SS II biology students.

Methodology

This study adopted a pre-test, post-test, non-equivalent control group, quasi-experimental research design to preserve classroom administrative stability while enabling a rigorous comparative empirical analysis. The target population comprised 1,384 Senior Secondary II (SS II) biology students across 18 public co-educational secondary schools within Zaria Local Government Area of Kaduna State. Through a multi-stage sampling procedure, four schools were randomly chosen, and two intact classes from each school were selected to yield eight distinct blocks. These intact classes were randomly assigned via a simple coin flip into either the experimental treatment group or the conventional control group, culminating in a final sample size of 312 students, with 164 in the experimental group and 148 in the control group, across a gender distribution of 142 male and 170 female students. Data collection relied on two primary diagnostic instruments: the Biology Academic Performance Test (BAPT), a 50-item multiple-choice test covering key plant physiology topics, and the Science Process Skills Performance Scale (SPSPS), which used five structured laboratory tasks to evaluate practical skills. Vetted by three senior subject-matter experts from the Faculty of Education at Ahmadu Bello University, Zaria, and pilot-tested outside the study area, the BAPT demonstrated an internal consistency of 0.86 using the Kuder-Richardson Formula 20, while the SPSPS achieved an inter-rater reliability value of 0.83 via Cronbach's alpha. The instructional intervention spanned exactly six weeks with three 40-minute lesson periods per week for both cohorts, bookended by a pre-test and a post-test using shuffled versions of the diagnostic tools. The experimental group was instructed via David Kolb's experiential learning cycle incorporating concrete experience, reflective observation, abstract conceptualisation, and active experimentation using hands-on setups like potometers to explore physiological mechanisms. In contrast, the control group was taught the exact same plant physiology topics by their regular classroom teachers using the conventional lecture method, which relied strictly on chalkboard explanations, passive textbook descriptions, and verbal note dictation without active inquiry. All collected data were compiled and processed using SPSS, deploying descriptive statistics to address the research questions and a two-way Analysis of Covariance (ANCOVA) at a significance level to statistically test the null hypotheses while controlling for baseline pre-test variations.

Presentation of Results

To determine if the observed differences were statistically significant, and to examine gender interaction effects, the post-test scores were analyzed using two separate 2-way ANCOVA models.

Hypothesis 1 and Hypothesis 3 (Academic Performance)

- H0₁: There is no significant difference in the mean academic performance scores of SS II biology students taught plant physiology using the experiential learning model and those taught using the conventional lecture method.
- H0₃: There is no significant interaction effect of teaching methodology and gender on the difference in the mean post-test academic performance scores.

Table 3 shows the 2-way ANCOVA results for the post-test academic performance scores, using the pre-test scores as a covariate.

Table 3: ANCOVA on Students' Post-Test Academic Performance Scores

Source of Variation	Sum of Squares	df	Mean Square	F	p-value	Partial η^2

Effects of Experiential Learning Models on ... Bako, L. S. P. (2026)

Corrected Model	17452.14 ^a	4	4363.04	248.11	.000	.764
Intercept	5812.41	1	5812.41	330.53	.000	.518
Pre-Test (Covariate)	114.28	1	114.28	6.50	.011	.021
Treatment	16845.82	1	16845.82	958.04	.000	.758
Gender	8.14	1	8.14	0.46	.497	.001
Method X Gender	14.26	1	14.26	0.81	.368	.003
Error	5398.45	307	17.58			
Total	284562.00	312				
Corrected Total	22850.59	311				

The ANCOVA results in Table 3 reveal a highly significant main effect of the teaching treatment on academic performance: $F(1, 307) = 958.04$, $p < .001$, and a large effect size (Partial $\eta^2 = .758$). Because the p-value is well below the $\alpha = 0.05$ threshold, the null hypothesis is rejected. This confirms that the difference in the mean scores of academic performances between students taught via the experiential learning model and those taught via the conventional lecture method is statistically significant, with the experiential group performing substantially better. Table 3 also shows that the interaction effect between teaching methodology and gender is not statistically significant: $F(1, 307) = 0.81$, $p = .368$, and Partial $\eta^2 = .003$. Therefore, the null hypothesis HO_3 regarding academic performance is accepted. This proves that the experiential learning model improves academic performance consistently across both male and female students.

Hypothesis 2 and Hypothesis 3 (Science Process Skills)

HO_2 : There is no significant difference in the mean science process skills scores of SS II biology students exposed to the experiential learning model and those exposed to the conventional lecture method.

HO_3 : There is no significant interaction effect of teaching methodology and gender on the difference in the mean post-test science process skills scores.

Table 4 shows the 2-way ANCOVA results for the post-test science process skills scores, using the pre-test scores as a covariate.

Table 4: ANCOVA on Students' Post-Test Science Process Skills Scores

Source of Variation	Sum of Squares	df	Mean Square	F	p-value	Partial η^2
Corrected Model	31124.58 ^a	4	7781.15	582.51	.000	.884
Intercept	4124.18	1	4124.18	308.74	.000	.501
Pre-Test (Covariate)	86.42	1	86.42	6.47	.011	.021
Treatment	30541.15	1	30541.15	2286.32	.000	.881
Gender	5.12	1	5.12	0.38	.536	.001
Method X Gender	2.88	1	2.88	0.22	.643	.001
Error	4100.91	307	13.36			
Total	288412.00	312				
Corrected Total	35225.49	311				

The ANCOVA results in Table 4 show a highly significant main effect of the teaching method on science process skills development: $F(1, 307) = 2286.32$, $p < .001$, and a massive effect size (Partial $\eta^2 = .881$). Because the p-value is less than $\alpha = 0.05$, the null hypothesis HO_2 is rejected. This establishes that the experiential learning model is significantly more effective at developing science process skills than the conventional lecture method. Furthermore, the interaction effect between teaching methodology and gender is not statistically significant: $F(1, 307) = 0.22$, $p = .643$, and Partial $\eta^2 = .001$. Thus, the null hypothesis HO_3 regarding science process skills is accepted. This confirms that the experiential learning model is highly effective and gender-inclusive, benefiting male and female students equally.



Effects of Experiential Learning Models on ... Bako, L. S. P. (2026)

Discussion of Findings

The findings of this study conclusively demonstrate that the experiential learning model significantly improves both academic performance and science process skills in plant physiology among senior secondary school biology students in Zaria. The pre-test scores indicated that students in both the experimental and control groups started with a limited and homogenous understanding of plant mechanics and weak practical skills. This baseline deficiency highlights the broader problem within secondary education in Kaduna State, where relying on verbal lectures turns dynamic biological systems into dry, abstract facts to be memorized for exams. However, introducing the four-stage experiential learning cycle led to a profound academic turnaround. The experimental group's post-test academic mean score rose to 36.99, far outpacing the control group's score of 22.03. This clear superiority matches the findings of Lin et al. (2026), who noted that combining organic, real-world experiences with active inquiry significantly deepens conceptual understanding and improves performance quality.

By actively working with plant models and setting up localized transpirational apparatuses, students shifted from passive listening to active discovery. This active engagement dismantles deep-seated botanical misconceptions, helping students understand plant functions as living, interconnected physiological processes rather than isolated definitions. As argued by Lu et al. (2025), when instructional models prioritize structured, active physical interactions, they create a superior cognitive environment that supports long-term retention and conceptual mastery. The improvement in student science process skills was even more pronounced, with the experimental group reaching an outstanding post-test mean of 38.29 compared to the control group's 18.31. This massive skill gain occurred because experiential learning embeds key science skills like systematic observation, precise measurement, hypothesis formulation, and data interpretation directly into daily learning. Instead of just looking at textbook diagrams of leaves, students physically cut cross-sections, measured water loss under varying conditions, and drew evidence-based conclusions from their own data. This matches the conclusions of Shittu et al. (2025) and Anil et al. (2025), who showed that structured, hands-on activities effectively bridge the gap between academic theory and practical execution, turning passive learners into capable scientific investigators. Furthermore, as Elkhailifa et al. (2021) and Fang et al. (2023) observed, reinforcing active inquiry within environmental and biological curricula develops the precise analytical habits needed for successful STEM research. A key finding of this study is the complete absence of a significant interaction effect between teaching methodology and gender across all tested variables. The experiential learning model enhanced the performance and practical skills of male and female students alike. This discovery strongly supports the work of Yusuf et al. (2019) and Iwuagwu and Okafor (2024), who noted that active, experience-driven models create a supportive, shared learning environment that eliminates traditional gender gaps in science engagement. When classrooms move away from passive lectures, female students are no longer sidelined; they engage equally in equipment setup, data recording, and hypothesis testing. This reinforces the view of Abdul-Hamid et al. (2009) that adjusting the instructional approach to focus on active, hands-on participation is essential for improving student physiological understanding across diverse groups. By providing equal access to physical, experiential inquiry, the model serves as an excellent tool for promoting gender equity in secondary science classrooms across Northern Nigeria. Finally, these findings have vital practical value for smallholder educational systems and secondary schools operating under resource constraints in Kaduna State. The successful implementation of experiential learning using low-cost, locally available biological materials and school gardens demonstrates that schools do not need expensive, imported laboratory kits to deliver high-quality science education. This aligns with the wider educational consensus that balanced, context-aware teaching methods can revitalize science classrooms, improve performance, and build the foundational skills necessary to support long-term regional food security, agricultural literacy, and scientific innovation (Chen et al., 2024; Xing et al., 2025).

Conclusion

This study evaluated the impact of experiential learning models on senior secondary school biology students in Zaria, Kaduna State. The empirical evidence confirms that the experiential learning model significantly improves students' academic performance and science process skills in plant physiology compared to the traditional lecture method. By guiding students through the full cycle of concrete experience, reflection, conceptualization, and active experimentation, the model turns abstract biological theories into clear, understandable concepts. Crucially, the study shows that this active approach is completely gender-inclusive, benefiting male and female students equally and helping close the equity gap in



Effects of Experiential Learning Models on ... Bako, L. S. P. (2026)

STEM education. We conclude that the widespread reliance on passive lecture methods in Zaria's secondary schools is a primary cause of low-test scores and weak practical skills. Adopting active, experiential methodologies is an effective way to improve biology education and prepare students for advanced scientific study.

Recommendations

Based on the findings of this study, the following recommendations are presented:

1. Secondary school biology teachers in Zaria and across Kaduna State should move away from passive lecture methods and actively integrate experiential learning cycles into their lessons, especially for complex topics like plant physiology.
2. The Kaduna State Ministry of Education, in partnership with tertiary institutions like Federal University of Education, Zaria, should organize continuous professional development workshops to train science teachers on how to design and manage low-cost experiential learning tasks.
3. Educational policymakers and bodies such as the Nigerian Educational Research and Development Council (NERDC) should explicitly integrate experiential learning frameworks and student-centered inquiry tasks into the National Senior Secondary School Biology Curriculum.

References

- Abdul-Hamid, H., Mohd-Hazimy, Y., Ab Shukor, N. A., & Mohamed-Hanafi, M. (2009). Effects of different fertilizer application level on growth and physiology of *Hibiscus cannabinus* L. (Kenaf) planted on BRIS soil. *Journal of Agricultural Science*, 1(1), 121–131. <https://doi.org/10.5539/jas.v1n1p121>
- Anil, N., Gumde, N., Bibi, I., & Bairwa, R. (2025). Comprehensive review of the effects of treated vermicompost on soil health, plant growth, and yield of okra (*Abelmoschus esculentus* L.). *Indus Journal of Bioscience Research*, 3(6), 372–380. <https://doi.org/10.70749/ijbr.v3i6.1477>
- Awolere, M. A. (2019). Effects of experiential and generative learning strategies on students' academic achievement, attitude to and practical skills in biology in Oyo State, Nigeria. *UI-Repository*, 1–15.
- Chen, X., Li, Z., Zhao, H., Li, Y., Wei, J., Ma, L., Zheng, F., & Tan, D. (2024). Enhancing maize yield and nutrient utilization through improved soil quality under reduced fertilizer use: The efficacy of organic–inorganic compound fertilizer. *Agriculture*, 14(9), 1482. <https://doi.org/10.3390/agriculture14091482>
- Chengere, A. M. (2025). Enhancing secondary school students' science process skills through guided inquiry-based laboratory activities in biology. *PMC*, Article PMC11984731.
- Elkhalifa, A. E. O., Alshammari, E., Adnan, M., Alcantara, J. C., Awadelkareem, A. M., Eltoum, N. E., Mehmood, K., Panda, B. P., & Ashraf, S. A. (2021). Okra (*Abelmoschus esculentus*) as a potential dietary medicine with nutraceutical importance for sustainable health applications. *Molecules*, 26(3), 696. <https://doi.org/10.3390/molecules26030696>
- Fang, X., Yang, Y., Zhao, Z., Zhou, Y., Liao, Y., Guan, Z., Chen, S., Fang, W., Chen, F., & Zhao, S. (2023). Optimum nitrogen, phosphorous, and potassium fertilizer application increased chrysanthemum growth and quality by reinforcing the soil microbial community and nutrient cycling function. *Plants*, 12(23), 4062. <https://doi.org/10.3390/plants12234062>
- Iwuagwu, C. C., & Okafor, C. B. (2024). Outcome of poultry manure rates and planting space on yield, incidence and severity of Fusarium necrotic leaf spot on roselle plants (*Hibiscus sabdariffa* L). *AKSU Journal of Agriculture and Food Sciences*, 8(3), 103–113.
- Lin, S., Zhao, X., Fu, Q., Ma, Z., Ma, Y., & Yang, T. (2026). Integrated organic-inorganic fertilization enhances soil microbial diversity and mitigates the yield-quality trade-off in pakchoi (*Brassica chinensis* L.). *Agricultural Water Management*, 325, Article 110189. <https://doi.org/10.1016/j.agwat.2026.110189>
- Lu, J., Zhang, X., Mu, Y., Gao, J., Yi, F., Wang, P., Jin, D., Tang, F., & Fan, W. (2025). Effects of organic fertilizer type and application rate on soil-microbe interactions, yield, and quality of greenhouse tomato. *Plants*, 14(21), 3333. <https://doi.org/10.3390/plants14213333>
- Nwuba, I. S. (2024). Probing experiential learning approach effect on critical thinking ability of secondary school students' in biology. *International Journal of Research in STEM Education*, 6(1), 45–58.
- Nwuba, I. S., & Osuafor, A. M. (2021). Effect of experiential learning approach on secondary school students' academic achievement in biology in Awka Education Zone. *South Eastern Journal of Research and Sustainable Development*, 4(2), 1–15.
- Ozoarinze, O. T. (2018). Influence of biology practical activities on academic achievement of senior secondary school students in biology. *Godfrey Okoye University Repository*, 1–24.
- Pany, P., Meier, F. D., Dünser, B., Yanagida, T., Kiehn, M., & Möller, A. (2022). Measuring students' plant awareness: A prerequisite for effective botany education. *Journal of Biological Education*, 58(5), 1103–1116. <https://doi.org/10.1080/00219266.2022.2159491>



Effects of Experiential Learning Models on ... Bako, L. S. P. (2026)

- Shittu, E. A., Aloba, A. I., & Buhari, F. Z. (2025). Growth and yield response of okra (*Abelmoschus esculentus* L.) as affected by varying rates of NPK fertilizer and cowdung manure in a semi arid ecology. *Journal of Agripreneurship and Sustainable Development*, 8(2), 1–11.
- Sinha, D., & Tandon, P. K. (2020). An overview of nitrogen, phosphorus and potassium: Key players of nutrition process in plants. In *Sustainable Solutions for Elemental Deficiency and Excess in Crop Plants* (pp. 85–119). Springer. https://doi.org/10.1007/978-981-15-8636-1_5
- Svandova, K. (2014). Secondary school students' misconceptions about photosynthesis and plant respiration: Preliminary results. *EURASIA Journal of Mathematics, Science and Technology Education*, 10(1), 59–67. <https://doi.org/10.12973/eurasia.2014.1018a>
- Xing, Y., Xie, Y., & Wang, X. (2025). Enhancing soil health through balanced fertilization: a pathway to sustainable agriculture and food security. *Frontiers in Microbiology*, 16, Article 1536524. <https://doi.org/10.3389/fmicb.2025.1536524>
- Yusuf, N., Ng, W. H., & Adzemi, M. A. (2019). Effects of organic fertilizers on growth and yield of roselle (*Hibiscus sabdariffa* L.) on bris soil. *Malaysian Applied Biology*, 48(1), 177–184.



Qualitative Assessment on Digitalization of ... Adeoye, K. F., Et. al. (2026)

Qualitative Assessment on Digitalization of Instructional Pedagogy among Higher institutions of Learning in Bauchi State, Nigeria

ADEOYE, Kayode Funminiyi¹

Email: adeoyefummy01@gmail.com

08032690679

MAIGARI, Mohammed Audu²

audumaigari@gmail.com

08060755703

ALKAMU, Fateh David³

davidfateh1971@gmail.com

08060745260

WAJE, Esther⁴

estherwaje78@gmail.com

08136477464

MSHELIA, Alheri Markus⁵

alherimark65@gmail.com

08065986471

¹Department of Business Administration, Adamu Tafawa Balewa Colleges of Education, Kangere, Bauchi State, Nigeria

²Department of Agricultural Science Education, Adamu Tafawa Balewa Colleges of Education, Kangere, Bauchi State, Nigeria

³Department of Voc. & Technical Education, Adamu Tafawa Balewa Colleges of Education, Kangere, Bauchi State, Nigeria

⁴Department of Christian Religion Studies, Adamu Tafawa Balewa Colleges of Education, Kangere, Bauchi State, Nigeria

⁵Department of English Language, Adamu Tafawa Balewa Colleges of Education, Kangere, Bauchi State, Nigeria

Abstract

Digitalization of instruction is no longer a contingency measure but a fundamental pedagogical requirement for higher institutions. This study adopts a mixed conceptual-empirical approach to examine digitalization as an imperative pedagogy for teaching and learning in Nigerian universities, polytechnics and colleges of education. Conceptually, the paper develops a model positioning digitalization as the integration of digital tools, pedagogy, and institutional culture to enhance access, personalization, and relevance. Empirically, a survey of 160 lecturers and students across three higher institutions in Bauchi assessed digital tool usage, digital literacy, and perceived impact on instruction quality. Findings reveal that while 68% of respondents agree digitalization improves access and feedback, only 42% report adequate digital literacy, and infrastructure deficit remain the top bottlenecks. The study concludes that digitalization is an indispensable pedagogy, meanwhile, its success depends on aligning National Information Technology Development Agency's [NITDA] Digital literacy policy, National University Commission [NUC] and National Board for Technical Education [NBTE] curriculum integration, and teacher capacity building. Recommendations are provided for policies designer and components of institutions.

Keywords: Digitalization, Digital Pedagogy, Tertiary Education, Instruction, Nigeria, NITDA, 3D Framework.

Introduction

Quality Education is among the fundamental Sustainable Development Goals of the 2030 Agenda of the United Nations and it goals to insure inclusive and equitable quality education and embrace lifelong learning opportunities for all, United Nations Educational, Scientific and Cultural Organization (UNESCO), (2015). Establishing the objectives of this goal requires digitalization among other things. Digitalization is a series of deep and cultural preservation, workforce and technology shifts that entails new educational and operating framework and transform an institution's business structure, strategic directions, and value proposition (Grajek S. & Reinitz B., 2019). Digitalization provides higher education institutions (HEIs) with opportunities to propel access to quality education and the essential tools and skills that contribute to ensuring equity in tertiary institutions (Kaputa V., Loucanova E. & Tejerina-Gaite F.A., 2022). The higher institutions sector has well-noted the substantial benefits of technological development for the growth of society and the provision of equitable quality higher education regardless of learners' foundations (Chankseliani M., Qoraboyeva E, & Gimranova D., 2021). That is why most higher education institutions globally are striving to adopt digital transformation as core component of their institutional strategic plan (Jensen T., 2019). Digitalization refers to the application of digital technologies to transform instructional processes, not just digitizing notes and assessments. As a pedagogy, it is not about replacing lecturers with screens, it redefines the teacher's task through redesigning instruction to leverage digital tools for



Qualitative Assessment on Digitalization of ... Adeoye, K. F., Et. al. (2026)

personalization, feedback, access, communication and involvement. The 21st century knowledge economy demands graduates who can think critically, engaged digitally, and adapt to rapid technological transformation. Obviously, traditional lecture-based instruction in many Nigerian tertiary institutions still dominant over application. In Nigeria, the Federal Ministry of Education has affirmed that, the future is technology-driven and artificial intelligence is now key to success, and without digital literacy thriving becomes a challenge, National Newspaper (2024).

Statement of Problem

Despite policy formulated by National Information Technology Development Agency's [NITDA], National University Commission [NUC] and National Board for Technical Education, to integrate digitalization as pedagogy in Nigerian higher institutions. Implementation remains fragmented and unrealistic. Recent investigations report low lecturer digital competence, students' negative perception and infrastructure inadequacy. Meanwhile, students are rapidly adopting generative artificial intelligent [AI] tools at rates above the global average. This creates a pedagogical gap, underscore the need for rapid policy implementation on adoption of technology as core pedagogy in higher institutions.

Objectives of Study.

1. Conceptually frame digitalization as an imperative pedagogy using the 3D Pedagogy structure.
2. Empirically assess the current state, perceived impact, and barriers of digitalized instruction in Nigerian higher education.

Research Questions

1. What conceptual framework analyzed digitalization as pedagogy?
2. Assess how digital tools and pedagogy are used for instruction?
3. What impact and barriers do lecturers and students aspire?

Literature Review

Global studies confirm digitalization enhance flexibility and outcomes when pedagogy leads technology. Digitalization of education is a core area of transformation for this industry (Olha P., 2021). It is said that changes associated with the application of digital technology in all aspects of human society are referred to as digitalization. Recently, the world is seeing an increasing influence of digital technology in professional and educational institutions. The rapid advancement of information and communication technology has changed the nature of many facets of public life, particularly the industrial revolution did in the 19th century (Fenwick T. & Edward R., 2016). The technical training of a contemporary expert includes the digitalization of education as a essential component. The significance and crops of information have been increasing rapidly and there are more multi-disciplinary studies and initiatives as a result of these advancements. In Nigeria, researchers identifies both prospects and challenges associated with digital transformations. Vanguard news (2025), study found pedagogic, technological, administrative, and socio-economic benefits of artificial intelligence integration, but also low awareness and infrastructure deficit. The application of digital technologies in teaching and learning has been accelerated globally over the last few decades. Emerging pandemics records, major cyber risks are caused by people's actions as well as failures of systems and technology (Wang L. & Alexander A.C., 2021). Competent technologies include 5G, blockchain, telemedicine, big data, cyber-attacks and cyber risks. Blockchain assisted for to reduced risks of pandemics, advanced the privacy and security of health systems, COVID-19 created new challenges in cybersecurity (Manalu E.P. & Gaffar J., 2020).

Digitalization of Tertiary Education

Three historical levels exist regarding the incorporation of Information and Communication Technologies (ICT) in higher education settings. First, is the extensive use of computers in accounting and office automation. Furthermore, is the advancement of highly specialized and certified software and their application in almost all other academic operations. Finally, there is a widespread use of communication software and Learning Management Systems (LMS) (Chong H. & Woo S., 2022). The use of Information and Communication Technologies in tertiary institutions was a gradual process which happened without much systematic need assessment nor any long-term strategy.

Pedagogical strategies for programming education

Explorations of key pedagogical strategies in programming education which encompassed collaboration, cognitive load management and the teacher's facilitative task. By evaluating designed collaboration and scaffolding, along with tools like



Qualitative Assessment on Digitalization of ... Adeoye, K. F., Et. al. (2026)

augmented reality. It underpins approaches that support student skill development, engagement, inclusive and effective learning in programming.

Flipped learning

Flipped learning create students with video lectures and other learner complement materials structure to teach and guide students outside of the classroom. This enable and promote valuable class time to be spent on more engaging and collaborative activities. Research by (Graziano K. J. & Hall J.D., 2017) considered flipped learning for newly arrived English language learners in mainstream public high schools in the U.S. The aim of the study was to unravel whether flipped algebra instruction affects the students' math's learning outcomes. The results indicates that there was no statistically significant difference in the academic performance of learners enrolled in algebra with flipped instruction compared to students enrolled in the same course with non-digital instruction.

Artificial intelligence and learning analytics

Artificial intelligence and learning analytics redefine education through personalised feedback, formative assessment and targeted interventions. Artificial intelligence tools such as intelligent tutoring systems and natural language processing, enable immediate feedback, mitigate teacher workload and promote student engagement. Learning analytics assists identify students at risk, enabling prompt interventions. Artificial intelligence enhanced collaborative tools support balanced group engagement and communication. Artificial intelligence applications also promote inclusivity, offering tailored accommodations for learners with disabilities.

Digital literacy in education

Digital literacy is the capability to locate, evaluate, use and create information using digital tools, platforms and frameworks. It includes several interconnected proficiencies essential for the effective use of technology in educational contexts. Technological comprehension is key, as it enables teachers and learners to effectively understand and use digital tools to achieve their goals.

Conceptual Framework: Digitalization as Imperative Pedagogy

Digitalization in Instruction.

Digitalization as pedagogy means instruction is intentionally redefined around digital accessibility. It moves beyond PowerPoint lectures to include adaptive learning, simulations, data-driven feedback, flipped classrooms, digital tools, digital content and digital pedagogy to establish learning objectives. NCCE's (2026) redesigned of the NCE curriculum now integrates artificial intelligence awareness, ethical use of emerging technologies, digital literacy and adaptive digital pedagogy.

The 3D Pedagogy Model, we propose three interlocking dimensions

- 1. Digital Tools D1:** The infrastructure and software. This includes Moodle, artificial intelligence tutors, video platforms and simulation software. NBTE (2025), is deploying decentralised artificial intelligence and machine learning centers that run on intranet so universities, polytechnics and colleges of education with poor internet can still access uniform technology tools.
- 2. Digital Pedagogy D2:** Applicable teaching methods. Examples include flipped classrooms, microlearning, adaptive assessment and prompt engineering for artificial intelligence. uLesson's digital homework assist now gives personalised learning, the artificial intelligence feature navigates responses to each student's individual needs.
- 3. Digital Culture D3:** The educational mindset, policy, and ethics. NITDA's draft National artificial intelligence Strategy 2024 envisions responsible, ethical and inclusive innovation. NUC and NITDA held a national dialogue in 2024 to formulate consensus guidelines for responsible, ethical and safe use of artificial intelligence in Nigerian tertiary institutions.

Proposed Conceptual Framework

Inputs: Digital infrastructure + Digital literacy + Policy support.

Process: Digital pedagogy in classroom design, delivery and assessment.

Outputs: Improved access, engagement, learning outcomes and 21st-century skills. The model argues that digitalization only becomes imperative pedagogy when all three inputs are present. Perhaps, when D1 + D2 + D3 are aligned.

Deficiency in any dimension undermines the others.

Imperativeness of Digitalization

Drivers that make it non-negotiable:



Qualitative Assessment on Digitalization of ... Adeoye, K. F., Et. al. (2026)

1. Scale: One lecturer cannot give effective feedback to 200 students. Digital tools are efficient in this aspect.
2. Relevance: Employers demand digital fluency and proactiveness. NITDA notes spectrum of employees still lack the digital skills required to use modern systems.
3. Access: Digital tools extend and navigate learning beyond physical lecture theater walls. During COVID, uLesson saw 70% month-on-month growth as students adapted to remote education.
4. Personalization: Adaptive systems adjust content difficulty per student, addressing Bloom's 2-sigma problem of needing individual tutoring and effective problem solving.

The study is anchored on these relevant theories

Cognitive load theory

Cognitive Load Theory as explained by (Sweller J.P., Ayres S. & Kalyuga S., 2011), examines how the human brain processes information, emphasising the deficiency of working memory when learning new material. This theory provides a model for understanding how mental effort is allocated during learning and how it can be optimised to enhance knowledge acquisition and retention. Cognitive Load Theory is particularly relevant in the context of digital education, where the structure of digital tools and learning climate can significantly influence cognitive load.

Motivational theory

Motivational theory particularly self-determination theory equivalence, although is not the prime focus. Relevancies of digitalisation relating to motivation in education. This theory described motivation through three basic psychological needs: autonomy, competence and relatedness. When these needs are established, students are more likely to experience intrinsic motivation and engage in learning for their immediate benefits rather than external recognitions.

Methodology

Mixed method approach was adopted, comprises descriptive survey design and Quantitative data tested the 3D Framework propositions of design was adopted in Bauchi, North-East Nigeria. The population comprised students and academic staff from selected tertiary institutions. (Using Trek's formula 1994), 160 respondents were sampled from a population of 410. Questionnaires distributed physically and via Google Forms using a five-point Likert scale. Data analyzed using SPSS v27. Descriptive statistics: frequencies, percentages, mean. Decision mean = 2.50. Inferential: t-test to compare lecturer vs student perceptions.

Population: Total population of one hundred and sixty [160] lecturers and undergraduate students in three higher institutions comprises Abubakar Tafawa Balewa University Bauchi, Federal Polytechnic Bauchi and Adamu Tafawa Balewa College of Education Kangere.

Sample: One hundred and sixty [160] respondents via stratified random sampling. Sixty [60] lecturers and one hundred [100] students. Margin of error 4.8% at 95% confidence.

Instrument

Digitalization Pedagogy Assessment Questionnaire [DPAQ] with 32 items. Section A: Demographics Section B: Digital Tools usage 5-point Likert, Section C: Digital Pedagogy practices Section D: Digital Culture and policy perception. Section E: Impact and barriers.

Validity: Face and content validity by 4 experts in educational technology. Reliability: Cronbach's alpha = 0.87.

Presentation of Results

Demographics Composition

Demographics comprises of 63% students, 37% lecturers. 55% universities, 30% polytechnic, 15% college of education.

Extent of Digitalization: Digital Tools and Pedagogy

Item	Mean	Decision
My institution has a functional LMS for courses	3.21	Accepted
Lecturers share recorded lectures/notes digitally	3.05	Accepted
Use of AI tools for quizzes or feedback is common	2.28	Rejected
Interactive simulations/virtual labs are used in my course	2.14	Rejected
Instruction includes flipped classroom activities	2.41	Rejected



Qualitative Assessment on Digitalization of ... Adeoye, K. F., Et. al. (2026)

Basic fundamental digitalization is been practiced in most of our higher institution. Advanced digital pedagogy is rare. Meanwhile, inadequate Infrastructures and cost implication are top barriers. Unstable power and poor internet and low digital literacy among lecturers is critical to possible implementation digital transformation policy. This supports NBTE's need for decentralised Artificial Intelligence laboratories. Proximity 38% agreed that institution has clear policy on ethical use of digital tools. 44% consented to the fact that leadership actively supports digital teaching. This shows Digital Culture D3 is inactive in the framework or link. This is an indication that Digitalization is in place, but shallow and ineffective.

Perceived Impact

Item	Mean	Decision
Digitalization improves access to learning materials	3.52	Accepted
Digital tools make feedback faster	3.36	Accepted
Digital instruction increases student engagement	3.24	Accepted
Digitalization reduces overall teaching workload	2.33	Rejected

The results from analysis confirm the conceptual model D1 recognised at basic level such as file sharing and transferring. D2 is weak because few lecturers use adaptive technologies or flipped methods. D3 is weakest and worst, revealed policies and culture lag. This explains why workload does not reduce despite application of tool. In addition, respondents significantly and strongly agree that digitalization improves access, feedback, and engagement. This underscored uLesson and Gradely impact data showing grade-level improvements and percentile gains. But without D2 and D3, the outcome remained limited. t-test showed no significant difference between lecturer and student ratings of impact $p > 0.05$, but lecturers rated barriers higher $p < 0.05$. It is obvious, students already using Artificial Intelligence at high rates, institutions must digitalize instruction to monitor and support usage, teach ethics, and ensure relevance. If not, the classroom becomes irrelevant. Digitalization is imperative not optional.

Conclusion

This mixed study reveals that digital learning activities, which promote purposeful communication, engagement, collaboration and inclusive amongst teachers and learners, provide massive opportunities to converse in creative, innovative and meaningful ways when compared to non-digital learning activities. Digital transformation was validated as an imperative pedagogy for higher institutions. Conceptually, the 3D Pedagogy Framework indicates that policies, designs and tools alone are insufficient. Empirically, Nigerian institutions have made drastic progress on access but lag in pedagogy and culture. Without urgent and adequate implementation, these effects will continue to undermine educational and national development.

Recommendations

1. Policy Level: NUC, NBTE, and NCCE should enforce digital pedagogy courses across teacher training and faculty development programs. Accelerate NUC and NITDA plan to embed AI and digital skills in all university curricula.
2. Institutional Level: All institutions should publish a Digital Teaching and Ethics Policy in alignment with Nigeria Data Protection Act 2023 and NITDA AI guidelines. Invest in solar-powered laboratories and offline content servers like NBTE's intranet AI center.
3. Lecturer Level: Departments should run regular micro-training on digital pedagogy skill such as creating quizzes on LMS, using AI for feedback and designing flipped lessons.
4. Future Research: Longitudinal quasi-experimental studies comparing learning outcomes of digitalized to traditional classes, using platforms like uLesson to track metrics.
5. Students Level: Exploring communicative digital tools into teaching and learning such as Facebook and discussion forums, to drive critical learning areas and digital literacy across subjects. Foster 21st century skills and embrace cultural awareness and digital citizenship.



Qualitative Assessment on Digitalization of ... Adeoye, K. F., Et. al. (2026)

Reference

- Chankseliani M., Qoraboyev I., & Gimranova D. (2021). Higher education contributing to local, national, and global development: new empirical and conceptual insights. *Higher Education*, 81, 109-127.
<https://doi.org/10.1007/s10734-020-00565-8>
- Chong, H. & Woo, S. (2022). Analysis of the effect of learners' preference for online classes on online course satisfaction. *Korean Journal of General Education*, 16(2), 257-273.
- Fenwick T. & Edwards R. (2016), Exploring the impact of digital technologies on professional responsibilities and education, *European Educational Research Journal*, vol. 15, no. 1, pp. 117–131, 2016.
- Grajek S., & Reinitz B. (2019). Getting ready for digital transformation: Change your culture, workforce, and technology. *EDUCAUSE*. <https://er.educause.edu/articles/7>.
- Graziano K. J., & Hall J. D. (2017), Flipped instruction with English language learners at a new high school. *Journal of Online Learning Research*, 3(2), 175–196.
- Jensen T. (2019). Higher education in the digital era: The current state of transformation around the world. Paris: International Association of Universities.
- Joyce, I. O., Anthonia, C. I., & Blessing, O. L. I. (2025). Prospects and challenges of AI integration into Nigerian educational systems. *International Journal of Library Science & Education Research*, 7(8), 85-97.
- Kaputa V., Loučanová, E., & Tejerina-Gaite, F. A. (2022). Digital transformation in higher education institutions as a driver of social oriented innovations. (pp. 61-85).
- Manalu, E. P. Gaffor J. (2020). Role of information technology for successful responses to covid-19 pandemic. *International Conference on Information Management and Technology*.
<https://doi.org/10.1109/ICIMTech50083.2020.9211290>
- National Commission for Colleges of Education. (2026). NCCE commences comprehensive review of NCE curriculum, integrates AI and emerging technology standards. <https://ncce.gov.ng>.
- National Information Technology Development Agency. (2025). GITEX: Nigeria positions itself as Africa's AI powerhouse. <https://nitda.gov.ng>.
- Olha P. (2021), Technological challenges of our time in the digitalization of the education of the future, *FED*, vol. 1, no. 2, pp. 4-13.
- Sweller J., P. Ayres S. & Kalyuga S., (2011), *Cognitive Load Theory*, Springer New York, <https://doi.org/10.1007/978-1-4419-8126-4>.
- TechCrunch. (2024). African edtech startup uLesson raises \$15M. <https://techcrunch.com>.
- The Nation Newspaper. (2024), Developing consensus framework for AI's use in Nigerian higher education. <https://thenationonlineng.net>
- Umar, A., & Liang, J. (2024), Barriers to incorporating artificial intelligence courses in Nigerian higher education. *SSRN Electronic Journal*. <https://doi.org>.
- United Nations Educational, Scientific and Cultural Organization [UNESCO], (2015). <https://fmino.gov.ng>
- Vanguard News. (2025). Technical education board mulls decentralised AI, machine learning for polytechnics. <https://vanguardngr.com>
- Wang L., & Alexander A. C. (2021). Cyber security during the COVID-19 pandemic. *Aims Electronics and Electrical Engineering*, 5(2). 146-157 <http://dx.doi.org/10.3934/electreng.2021008>.



Leveraging on Pedagogical Potential of Scriptwriting in Mathematics Classroom among Prospective Teachers in Waziri Umaru Federal Polytechnic, Birnin Kebbi, Nigeria

SANI, Mukhtar Muhammad¹

mmsani@wufpbk.edu.ng,

SANI, Muhammad Abdurrahman²

abdurrahman@wufpbk.edu.ng

BAYARO, Aliyu¹

UCHIRI, Abdulazeez Muhammad Tanko¹

¹Department of Mathematics, Waziri Umaru Federal Polytechnic Birnin Kebbi, Kebbi State, Nigeria

²Department of Science Education, Federal University Birnin Kebbi, Kebbi State, Nigeria

Abstract

This paper explores the pedagogical potential of scriptwriting in mathematics classroom, drawing insights centered around the concept of number line from prospective teachers. 30 prospective teachers enrolled in National Certificate of Education (NCE) II from Waziri Umaru Federal Polytechnic Birnin Kebbi, Kebbi State, Nigeria were used for this study. The study positions scriptwriting as a transformative instructional strategy that bridges abstract mathematical concepts with real-life applications through the Gradual Release of Responsibility (GRR) model using the phrases: “I do, we do, and you do” to deliberating the use of number line to generate multiplication table via skip-counting. The study highlights the purpose of scriptwriting in mathematics classroom, then uses the acronym “MATH S-C-R-I-P-T” to suggest a concise procedure for writing a mathematics dialogue, and also demonstrates a real-time assessment of a sample fictional dialogue involving two skeptical peers using the Knowledge Quartet (KQ) dimension contributory codes as an observation card. The findings feature scriptwriting as a reflective and diagnostic tool for cultivating creativity, critical thinking, communication and instructional design skills. Additionally, scriptwriting offers a dynamic approach to traditional instructions by engaging prospective teachers with a form of dramatized imaginary conversational exchange adequate for enhancing mathematical, and pedagogical content mastery of prospective teachers.

Keywords: Scriptwriting, Number line, Skip-counting, Pedagogy, Math-Script.

Introduction

In the evolving landscape of mathematics education, integration of creative teaching strategies has become central to fostering student's engagement. One such strategy gaining traction is the use of scriptwriting. Scriptwriting often referred to as lesson-play or teaching simulation (Kar, Ozturk, Ocal & Ozkaya, 2025) has been used as a valuable teaching strategy and a research tool in several contexts that enable teachers to rehearse pedagogical moves and reflect on their instructional decisions in an imaginative format (Zazkis, Sinclair & Liljedahl 2013; Zazkis & Zazkis, 2014). In this technique participants are asked to write imaginary interaction between a teacher and his students in form of a lesson-play, this expanded overtime to include classroom activities that describes dialogue between characters to resolve a problematic situation, a disagreement, a student error or inappropriate reasoning (Kar et al., 2025). Scriptwriting serves as a medium for assessing prospective teachers understanding, knowledge and teaching skills in mathematics classroom (Herbst & Milewski 2018; Kontorovich 2018; Dahl, Enge, Hensen & Valenta 2019; and Arnesen & Valenta, 2023). To this end, Dahl et al. (2019) considers scriptwriting suitable for prospective teaching experiences. Script writing is taking an idea and making it into a story that will be realized in action and dialogue (Frank 2006). Zazkis et al. (2013) sees scriptwriting as a tool for advancing prospective teachers' knowledge in mathematics, the researchers argued that the advancement is expected to grow through structured prompts (in this case the scripted dialogue) designed to address challenges in mathematics content and pedagogy. Scriptwriting is worthy of use in this research as it provides insights into participants pedagogical potentials. The study was guided by a research question asking; What insights about pedagogical knowledge can be gained from analyzing prospective teachers' script in Birnin Kebbi, Kebbi State, Nigeria?

Literature Review

Purpose of Scriptwriting in Mathematics Classroom

In line with the Zazkis & Zazkis (2014); Dahl et al (2019); Krecher & Zazkis (2024), scriptwriting seeks to influence mathematics classroom in the following manner:

1. Deepen students understanding as they struggle to break-down and resolve mathematics problems whilst confronting and correcting misconceptions

Leveraging on Pedagogical Potential of Scriptwriting in Mathematics Classroom among ... Sani, M. M., Et. al. (2026)

2. Builds communication skills in an attempt to transform mathematics ideas into fictional story circles.
3. Envision student's creativity in their bid to creating meaningful learning experience.
4. Promotes pedagogical skills by offering avenue for simulating classroom realities.
5. Makes abstract mathematics concepts more relatable whilst confronting and correcting misconceptions
6. Serve as a means for assessing participants' pedagogical and mathematical content knowledge.

Procedure for Writing a Mathematics Script

The current study uses the acronym "MATH S-C-R-I-P-T" to suggests a framework that supports meaningful learning experience in mathematics classroom and guides the writing process of a creative and concise mathematics dialogue, these includes:

MATH: Make Abstract Thinking Human

Purpose: Use analogy, diagram or manipulative to connect Mathematics idea to everyday experience.

Example: Draw a simple line on a piece of paper; label from -5 to 6. Try adding $2 + 3$; start at 2, count right 3 units to 5. For subtraction, like $4 - 6$; start at 4, count left, 6 units to -2 . This demonstrates addition and subtraction of numbers in real life.

S: Select a concept

Purpose: Select a mathematics concept to be explored in line with curriculum whilst clearly emphasizing the behavioral objectives to be attained.

Example: Basic Arithmetic (Generate the multiplication table using the number line)

C: Create characters

Purpose: Assign roles to represent diverse viewpoints in line with the adopted script format. Dialogue between Skeptical peer, teacher – curious explainer, role play, etc.

Example: "Abdu and Meri are two skeptical peers deliberating the use of number lines to generate the multiplication table."

R: Raise a conflict

Purpose: Introduce a challenge, argument, or disagreement that require mathematical reasoning to resolve.

Example: "Abdu claims that multiplication table can be generated from the number line. But Meri disagrees and ask for a clear demonstration."

I: Investigate solutions

Purpose: Let characters explore, reason and solve the problems. Encourage them to explain their thinking in writing.

Example: "Abdu: By skipping one place (forward jump) on the number line, multiplication table of 2×1 is generated."

P: Probe the procedure

Purpose: Use questions and justifications to guide the dialogue while integrating misconceptions and corrections to support deeper understanding.

Example: "Meri: Why skip numbers instead of just move sequentially? Abdu: Skip-counting is the building block for multiplication (forward jumps) and division (revers jumps). E.g., for 2×3 , we skip one place three times to land on 6."

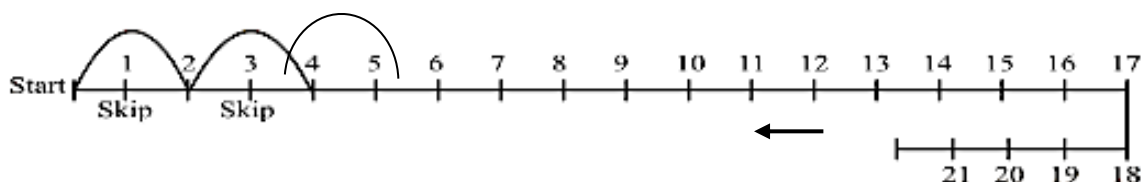


Figure 1: Number line showing skip-counting

Source: Sani, Sani, Abdullahi & Bayaro (2023)

T: Tie-up with reflection

Purpose: End with a clear reflection, insight or new question that reinforces the learning objective

Example: "Meri: Wow, what happens if I want to generate five times table, how many numbers must I skip? Abdu: You skip four places on the number line, to generate the multiplication table of five."



Review of Related Studies

Zazkis & Zazkis (2014) reveal that scriptwriting encourages active engagement, foster mathematical content knowledge and pedagogical skills of prospective teachers. Additionally, the authors advocate the use of scriptwriting to improve prospective teachers' pedagogical skills. Dahl et al. (2019) define lesson plays as scripted, imagined classroom conversation between a teacher his students. Their findings reveal that lesson plays foster prospective teachers conceptual understanding and professional knowledge for teaching mathematics. In another study Krecher & Zazkis (2024) suggests that scriptwriting promote deep reflection, reveal conceptual gaps and fosters pedagogical creativity. It could be deduced from the foregoing that a number of studies have investigated the use of scriptwriting in mathematics classrooms. Qualitative research design was employed to interpret content knowledge and pedagogical development of prospective teacher. The researchers analyze the content and structure of the scripted dialogue using thematic interpretations to identify pedagogical skill and the four-knowledge quartet to understand pedagogical development of each participant. Obviously, the literatures reviewed present the written scripts as a form of conversational exchange that involves at least two characters; dialogue between students, teacher-student interaction, and role-play. Benefits drawn from the content, structure, and characters of the scripted dialogue as well as the methodology of the reviewed literatures were used as a guide in the present study. However, the present study identifies and demonstrates in real-time the procedure for writing a mathematics script.

Theoretical Framework

Effective teaching is a dynamic interplay between instructional design and pedagogical content knowledge. In exploring the complexities of classroom dynamics, this study draws upon two complementary theoretical frameworks: The gradual release of responsibility model and the Knowledge quartet. Together, these, frameworks provide a robust lens for examining how to scaffold learning.

The Gradual Releases of Responsibility (GRR) Model

The study adopts the Gradual Release of Responsibility (GRR) model refined by Douglas Fisher and Nancy Frey to execute this study, which is deeply rooted in scaffolding theory developed by constructivists like of Lev Vygotsky and Jerome Bruner. To them, scaffolding describes how teachers support students just enough to help them succeed, then gradually remove the support as they become efficient. This gradual shift is designed to build learners confidence, competence, and independence in the classroom. The GRR model was coined using the phrases: “I do, we do, and you do” to describe how teacher can slowly shift the engagement of learning from the teacher to his students, can be integrated into scriptwriting through giving students chance to watch as passive observers and listeners (where teacher demonstrate how to do something), then working alongside the teacher with less support (where teacher and students do it together), and finally to the point of allowing student to work independently taking full ownership of the learning experience (student try it on their own).

The Knowledge Quartet Framework

The Knowledge Quartet (KQ), developed by Rowland, Huckstep Thwaites (2005) emanates from Shulman's (1986) concept of Pedagogical Content Knowledge (PCK), which emphasize the importance of blending content knowledge with effective pedagogical strategy (Dahl et al. 2019). The KQ extends PCK in practice by offering a robust practical tool for analyzing and developing mathematics teaching in real-time via teacher's knowledge, based on the belief that subject matter knowledge must be complemented with effective teaching strategies in mathematics classroom (Rowland et al. 2005). The KQ framework highlight how teachers utilize their knowledge in classroom through four interrelated dimensions: Foundation, Transformation, Connection, and Contingency). *Foundation dimension* denotes the prospective teacher's math knowledge, pedagogical awareness and understanding of the curriculum (i.e., knowledge acquired through educational training). *Transformation dimension* denotes ability to breakdown, modify, or convert foundational knowledge to meet the learners needs using examples, analogies, and demonstrations. *Connection dimension* highlights the ability to articulate logical relationship (prior-new, complex-simple or abstract-concrete) concerning the transformed knowledge through relationships and representations. *Contingency dimension* being the final, reflects prospective teachers' responsiveness to unexpected classroom events demanding revised explanation, this could be through questioning or while correcting student errors and misconceptions.



Leveraging on Pedagogical Potential of Scriptwriting in Mathematics Classroom among ... Sani, M. M., Et. al. (2026)

The Sample Study

In this study, a sample script was presented to give an idea about how the data would be analyzed. The MATH-Script procedure was employed to consider conversation between two curious characters with respect to number line. To create a dialogue between the characters the script writers have to assume each role, and present or interact from the perspective of the diverse characters. The topic focused on generating the multiplication table through skip counting on the number line. In particular, the participants were introduced to the method of skip counting that is to say if “n” is a positive integer, we skip count (n – 1) times from left to right (forward skipping) starting at zero on the number line to illustrate the Multiplication of numbers. On the other hand, we can also skip (n – 1) times from right to left (reverse skipping) starting from a given number to illustrate the Division of numbers using the number line. It is worthy of note that “n” in the case of Division is the divisor. So, for $6 \div 2$ “6” is called the dividend and “2” the divisor we have, $(2 - 1) = 1$. This means (reverse skipping) one place starting from “6”. A script of dialogue between these two characters that include exchange of their viewpoints was prepared. Consider the examples, experience or patterns they both used to convince each other that led Abdu to his conclusion. The paper annotates the script and analyzed the argument between the characters using the knowledge quartet dimensions contributory codes observation rubric.

Abdu and Meri are two skeptical peers deliberating the use of number lines to generate the multiplication table.

Abdu claims that multiplication table can be generated from the number line. But Meri disagrees.

I DO: Teacher demonstrate how to do something

1. Abdu: Claim multiplication table can be generated from a number line.
2. Meri: Can you give me an example?
3. Abdu: By skipping one place on the number line, multiplication table of 2 will be generated.
4. Meri: How is that possible, now that we don't have a number line chart?
5. Abdu: No problem, we can improvise and draw one together.
6. Meri: What do you mean by that, and why skipping instead of just moving sequentially along the number line?
7. Abdu: Skip-counting is the building block for multiplication (forward jumps) and division (reverse jumps) e.g., for 2×3 , we skip one place of size three to land on 6. So, sequential movements (to-and-fro) demonstrate addition or subtraction.
8. Meri: How do you mean, we skip one place of size three, and how does that even align with 2×3 ?
9. Abdu: Okay, how many jumps did you take, what is the size of the jump, and what does that lead you to?
10. Meri: I take one jump and skip three places, from zero to land on 4
11. Abdu: Oh no Meri...! by skipping one place three times (of size three), you are required to skip one place three times, from 0 you skip one place to rest on 2, skip one place again from 2 rest on 4, and skip one place again from four to finally land on 6 three jumps in total)
12. Meri: Wow, it appears to be so interesting and in line with $2 + 2 + 2$ or two rows of three...!
13. Abdu: Really, oya tell me how does the array (two-rows of three) and $(2 + 2 + 2)$ match skip-counting on the number line?
14. Meri: Two-rows of three items represents counting every item in row one and row two, $2 + 2 + 2$ means adding 2 three times, which matches making three jumps of 2 units on the number line.
15. Abdu: Brilliant, how many numbers must I skip in order to generate the five times table on the number line?
16. Meri: You skip four places, if you want to construct the multiplication table of five.
17. Abdu: Astonishing, what if I want to construct the multiplication table of one?
18. Meri: I guess we don't skip any place; we just move around sequentially from place to place for the said number of times for 1-times table.
19. Abdu: Ahh, it works. I have noticed a pattern, while constructing the multiplication table, we are skipping one less than the element we are generating for $(n - 1)$.

WE DO: Teacher and learners work on it together

20. Meri: Exactly...! you are on point Abdu, but I am curious whether this trick is true for Division.



Leveraging on Pedagogical Potential of Scriptwriting in Mathematics Classroom among ... Sani, M. M., Et. al. (2026)

21. Abdu: Sorry Boss, I don't think the trick will work for division of numbers. Besides, how do we skip-count in the case of division?
22. Meri: I don't know, how about we skip-count in the opposite direction since multiplication is the reverse of division.
23. Abdu: Hmm... that's an interesting thought, Meri. I don't have that in mind today, but let's test $6 \div 2$ and see even though it appears somewhat challenging. But then how do we resolve $(n - 1)$ in this instance?
24. Meri: It is worthy of note that "n" in the case of Division is the divisor. So, for $6 \div 2$ "6" is called the dividend and "2" the divisor we have, $(2 - 1) = 1$.
25. Abdu: Oh..., This means (reverse skipping) one-one places starting from "6".
26. Meri: Wonderful, this makes so much sense. For $6 \div 3$ we skip 2 places and for $6 \div 6$ skip 5 places all in reverse starting from the number "6" on the number line.
27. Abdu: Truly Meri; I'm now convinced that division of numbers can also be illustrated using the number line through skip counting.
28. Meri: Sure Abdu, I'm really glad that you challenged me when I first suggested that and I think it is safe to say that appropriate use of the number line eases multiplication and division.

YOU DO: Learners recreate it on their own (Assessment)

29. Teacher: Prepare a mathematics script between two skeptical peers to deliberate the use of addition and subtraction centered around the concept of number line.

The above task is a strong example of how prospective teachers can use creative methods like the scriptwriting to explore and express their knowledge of mathematics and pedagogical practice.

Table 1: The KQ Observation Rubric for Scriptwriting Assessment

Dimension	Contributory Codes	Evidence	Insight/Rating (S/W/N)
Foundation	Awareness of purpose	1, 26	Aims to build beyond rote Memorization(S)
	Adherence to textbook	3 – 26	Demonstrate awareness of curriculum and level appropriateness (W)
	Concentration to procedures	5	Emphasizes stepwise approach to problem solving(S)
	Overt display of subject knowledge	11, 19	Reflect clear understanding of mathematical procedure (S)
	Theoretical underpinning of pedagogy	24	Reflects understanding & development of numerals (S)
	Use of terminology	7, 18	Reflect understanding of mathematical vocabularies. (W)
	Identifying errors	8	Spotting reasoning or notation misuse for apt intervention (W)
Transformation	Communication	12, 14	Clear/accurate expression of mathematical ideas (S)
	Choice of examples	5, 13, 15, 18-22	Use of appropriate and purposeful examples to express math ideas (S)
	Choice of representation	12 – 14	Refers to effective use of different models to express a concept (S)
	Use of instructional materials	5, 7, 9, 12, 14, 22 16	Physical/digital tools used to deliver the chosen representation (S)
	Teacher/Learner demonstration (to explain a procedure)	5, 7, 9, 12, 14, 22	Clearly shows how to perform a procedure ()
Connection	Anticipation of complexity	4, 15, 19	Extent of application on related concepts, in this case division (S)
	Decision about sequencing	15 – 18	Logically order math content from simpler-complex ideas (S)
	Recognition of conceptual appropriateness	2, 10, 20, 22	Learner engagement in developing and validating ideas (S)



Leveraging on Pedagogical Potential of Scriptwriting in Mathematics Classroom among ... Sani, M. M., Et. al. (2026)

Contingency	Making connection between procedures	9	Emphasizes steps, methods or how to solve problem (S)
	Making connection between concepts	13, 22, 26	Emphasizes idea, meaning or why procedures work (S)
	Teacher/learner insight during instruction	9, 22, 25	Ability to engage and build on student thinking (S)
	Responding to students' ideas	23, 27	Active listening to adapt & validate learner's contribution (S)
	Deviation from agenda	23	Ability to shift focus to address emergent learners needs (W)
	Responding to the unavailability of tools and resources	3	Flexibility to modify plans based on available materials (S)

Key: (S) Strong/Solid, (W) Weak, (N) Neutral/Not applicable

Source: Field work (2025)

Table 1 organizes scriptwriting assessment into four pedagogical dimensions, each includes *Contributory codes* for assessing specific aspects of prospective teachers' mathematics and pedagogical content knowledge, *Evidence* of observable indicators of performance that points towards a particular code, *Remark* paired with *Rating* to interpret quality of what each code assesses within its domain and how well the script mirrored each and every contributory code. We will now use the KQ dimension contributory codes observation rubric to analyze the dialogue between Abdu and Meri.

Methodology

Participants

30 prospective teachers who were enrolled in NCE II in Waziri Umaru Federal Polytechnic Birnin Kebbi were presented with a scenario in which two characters interacts with each other on addition and subtraction in an attempt to work on arithmetic strategies to find the sum and difference of two numbers using the number line. These prospective teachers are charged with the task of writing a script independently for 10 to 20 minutes-long discussion to be realized in a mathematics classroom, with each character attempting to convince the other of the validity of their diverse viewpoint. The discussion is supposed to be in line with the specific objectives drawn from Nigerian Educational Research and Development Council (NERDC) curricula for teaching addition and subtraction in Primary Two. The choice of this sample was influenced by factors such as time constraint, cost implication, and also the subject's convenience. It could be deduced from the forgoing that the pedagogical and mathematical content knowledge of all the prospective teachers involved in this task is expressed in the claims made by their assigned characters. The participants were further advised that the characters in their scripts might expose incorrect justification or claims, or inappropriate mathematical expressions, but this should be acknowledged and addressed in the study, draw clear distinction to differentiate between the language and argumentation that the script writers attributed to their characters. Particular information on how the task would be assessed known as the observation rubric is neither provided nor sought by participant.

Data Analysis

This study adopts the Rowland (2014) KQ dimension to analyze teaching quality of the scripted dialogue with respect to instructional design. For each dimension, there exist contributory codes to describe instances or actions in teaching where script writer's math and pedagogical knowledge manifest (Rowland 2014). The data analysis for this study was conducted in three steps. First, the 30 scripts were analyzed independently by the four researchers using the observation rubric for scriptwriting analysis, before coming together to compare and discuss an agreed upon interpretation of the contributory codes and yet again identify evidence of such actions in each participant's script. The observation rubric was certified for face, content, and construct validity before-hand by experts in mathematics education research, who recommends the notion (solid, weak, & not-applicable) suitable for rating the contributory codes.

Presentation of Results

The result of the data collected were presented according to insights concerning pedagogical knowledge focusing on the four KQ dimensions. The findings reveal a mix of what prospective teachers are doing well and areas they need to improve. The purpose of the data collected is not to provide a quantitative assessment of the script dialogue, but rather, serves as a tool to help recognize the specific aspects of prospective teachers' pedagogical insights that were captured in the script.

Foundation Dimension

Leveraging on Pedagogical Potential of Scriptwriting in Mathematics Classroom among ... Sani, M. M., Et. al. (2026)

Table 2: Prospective Teachers' Scripts that Captures the Foundation Dimension

Contributory code	Strong	Weak	Not applicable
Awareness of purpose	26	03	1
Adherence to textbook	19	11	-
Concentration to procedures	25	05	-
Theoretical underpinning of pedagogy	23	07	-

Source: Field work 2025

Table 2 highlight insights into prospective teachers' pre-instructional knowledge such as awareness about curriculum use, teaching strategies, classroom responsiveness, and instructional design, all of which yielded positive results. A significant majority of the participants (n=26) demonstrated strong awareness of instructional purpose, indicating clarity in lesson objectives and intended learning outcomes. Similarly, 25 participants exhibited a strong concentration on procedural fluency in mathematics instruction. Moreover, 23 participants showed a solid grasp of the theoretical underpinnings of pedagogy, reflecting an understanding of educational principles guiding their instructional choices. However, adherence to textbooks was comparatively weaker, with only 19 participants rated strong and 11 rated weak. This suggests partial disconnect between instructional practices and curriculum materials, potentially

Transformation Dimension

Table 3: Prospective Teachers' Scripts that Captures the Transformation Dimension

Contributory code	Strong	Weak	Not applicable
Use of instructional materials	17	13	-
Teacher demonstration (to explain a procedure)	-	-	30

Source: Field work 2025

Table 3 shows a mix of strength and challenges on insights that addresses how teachers present mathematical ideas to life in classroom. It is evident that 17 participants utilized instructional materials effectively while 13 were rated weak, which highlights variability in the integration of visual and physical tools to support conceptual understanding. One major concern was that not a single prospective teacher demonstrates how to carry out mathematical procedure during his lessons. This means students may miss out on seeing step by step approach to problem solving, which is essential for scaffolding.

Connection Dimension

Table 4: Prospective Teachers' Scripts that Captures the Connection Dimension

Contributory code	Strong	Weak	Not applicable
Anticipation of complexity	10	15	5
Decision about sequencing	28	2	-

Source: Field work 2025

Table 4 also shows a mix of strength and challenges on insights that reflect how well prospective teachers link mathematical ideas, plan lesson sequence and anticipate students misconceptions. The result showed 28 participants demonstrating strong ability to organize their lessons, indicating a well-developed sense of instructional progression and coherence. However, only 10 participants were able to predict the kinds of difficulties students might encounter, clearly suggesting that many prospective teachers struggle to foresee potential students' misconceptions or areas of difficulty, which could hinder effective remediation.

Contingency Dimension

Table 5: Prospective Teachers' Scripts that Captures the Contingency Dimension

Contributory code	Strong	Weak	Not applicable
Responding to students' ideas	16	11	3
Deviation from agenda	23	7	-
Responding to the unavailability of tools and resources	21	9	-

Source: Field work 2025

Table 5 shows a mix of strength and challenges on how well prospective teachers addresses students ideas or unexpected classroom challenges. The result portrays strong instructional flexibility and situational awareness, with 23 participants adjusting their lesson plans to adapt meaningful students contributions and 21 participants improvising to teach with limited



Leveraging on Pedagogical Potential of Scriptwriting in Mathematics Classroom among ... Sani, M. M., Et. al. (2026)

resources. However, responsiveness to students ideas inconsistent, pointing to the need for further strengthens teachers listening and use of students input to support instructions.

Conclusion

Overall, the findings suggest that many prospective teachers possess a strong grasp of how to plan lessons and guide students through step-by-step procedures. They are especially good at organizing content in a logical order and adjusting when things did not go as planned in the classroom. However, there are critical gaps in the areas of prospective teachers demonstration, anticipation of complexity, and the integration of students ideas into instruction. These areas are essential for fostering deep mathematical understanding and responsive teaching. To address these gaps, teacher training programs should place more emphasis on showing teachers how to model mathematical procedures, anticipate students misconceptions, and leverage effective use of textbooks and curriculum resources. Additionally, professional teacher development focus on enhancing teachers capacity to recognize and respond to students ideas as they emerge during instruction, thereby strengthening both their pedagogical knowledge for teaching and understanding of how students learn mathematics.

References

- Dahl, H., Enge, O., Hensen, T. h., & Valenta, A. (2019). Lesson plays as a mirror on prospective teachers professional knowledge for mathematics teaching. *Mathematics Teacher Education and Development*, 21(1), 82-99.
- Frank, W. B. (2006). *Script Writing in the Classroom – Media Literacy Clearinghouse*. Retrieved August 28th, 2021, from <http://www.frankwbaker.com/mlc/scriptwriting>.
- Gersten, R., Chard, D. J., Jayanthi, M., Baker, S. K., Morphy, P., & Flojo, J. (2008). *Mathematics Instruction for Students with Learning Disabilities or Difficulty Learning Mathematics: A Synthesis of the Intervention Research*. Portsmouth, NH: RMC Research Corporation, Center on Instruction.
- Herbst, P., & Milewski, A. What story circles can do for mathematics teaching and teacher education. in *Designing Professional Development for Mathematics Teaching and Learning*, 347-366. Springer.
- Idris, N. & Nor, N. M. (2010). Mathematical Creativity: Usage of Technology. *Procedia Social and Behavioral Sciences* 2(2), 1963-1967.
- Kar, T., Ozturk, F., Ocal, M. F., & Ozkaya, M. (2025). Problem posing via scriptwriting: What instructional flows do mathematics teachers use in implementing the Problem-posing task? *International Journal of Science and Mathematics Education*, 23(4), 1127-1151.
- Kontorovich, I. (2018). What can we learn about students' mathematical understanding from their writing? *Proceedings of the 41st Annual Meeting of the Mathematics Education Research Group of Australasia (MERGA)*, Auckland, New Zealand.
- Manalo, E., Bunnell, J. K., & Stillman, J. A., (2000). The Use of Process Mnemonics in Teaching Students with Mathematics Learning Disabilities. *Learning Disability Quarterly* 23(2), 137-156.
- Mitchelmore, M., & White, P. (2004). *Abstraction in Mathematics and Mathematics Learning*. Proceedings of the 28th Conference of the International Group for the Psychology of Mathematics Education, 2004 Vol. 3, 329-336.
- Rowland, T. (2014). The knowledge quartet: the genesis and application of a framework for analyzing mathematics teaching and deepening teachers mathematics knowledge. *SISYPHUS Journal of Education*, 1(3), 15-43.
- Rowland, T., Huckstep, P., & Thwaites, A. (2005). "Elementary teachers" mathematics subject knowledge: The knowledge quartet and the case of Naomi. *Journal of Mathematics Teachers Education*, 13(2), 137-153.
- Sani, M. M., Sani, M. A., Abdullahi, F., & Bayaro, A. (2023). The effect of using manipulatives on the performance of pupils in primary school mathematics. *Journal of Mathematical Sciences & Computational Mathematics (JMSCM)*, 4(2), 223-232.
- Stapel, Elizabeth. (2015). Introduction to the x,y- Plane (The Cartesian Plane). Purplemath Retrieved 12 September, 2021, from <http://www.purplemath.com/modules/plane.htm>.
- Stewart, J. B., Redlin, L., & Watson, S., (2008). *College Algebra (5th ed.)*. Brooks Cole. pp. 13–19. ISBN 0-495-56521-0.
- Xin, Y. P. & Jitendra, A. K. (1999). The effects of Instruction in solving mathematical word problems for students with learning problems: A meta-analysis. *The Journal of Special Education*, 32, (4), 207-225.
- Zazkis, D. & Herbst, P. G. (2021) *Scripting approaches in mathematics education: task design and teacher education*. Springer.
- Zazkis, R., Sinclair, N., & Liljedahl, P. (2013). *Lesson play in mathematics education: A tool for research and professional development*. New York, NY: Springer.
- Zazkis, R. & Zazkis, D. (2014). Script Writing in The Mathematics Classroom: Imaginary Conversations on the Structure of Numbers. *Research in Mathematics Education*. 16(1), 54-70.



Utilisation of Web 2.0 Technologies for ... Ishola, A. M., Et. al. (2026)

Utilisation of Web 2.0 Technologies for Collaborative Learning among University Undergraduate Students in Lagos State, Nigeria

ISHOLA, Adebayo Monsur

email: isholaam@tasued.edu.ng

ORCID: <https://orcid.org/0000-0002-9747-4098>

Phone Number: 07059209901

AKOREDE, Olufunbi Jimoh

email: akoredeji@tasued.edu.ng

Phone Number: 07045391863

Department of Educational Technology, College of Specialised and Professional Education, Tai Solarin Federal University of Education, Ijagun, Ogun State, Nigeria.

Abstract

The study examined the utilisation of Web 2.0 technologies for collaborative learning among undergraduates in public universities in Southwest, Nigeria. Four research questions guided the study. A descriptive survey research design was used. The population comprised undergraduates of Lagos State University (LASU) and University of Lagos (UNILAG), Southwest Nigeria. The sample size was 300 undergraduates from Lagos State University (LASU) and University of Lagos (UNILAG), Nigeria. This was selected using stratified sampling technique. A self-researchers-designed instrument tagged Utilisation of Web 2.0 Technologies and Collaborative Learning Questionnaire (UWEBCLQ) was used for this study with ($r = .88$) as reliability coefficient. Descriptive statistics of mean and standard deviation were used for answering research questions 1, 2 and 4. Research question 3 was analysed using inferential statistics of regression analysis. The findings indicated that there was medium level of utilization of Web 2.0 technologies for collaborative learning among undergraduates. It was also showed that there was medium level of collaborative learning among the undergraduates. Web 2.0 technologies positively influence collaborative learning among undergraduates ($\beta = .482$, $t = 12.191$, $P < .05$). It was recommended that institutions should invest in high-speed internet, provide training for both staff and students on Web 2.0 tools, and integrate platforms like Google Workspace, WhatsApp, blogs, and wikis directly into the curriculum.

Keywords: Utilisation, Web 2.0 Technologies, Collaborative Learning, Undergraduates

Introduction

The need for collaborative learning stems from its ability to develop crucial academic, social, and emotional skills by having undergraduates work together to solve problems, share ideas, and build on diverse perspectives, fostering critical thinking, communication, empathy, and real-world teamwork, making learning more engaging and preparing students for collaborative modern workplaces. Undergraduate collaborative learning is an active teaching method where small groups of undergraduates work together on tasks, projects, or problems to achieve shared goals, moving beyond passive listening to actively construct knowledge through discussion, shared responsibility, and peer teaching, enhancing critical thinking, communication, and deeper understanding (Emeka et al., 2025). It relies on peer interaction, mutual effort, and collective problem-solving, contrasting with traditional teacher-centered models by leveraging students' diverse skills and perspectives to achieve better learning outcomes. In collaborative learning, undergraduates work in small groups (pairs or more) for joint intellectual effort; teams work towards a common objective, product, or understanding; focuses on undergraduates exploring, applying, and debating material, not just receiving it; undergraduates rely on each other as resources, sharing knowledge and skills and that learning is seen as a social process, built through conversation and interaction (Abubakar, 2025). In short, collaborative learning benefits undergraduates by boosting academic performance, critical thinking, and retention through active engagement, while also developing crucial social skills like communication, teamwork, and conflict resolution, preparing them for future careers and fostering a more inclusive, supportive learning environment. Bitrus (2023) believed that collaborative learning aid discussion on ideas and solving problems together deepens comprehension and makes learning more memorable; analyzing problems from multiple perspectives strengthens analytical and evaluation skills; and active participation and shared ownership of tasks keep students motivated among undergraduates. However, the goal attainment of collaborative learning could not have been achieved through traditional method of teaching, but through digital technologies tools. On that note, Chukwu-Umahil and Okoli (2023) stated that Web 2.0 technologies, like wikis, blogs, and social media, foster collaborative learning by transforming undergraduates from passive consumers to active creators, enabling real-time co-creation, sharing, and



Utilisation of Web 2.0 Technologies for ... Ishola, A. M., Et. al. (2026)

discussion in dynamic online communities, moving education from teacher-centric to student-driven, problem-based, and globally connected experiences. Web 2.0 technologies are tools and platforms enabling the interactive, user-driven internet, shifting from static pages (Web 1.0) to dynamic spaces for collaboration, content sharing, and social networking, driven by user-generated content, APIs, and mobile access, exemplified by social media, blogs, wikis, and cloud apps like Facebook, YouTube, and Wikipedia (Ishola, 2024). Web 2.0 technologies in education are interactive, user-centered online tools (like blogs, wikis, social media, and video platforms) that shift learning from passive content consumption to active creation, collaboration, and knowledge sharing, fostering communication, community, and critical thinking among students and educators. These "read/write" web applications enable learners to become creators, not just consumers, by easily sharing multimedia, participating in discussions, building projects together, and receiving authentic feedback (Mamman & Mathew, 2024). Mamman (2019) stated that tools like wikis (e.g., Wikiversity) allow undergraduates to collaboratively build and edit knowledge bases, fostering group work and collective understanding; blogs (undergraduates e-portfolios, reflections), podcasts, and video platforms empower students to publish their work and ideas; social networking sites, discussion forums, and tools like Padlet (digital corkboards) facilitate conversations, debates, and peer feedback; user-generated content, focuses on users as content creators, moving beyond static webpages to dynamic, participatory environments and bookmarking, tools like Delicious or Diigo (though less common now) allowed users to tag and share interesting web pages, creating shared resource lists.

Web 2.0 technologies are highly effective in aiding collaborative learning among undergraduates by providing platforms for communication, content creation, and knowledge sharing that surpass the limitations of traditional learning environments. These tools have a positive and moderate impact on academic performance and skill development. Tools like WhatsApp, discussion forums, and instant messaging allow continuous communication between undergraduates and lecturers, breaking down physical and time barriers. Web 2.0 shifts undergraduates from passive consumers of information to active participants and creators of content. Collaborative platforms like Google Docs and wikis enable groups to work together on projects, edit documents, and brainstorm in real-time, regardless of location (Padayachee & Moodley, 2023). In the opinion of Chukwu-Umahil and Okoli (2023), the interactive and dynamic nature of these Web 2.0 technologies, such as video-sharing sites (YouTube) and educational games, makes learning more engaging and enjoyable for digital-native students, increasing their interest in coursework. Utilizing Web 2.0 tools helps undergraduates develop essential 21st-century skills, including digital literacy, critical thinking, problem-solving, and teamwork. Students can access learning materials and collaborate with peers anytime and anywhere, which is particularly beneficial for distance education or those with time constraints. Platforms facilitate the easy sharing of resources, ideas, and feedback among peers and instructors, leading to a robust, collectively built body of knowledge. Although, despite the benefits, the effectiveness of Web 2.0 technologies can be hampered by several challenges: poor internet connectivity, low bandwidth, and a lack of access to necessary devices in some areas remain significant barriers to successful implementation; some undergraduates and academics may have limited prior experience or knowledge on how to use specific tools effectively for educational purposes, requiring sufficient training and support from the university; integrating new technologies into the curriculum and learning how to use them can require additional time and effort from both lecturers and students and the vast amount of user-generated content means students must develop critical evaluation skills to filter trustworthy and legitimate information from false or incorrect sources (Ishola, 2024). Overall, with appropriate pedagogical design, adequate technical infrastructure, and proper training, Web 2.0 technologies can serve as powerful instruments to foster effective collaborative learning experiences among university undergraduates.

Statement of the Problem

Although, collaborative learning among undergraduate offers extensive benefits, including enhanced academic performance, the development of essential workplace skills, and improved social and psychological well-being. However, in the context of Nigeria public universities, the attainment of effective collaborative learning among undergraduates is primarily hindered by student-related behavioural issues (e.g., lack of skills), pedagogical shortcomings (e.g., inadequate instruction and assessment methods), and logistical constraints (e.g., time management and class size). Observation indicated that many undergraduates enter university without the necessary skills for effective group work, such as active listening, providing constructive feedback, negotiating, or coordinating tasks. Poor collaborative learning creates a negative multiplier effect by inhibiting the development of essential academic and professional skills, leading to a downward spiral



Utilisation of Web 2.0 Technologies for ... Ishola, A. M., Et. al. (2026)

of poor academic performance, reduced motivation, and frustration that can spread through a student's entire educational experience and beyond. Thus, in order to ensure collaborative learning, this study therefore examined the utilisation of Web 2.0 technologies for collaborative learning among undergraduates in public universities in Southwest, Nigeria.

Objectives of the Study

The main objective of the study was to examine the utilisation of Web 2.0 technologies for collaborative learning among undergraduates in public universities in Southwest, Nigeria. Specifically, the study sought to:

1. determine the level of utilization of Web 2.0 technologies for collaborative learning among undergraduates;
2. ascertain the level of collaborative learning among the undergraduates;
3. find out the extent to which Web 2.0 technologies influence collaborative learning among undergraduates;

Research Questions

The following research questions guided this study:

1. What is the level of utilization of Web 2.0 technologies for collaborative learning among undergraduates?
2. What is the level of collaborative learning among the undergraduates?
3. To what extent Web 2.0 technologies influence collaborative learning among undergraduates?

Theoretical Framework

Zone of Proximal Development (ZPD)

This theory was propounded by Lev Vygotsky in the late 1920s. Zone of Proximal Development (ZPD) is Vygotsky's concept of the learning sweet spot: the gap between what an undergraduate can do alone and what they can achieve with help from a more knowledgeable peer or instructor (MKO), crucial for collaborative learning as it fosters growth through shared problem-solving and scaffolding, where peers provide temporary support to reach new levels of understanding. In collaborative settings, peers act as MKOs, offering hints, explanations, or modeling skills (scaffolding), helping each other master complex tasks, promoting deeper understanding, and developing self-regulation as they transition from guided to independent performance, effectively pushing everyone's potential. The ZPD defines the challenging yet achievable tasks that undergraduates can't do independently but can tackle in groups. In undergraduate groups, peers (or instructors) become the MKOs, possessing broader skills or knowledge to guide others. This is the temporary support (prompts, modeling, asking questions) provided by peers, gradually removed as the learner internalizes the skill. According to this theory, learning is inherently social; interaction within the ZPD builds cognitive skills and understanding. For instance, a group of undergraduates working on a complex statistical analysis. One undergraduate understands a specific formula (independent skill). Another struggles. The first undergraduate explains the formula, demonstrates its application with a small dataset (scaffolding), and then they both apply it to the main problem (within the ZPD). They learn together, and both eventually grasp the concept deeply.

Relevance of the theory to this study

Vygotsky's Zone of Proximal Development (ZPD) theory posits that undergraduates achieve their greatest potential when working on tasks that are challenging yet attainable with the guidance of a more knowledgeable other (MKO), who can be a teacher or more experienced peer. Web 2.0 technologies facilitate this process by providing platforms for enhanced social interaction, effective scaffolding, and the creation of rich, authentic learning communities. According to the theory, Web 2.0 tools help create a learning environment where tasks are neither too easy (leading to boredom) nor too difficult (leading to frustration). Working within this "sweet spot" of the ZPD, with appropriate support, boosts undergraduate motivation, self-confidence, and engagement, as they experience a sense of accomplishment by mastering tasks they couldn't do alone. the core of ZPD is social interaction. Web 2.0 tools like wikis, discussion boards, and social media platforms facilitate communication beyond the constraints of a physical classroom or schedule. This continuous interaction allows undergraduates to exchange ideas, give and receive immediate feedback, and negotiate meaning, leading to deeper understanding and improved communication skills.

Methodology

A descriptive survey research design was used for the study. The population of this study comprised undergraduates of Lagos State University (LASU) and University of Lagos (UNILAG), Southwest Nigeria. The sample size was 300 undergraduates from Lagos State University (LASU) and University of Lagos (UNILAG), Nigeria. This was selected using stratified sampling technique. In that situation, 150 undergraduates were selected from LASU and 150 from UNILAG. A self-

Utilisation of Web 2.0 Technologies for ... Ishola, A. M., Et. al. (2026)

researchers-designed instrument tagged Utilisation of Web 2.0 Technologies and Collaborative Learning Questionnaire (UWEBCLQ) was used for this study. UWEBCLQ was used for the collection of data from the respondents on the level of utilization of Web 2.0 technologies for collaborative learning among undergraduates; the level of collaborative learning among the undergraduates. The questionnaire request responses on a four (4) – point scale format which was a modification of 5-point Likert scale. To ensure the face and content validity of the instrument, copies of the instrument were given to an expert in the Department of Educational Technology, Tai Solarin Federal University of Education. Reliability test of the instrument was done using a test-retest method. In this case, copies of the instrument (UPSMLTQ) were administered twice on 20 undergraduates from the Faculty of Education, Lagos State University of Education (LASUED), that were not part of the sample size within a week interval. The collected data from the dual administration of the instruments were compared using Pearson Product Moment Correlation (PPMC) and reliability coefficient was reported as ($r = .88$). Primary method of data collection was used in this study. Primary method includes the usage of questionnaire to collect data from the identified respondents. Descriptive statistics of mean and standard deviation were used for answering research questions 1 and 2. Research question 3 was analyses using inferential statistics of regression analysis.

Presentation of the Results

Research Question 1: What is the level of utilization of Web 2.0 technologies for collaborative learning among undergraduates?

Table 1: Descriptive statistics on the level of utilization of Web 2.0 technologies for collaborative learning among undergraduates

Items	Mean	SD	Remarks
I used Facebook for learning new knowledge most of the time.	2.87	.882	Utilized
I usually use Blogs in providing analytical deliberation for learning development.	2.77	.817	Utilized
I frequently use Wikis to provide new ideas for innovative learning.	2.81	.800	Utilized
I always use YouTube as it helps in showing how knowledge can be shared for effective learning.	2.56	.825	Utilized
I seldomly used Folksonomy to get new knowledge.	2.71	.833	Utilized
I regularly used Blogs to source for new knowledge about my studies.	2.90	.816	Utilized
I often times source information from Wikipedia for effective learning.	2.69	.802	Utilized
Most of the time I and my friends regularly share information through WhatsApp to improve effective learning.	2.74	.821	Utilized
I sometimes used Instagram for learning enlightenment.	2.66	.867	Utilized
I regularly use Blogs with fellow students for learning engagement towards improvement in learning outcomes.	2.85	.808	Utilized
Cluster Mean	2.76		

Source: Field Survey, 2026.

From table 1, it was revealed that cluster mean level of 2.76 which was found to be greater than the bench mark mean value. i.e $2.76 > 2.50$. The implication of this study showed that there was medium level of utilization of Web 2.0 technologies for collaborative learning among undergraduates.

Research Question 2: What is the level of collaborative learning among the undergraduates?

2: Descriptive statistic on the level of collaborative learning among the undergraduates

Items	Mean	SD	Remark
Undergraduate actively engaging with material through discussion and problem-solving tend to have better comprehension and remember information for longer than those in passive learning environments.	2.68	.895	Medium
Collaborative projects encourage critical thinking, analytical reasoning, and creative problem-solving.	2.83	.899	Medium
Working in groups requires effective verbal and written communication, active listening, empathy, and the ability to give and receive constructive feedback.	3.02	.847	High
Undergraduates interact with peers from different backgrounds, cultures, and with varied opinions, which broadens their worldview and fosters open-mindedness and acceptance.	2.99	.886	Medium



Utilisation of Web 2.0 Technologies for ... Ishola, A. M., Et. al. (2026)

Team-based activities simulate modern workplace environments, equipping undergraduates with the teamwork, leadership, and self-management skills valued by employers.	2.86	.857	Medium
Cluster Mean	2.88		

Source: Field Survey, 2026

From table 2, it was showed that cluster mean value was reported as 2.88 and the bench mark mean value was 2.50, i. e since $2.88 > 2.50$. This implied that there was medium level of collaborative learning among the undergraduates.

Research Question 3: To what extent Web 2.0 technologies influence collaborative learning among undergraduates?

Table 3: Extent Web 2.0 technologies influence collaborative learning among undergraduates

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	21.947	.840		26.118	.000
	Web 2.0 technologies	.545	.045	.482	12.191	.000

a. Dependent Variable: Collaborative learning

Table 3 showed that the sign of the coefficient of Web 2.0 technologies is positive which implied that an increase or improvement in it will increase collaborative learning among undergraduates. The independent variables (Web 2.0 technologies) were found to be significant and strongly determine collaborative learning among undergraduates with the P-value less than 0.05 and magnitude of Web 2.0 technologies ($\beta = .482$, $t = 12.191$, $P < .05$). This implied that Web 2.0 technologies positively influence collaborative learning among undergraduates and that 48.2% increases in collaborative learning among undergraduates was accounted for by the linear combination of Web 2.0 technologies.

Discussion of Findings

The findings of the study showed that there was medium level of utilization of Web 2.0 technologies for collaborative learning among undergraduates. These findings were in tandem with Baguma et al. (2025) who investigated the utilization of Web 2.0 technologies by academics at a Higher Education Institution (HEI) in Uganda and concluded that the level to which students and lecturer utilized web 2.0 technologies were mediumly. Ishola (2024) findings of the study indicated that there was high level utilization of Web 2.0 technologies among students in Ogun state owned universities. Web 2.0 technologies have helped to acquire new knowledge, acquiring a new innovative idea, effectively manage information acquired for learning, improves academic performance through access to information needed on time and helps in developing skills and capabilities for collaboration were among benefits of Web 2.0 technologies utilization for students learning outcomes in Ogun state owned universities. The findings of the study showed that there was medium level of collaborative learning among the undergraduates. These findings correlate with Abubakar (2025) found a medium level of collaborative learning among undergraduates is often characterized by a blend of individual and group efforts, where collaboration is present but not consistently deep, or where it is highly structured but not fully adopted by all participants. Based on studies of undergraduate collaborative dynamics. The findings of the study revealed that independent variables (Web 2.0 technologies) were found to be significant and strongly determine collaborative learning among undergraduates. This implied that Web 2.0 technologies positively influence collaborative learning among undergraduates and that 48.2% increases in collaborative learning among undergraduates was accounted for by the linear combination of Web 2.0 technologies. These findings were correlate with Abanikannda and Okedokun (2024) showed that Web 2.0 technologies aid collaborative learning by transforming the internet from a passive, read-only medium (Web 1.0) into an active, participatory, and user-generated platform. This shift enables students and educators to connect, share, create, and collaborate in real-time or asynchronously, breaking down geographical and temporal barriers.

Conclusion

This study examined the utilisation of Web 2.0 technologies for collaborative learning among undergraduates in public universities in Southwest, Nigeria and the following conclusions were drawn based on the findings that Web 2.0 technologies was positive which implied that an increase or improvement in it will increase collaborative learning among undergraduates. This implied that Web 2.0 technologies positively influence collaborative learning among undergraduates and that 48.2% increases in collaborative learning among undergraduates was accounted for by the linear combination of Web 2.0 technologies.



Utilisation of Web 2.0 Technologies for ... Ishola, A. M., Et. al. (2026)

Recommendations

The following recommendations were raised in line with the findings of the study:

1. Institutions should invest in high-speed internet, provide training for both staff and students on Web 2.0 tools, and integrate platforms like Google Workspace, WhatsApp, blogs, and wikis directly into the curriculum.
2. Encouraging the use of these tools for group projects fosters user-generated content, knowledge sharing, and active participation.
3. Design academic activities (e.g., joint reports, research projects) that require the use of tools like Wikis, Google Docs, or Microsoft Teams for collaborative, real-time editing.
4. Create a supportive atmosphere that encourages adopting new, open-source technologies for academic work.
5. Establish clear, pedagogically sound guidelines for expected activity,, assessment, and grading when using these technologies and shift from passive learning to active, student-centered, and peer-to-peer engagement.

References

- Abanikannda, M. O., & Okedokun, D. V. (2024). Collaborative learning through social media and undergraduates' self-regulation in Obafemi Awolowo University, Ile-Ife, Nigeria. *DIDACTICA DANUBIENSIS*, 4(1), 134-149.
- Abubakar, A. (2025). Effectiveness of collaborative-based learning on the achievement of students in basic science at junior secondary schools in Kebbi State, Nigeria. *International Journal of Multidisciplinary Research and Growth Evaluation*, 06(06), 349-353.
- Adefuye, A. L., Omoyajowo, B. S., Oluwole, M. I., Akorede, O. J., Osisanwo, T. A., & Adewoga, T. A. (2023). Perception of undergraduates on the utilization of online collaborative tools for learning in selected universities in south-west, Nigeria. *International Journal of Library Science & Education Research*, 29(8), 15-36.
- Adewoye, M., & Akinde, T. A. (2023). Frequency and perceived enjoyment of the use of web 2.0 tools by undergraduates of two universities in Nigeria. *International Journal of Library and Information Science Studies*, 8(3), 1-23.
- Alabi, E. B., & Atah, C. K. (2024). Perceived obstacles to the utilization of web 2.0 technologies in the delivery of business education course content in Southern Nigeria. *World Journal of Innovation and Modern Technology*, 8(1), 89-99.
- Babalola, S. O. (2023). Factors influencing adoption and use of web 2.0 among Polytechnic students in Nigeria. Federal Polytechnic, Ilaro Ogun State.
- Baguma, I., Aduwo, J. R., Kimuli, J., & Kabaale, E. (2025). A qualitative investigation into the use of web 2.0 technologies by academics at a higher education institution in Uganda. *International Journal of Research and Innovation in Social Science (IJRISS)*, IX(V), 4958-4971.
- Bitrus, S. C. (2023). Impact of collaborative learning strategy on academic achievement and retention of senior secondary school geography students in Bosso, local government area, Minna. Department of Educational Technology, School of Science and Technology Education, Federal University of Technology, Minna, Niger State.
- Chukwu-Umahi, S. S., & Okoli, B. E. (2023). Extent of utilization of the available web 2.0 technologies by business educators in teaching business education courses in tertiary institutions in South East Nigeria. *International Journal of Innovative Education Research* 11(2),148-156,
- Chukwu-Umahi1, S. S., & Okoli, B. E (2023). Availability and accessibility of web 2.0 technologies for teaching business education courses in tertiary institutions in South East Nigeria. *International Journal of Innovative Information Systems and Technology Research*, 11(1), 54-63.
- Emeka, I. D., Onyebuchi, A. C., & Emmanuel, I. A. (2025). Effect of collaborative approach of learning on students' academic performance in mathematics in Anambra state. *African Journal of Educational Management, Teaching and Entrepreneurship Studies*, 14(2), 52-62.
- Faboya, O. T., & Adamu, B. J. (2017). Integrating web 2.0 tools into teaching and learning process through mobile device technology in Nigerian schools: Current status and future directions. *International Journal of Education and Research*, 5(5), 113-124.
- Hassan, I., Gamji, M. B., Nasidi, Q.Y., & Azmi, M. N. L. (2021). Challenges and benefits of web 2.0-based learning among international students of English during the Covid-19 pandemic in Cyprus. *Arab World English Journal (AWEJ) Special Issue on Covid 19 Challenges* (1) 295-306.
- Ishola, A. M. (2024). Utilization of Web 2.0 technologies as veritable tools for students learning outcomes in Ogun State Owned Universities. *FUOYE International Journal of Business and Economics Education*, 1(1), 83-95.
- Ishola, A. M., & Jesse, D. I. (2024). Impact of web 2.0 technologies on undergraduates' learning in Ogun state, Nigeria. *Social Science Education Journal (SOSCED-J)*, 6(1), 22-31.
- Lev Vygotsky (1920). Zone of Proximal Development (ZPD). <https://www.simplypsychology.org/>
- Mamman, J. S., & Mathew, E. D. (2024). Awareness and utilization of web 2.0 technologies in teaching business education courses in universities in north central Nigeria. *KWASU International Journal of Education*, 7(2), 222-233.



Utilisation of Web 2.0 Technologies for ... Ishola, A. M., Et. al. (2026)

Mercy, T., Adewoye, T., & Adetoun, A. (2023). Perceived usefulness of web 2.0 tools for knowledge management by university undergraduate students: A Review of Literature. *American Journal of Information Science and Technology*. 7(3), 101-109.

Padayachee, I., & Moodley, K. (2023). Factors influencing web 2.0 technology usage among academics: A case study of two South African Tertiary Institutions. *International Journal of Technology and Human Interaction*, 18(1), 1-22.



Assessment of Problems associated with the Use of Family Planning Pills among Married Adults in Ibadan, Oyo State, Nigeria

ALWAJUD-ADEWUSI, Mariam Bukola¹

alwajud.mb@unilorin.edu.ng

<https://orcid.org/0000-0003-1856-6582>

OBALOLA, Moriam Olayemi²

MAGAJI-YUSUF, Khadijat¹

ARIYO, Nafisat O.¹

¹Department of Educational Guidance and Counselling, Faculty of Education, University of Ilorin, Nigeria

²Department of Educational Foundations, School of Technical Education, Yaba College of Technology, Lagos State, Nigeria

Abstract

Family planning pills carry the risk of multiple side effects. The side effects may likely be short or long term depending on the intervention techniques. Therefore, this study examined problems associated with the use of family planning pills as expressed by married adults in Ibadan, Oyo State. The descriptive research design was adopted for the study. The population of the study comprised all married adults in Ibadan, while the target population are married adults from selected local government areas in Ibadan. 300 married adults constitute the sample for this study selected through simple, stratified and convenience sampling techniques. The questionnaire employed for the study was designed by the researchers. The content validity of the questionnaire was ascertained by the researchers and the reliability was determined. The data collected was analysed using descriptive and inferential statistics at 0.05 alpha level. The finding of the study revealed that the problems associated with the use of family planning pills include headaches, nausea, weight increase, fatigue and hair loss. Based on the findings of this study, it was therefore recommended that Health institutions should organise regular sensitisation programs on the side effects of family planning pills. Fertility experts should carry out an eligibility assessment before the commencement of the pills.

Keywords: Problems, Family Planning Pills, Married Adults, Ibadan

Introduction

Marriage is a social and cultural institution, a cornerstone for family formation and economic stability. In many communities, marriage is a legally recognised social contract between individuals that establishes rights and obligations between them, their children, and their in-laws. It is often based on a sexual or intimate relationship and implies cohabitation and the permanence of the union (Adepoju, 2025). Marriage is a fundamental institution in society, serving as the foundation for family formation and social stability. In Nigeria, marriage is highly valued across various cultural and religious groups, with expectations of procreation and family expansion playing a central role (Adebayo, 2020). The institution of marriage is not only a social contract but also a significant determinant of emotional and economic well-being, particularly in traditional societies where extended family structures influence marital relationships (Olawale & Adeyemi, 2020). In many parts of Nigeria, marriage is often influenced by cultural norms, religious doctrines, and socio-economic factors, which impact the decision-making process of couples regarding childbearing and family planning (Suleiman & Ibrahim, 2021). Married adults are individuals who have entered into legally and culturally recognised union. They are typically expected to fulfil roles and responsibilities associated with marriage, including mutual support, cohabitation, and, in many cultures, procreation. In Nigeria, these roles are often influenced by traditional gender norms and cultural expectations, which can vary significantly across different ethnic groups. One of the critical aspects of family life is reproductive health management, particularly the use of family planning methods. Family planning is essential for controlling birth rates, improving maternal and child health, and promoting economic stability within households (Bamidele, Adepoju & Ogunleye, 2022). Among the various contraceptive methods available, oral contraceptive pills are widely used due to their effectiveness and accessibility (Akinola & Yusuf, 2021). Despite the benefits, the usage of family planning pills is often met with scepticism, misconceptions, and resistance, particularly due to cultural and religious beliefs (Omotosho, 2020).

Assessment of Problems associated with the use of ... Alwajud-Adewusi. M. B., Et. al. (2026)

According to Ojo, Ajibola and Salami (2020), married women face challenges in accessing and effectively utilising contraceptive pills, with barriers including lack of awareness, fear of side effects and opposition from spouses or family members. Further research has indicated that myths and misconceptions about the side effects of contraceptive pills, such as infertility, weight gain, and prolonged menstrual irregularities, contribute to the underutilization among married women (Abiodun & Salawu, 2022). Another major factor influencing the utilisation of contraceptive pills is religious beliefs. Religious teachings often shape attitudes towards contraceptives. Some religious leaders discourage the use of family planning, perceiving it as contrary to divine will, while others support it as a means of responsible parenthood (Olowookere & Alabi, 2022). These differences result in varied levels of acceptance and usage of family planning pills among married couples. Furthermore, spousal communication plays a crucial role, as studies have shown that women who discuss family planning with their husbands are more likely to use contraceptive methods compared to those who do not (Adeyemi & Olatunji, 2023). Adetunji and Kolawole (2023) posited that for married adults, decisions regarding family planning are not solely individual choices but are influenced by spousal communication, societal expectations, and healthcare accessibility. Many married women depend on the approval of their husbands before opting for contraceptive pills, leading to low utilisation rates among couples who hold conservative views on family planning (Afolabi & Odetola, 2021). Additionally, economic factors play a role, as financial instability can either encourage or discourage the use of contraceptive pills depending on the perceived burden of child-rearing (Ogunleye & Balogun, 2020). Marriage is expected to provide a structured environment for childbearing and rearing. Couples, often under societal and familial expectations, rely on family planning methods to space or limit the number of children to balance economic constraints and enhance women's health. However, the choice and continued use of these methods have far-reaching implications for marital harmony, reproductive health, and overall family welfare.

Family planning pills are among the most widely used modern methods of contraception. They offer a reversible and convenient way to prevent unwanted pregnancies. Nonetheless, recent evidence suggests that these pills are not without problems, and several adverse effects have been documented both in terms of physical health and psychological well-being. Recent studies have shown that hormonal contraceptives can lead to several short- and long-term physical side effects. For instance, a study reported that up to 30– 50% of pill users experience breakthrough bleeding within the first three to six months of use, which often causes discomfort and affects adherence to the method (Okafor & Babalola, 2020). Other common complaints include nausea, headaches, weight fluctuations, and an increased risk of blood clots. These adverse effects can compromise a woman's health and may necessitate frequent medical consultations, thereby adding both physical and financial burdens. Karpowicz et al. (2024) noted that the adverse side effects of family planning pills are weight gain, headaches and mood swings. In addition to physical complaints, there is growing evidence that family planning pills may adversely affect psychological well-being. Mengelkoch et al. (2023) reported that women using hormonal contraceptives exhibited altered stress responses both at the molecular and psychological levels, with users reporting a more negative emotional reaction to acute stress compared to non-users. A significant proportion of married women hold negative attitudes toward contraceptive pills, citing side effects as a major reason for discontinuation. Younger couples may have different attitudes towards contraception compared to older couples due to generational shifts in knowledge, exposure, and societal expectations. Younger married adults, particularly those with access to digital media and modern health education, are more likely to embrace contemporary contraceptive methods (Okafor & Babalola, 2020). They often view contraception as a means of achieving financial stability and ensuring adequate child spacing, which aligns with their aspirations for career development and personal growth (Nwankwo & Adebisi, 2022). In contrast, older couples, particularly those raised in more conservative environments, may hold traditional beliefs that discourage or limit the use of contraceptives. For many older women, past experiences with contraceptive side effects, limited exposure to modern health campaigns, and reliance on natural family planning methods contribute to their scepticism about family planning pills (Alabi & Ojo, 2023). Traditionally, gender roles assign the primary decision-making power on reproductive issues to husbands, which can influence their perceptions of modern family planning methods. Husbands may rely on prevailing cultural or religious beliefs that favour natural or traditional methods, while wives who directly experience both the benefits and side effects of modern contraceptives tend to develop a negative view of these methods (Eze &



Assessment of Problems associated with the use of ... Alwajud-Adewusi. M. B., Et. al. (2026)

Uche, 2021). Religious doctrines can significantly influence decisions regarding family planning, often shaping couples' choices on whether or not to use contraceptive pills. In Nigeria, major religious institutions, including Christianity and Islam, have varying perspectives on family planning. While some denominations advocate for responsible parenthood and encourage contraception as a means of improving maternal and child health, others oppose artificial birth control methods, perceiving them as contrary to divine will (Olowookere & Alabi, 2022). For instance, some Islamic teachings emphasise reliance on natural birth spacing methods rather than modern contraceptives, leading to lower acceptance rates of family planning pills among Muslim women (Ibrahim & Salawu, 2020). Similarly, certain Christian denominations discourage contraceptive use, advocating for procreation as a divine obligation of marriage. These religious teachings can create significant barriers, particularly for women who prioritise their faith over medical advice or societal expectations (Ogunbiyi & Adepoju, 2021). Educational attainment can affect awareness and understanding of family planning options, influencing the extent to which individuals seek and use contraceptive methods. Women with higher levels of education are generally more informed about reproductive health, contraception, and the benefits of birth control (Nwankwo & Adebisi, 2022). They are more likely to understand the efficacy and potential side effects of family planning pills, making informed choices regarding their reproductive health (Egbeyemi & Adeniran, 2021). In contrast, women with lower levels of education may lack access to accurate information, leading to misconceptions about contraceptive pills, such as the belief that they cause infertility or serious health complications (Abiodun & Salawu, 2022). The duration of marriage may impact family planning decisions, with longer-married couples possibly having different perspectives compared to newlyweds. Newly married couples, particularly those without children, may initially avoid contraceptive methods due to the pressure to conceive early in marriage (Alabi & Ojo, 2023). Various research studies reviewed suggest that while family planning pills are a critical tool for reproductive health management, their associated problems, ranging from physical side effects and altered stress responses to pervasive misinformation, are significant. In a socio-cultural setting where marriage is central to family life, these issues can lead to disrupted contraceptive use and may negatively affect marital stability and overall family well-being.

Statement of The Problem

Family planning pills have assisted married adults to achieve the desired family size, regulate the timing of births and also control the fertility periods. Although the family planning pills have been associated with numerous challenges. Many women reported excessive weight gain, irregular menstrual cycles, reduced sexual libido, permanent headaches, heavy menstrual flow, mood swings, sleeplessness and other related health problems. These challenges, often experienced by married adults, necessitate discontinuation of the family planning pills and weaken their effectiveness. Based on this background, this study investigated problems associated with the use of family planning pills as expressed by married adults in Ibadan, Oyo State, which is crucial for informing targeted interventions and improving counselling services.

Research Question

The following research question was raised to guide the conduct of the study:

1. What are the problems associated with the use of family planning pills as expressed by married adults in Ibadan, Oyo State?

Methodology

The research design that was employed for this study is a descriptive survey research design. The population of this study comprised all married adults in Ibadan, Oyo State. The target population consist of married adults from the selected local government in Ibadan. The sample for the study was selected through a multi-stage sampling procedure. At stage one, simple random sampling technique was used to select five local government areas from the eleven existing local government areas in Ibadan. At stage two, the stratified sampling was employed to classify respondents into stratum such as age, educational qualification and religion. At stage three, the convenience sampling method was used to select 300 participants across the strata. The instrument that was used to collect data for this study will be developed by the researchers and titled the "Problems Associated with the Use of Family Planning Pills Questionnaire (PAUFPPQ)". Items in the questionnaire were formulated based on a comprehensive review of relevant literature. The instrument



Assessment of Problems associated with the use of ... Alwajud-Adewusi. M. B., Et. al. (2026)

was divided into two sections, A and B. Section A described the demographic data of the respondents, while Section B contained 20 items on problems associated with the use of family planning pills. Section B was patterned on a four-point Likert scale of Strongly Agree, Agree, Disagree and Strongly Disagree. To ensure content validity of the "Problems Associated with the use of Family Planning Pills Questionnaire (PAUFPPQ)," the draft was validated by five lecturers in the Department of Educational Guidance and Counselling, University of Ilorin, Nigeria. The recommendations were carefully incorporated into the final version of the instrument, ensuring that it adequately captures what it measures. To ascertain the reliability of the PAUFPPQ, a test-retest method was employed. The questionnaire was administered on a sample of 30 married adults from Ilorin Metropolis who were not part of the respondents. After a four-week interval, the same group of respondents completed the questionnaire. The responses from the two administrations were then compared using Pearson's Product-Moment Correlation to determine the stability of the instrument over time. The analysis yielded a correlation coefficient of 0.73, indicating a strong reliability. In order to administer the questionnaire, the researchers obtained permission from the respondents and consent was obtained to willingly participate in the study. The questionnaire was administered by the researchers, and respondents were given adequate time to respond to the items on the questionnaire. The completed questionnaires were retrieved from the respondents for data analysis. The data collected was analysed using both descriptive and inferential statistical methods. To answer the research question, Mean and Rank Order were used. The hypothesis formulated was tested using Analysis of Variance (ANOVA) at 0.05 significance level.

Presentation of Results

Demographic Characteristics of Respondents

Table 1: Percentage Distribution of Respondents' Demographic Data

Variable	Categories	Frequency (f)	Percentage (%)
Age	18–25 years	20	6.7%
	26–32 years	50	16.7%
	33–39 years	90	30.0%
	40–46 years	60	20.0%
	47–53 years	45	15.0%
	54–59 years	25	8.3%
	60 years and above	10	3.3%
	Total	300	100.0
Religion	African Traditional	15	5.0%
	Christianity	165	55.0%
	Islam	120	40.0%
	Total	300	100.0
Educational Level	Primary School Cert	30	10.0%
	O'Level	60	20.0%



Assessment of Problems associated with the use of ... Alwajud-Adewusi. M. B., Et. al. (2026)

	NCE/OND	75	25.0%
	Bachelor's Degree/HND	85	28.3%
	Master's Degree	40	13.3%
	PhD	10	3.3%
	Total	300	100.0
Duration of Marriage	0–5 years	50	16.7%
	6–10 years	90	30.0%
	11–15 years	80	26.7%
	16–20 years	50	16.7%
	Above 20 years	30	10.0%
	Total	300	100.0

Table 1 presents the demographic characteristics of the respondents. The majority (30.0%) of the participants were within the age range of 33–39 years, followed by 40–46 years (20.0%). Christianity was the most practiced religion among the respondents (55.0%), followed by Islam (40.0%). Most of the respondents had either a Bachelor's Degree/HND (28.3%) or NCE/OND (25.0%). In terms of marital duration, the highest number of respondents (30.0%) had been married for 6–10 years.

Research Question: *What are the problems associated with the use of family planning pills as expressed by married adults in Ibadan, Oyo State?*

Table 2: *Mean, Standard Deviation and Rank Order Analysis of Problems Associated with Family Planning Pills.*

No.	Items	Mean	SD	Rank
15	Back pain	3.62	.481	1 st
2	Headaches	3.58	.490	2 nd
18	Body pain	3.55	.493	3 rd
1	Nausea	3.48	.512	4 th
4	Increased fatigue	3.44	.507	5 th
14	Chest pain	3.41	.523	6 th
11	Abdominal pain	3.36	.514	7 th



Assessment of Problems associated with the use of ... Alwajud-Adewusi. M. B., Et. al. (2026)

3	Weight gains	3.31	.549	8 th
8	Spotting between periods	3.30	.562	9 th
20	Frequent mood swing	3.28	.576	10 th
5	Skin changes (acne)	3.22	.590	11 th
19	Itching of private part	3.17	.607	12 th
7	Leg cramps	3.13	.613	13 th
16	Ringin in the ears	3.05	.631	14 th
10	Allergic reaction	3.02	.634	15 th
17	High cholesterol level	2.96	.678	16 th
12	Changes in vision	2.94	.679	17 th
9	Gall bladder issues	2.85	.689	18 th
13	Changes in bowel movements	2.77	.716	19 th
6	Great hair loss	2.65	.721	20 th
	Average Mean	3.20		

Table 2 presents the mean, standard deviation and rank order of problems associated with the use of family planning pills as expressed by married adults. The table reveals that "back pain," "headaches," and "body pain" ranked highest with mean scores of 3.62, 3.58, and 3.55 respectively. Conversely, "great hair loss," "changes in bowel movements," and "gall bladder issues" had the lowest mean scores. Since all the problems have a mean score above the cut-off point of 2.50, it implies that the respondents experienced these problems as side effects of family planning pills.



Assessment of Problems associated with the use of ... Alwajud-Adewusi. M. B., Et. al. (2026)

Discussion of Findings

The finding showed that problems such as back pain, headaches, and body pain were the problems associated with the use of family planning pills. This supports the findings of Karpowicz et al. (2024), who noted that hormonal contraceptives often lead to discomfort, which includes excessive weight gain and decreased libido. These symptoms may discourage sustained use and suggest a need for detailed counselling before and during contraceptive use. The occurrence of symptoms like nausea and mood changes aligns with studies of Barr (2010), who highlighted that while these issues are common, they are often minimised by users. These problems may be attributed to the fact that some of these pills affect the hormonal composition in the body. As a result of the pill's usage, some hormones are released at high levels, which causes the body to malfunction, and the body responds negatively.

Recommendations

Based on the findings, the following recommendations are made:

1. Health institutions should organise regular sensitisation programs on the side effects of family planning pills.
2. Family life counsellors should ensure that marriage counselling covers both common and less frequent side effects of family planning pills.
3. Educational initiatives should use local languages and media platforms to reach couples with lower literacy levels.
4. Fertility experts should carry out an eligibility assessment before the commencement of the pills.

References

- Abiodun, F. M., & Salawu, K. A. (2022). Barriers to contraceptive use among women in southwestern Nigeria. *African Journal of Reproductive Health*, 26(2), 45-58.
- Adebayo, T. (2020). *Marriage and societal expectations in Nigeria*. Ibadan: University Press.
- Adepoju, A. (2025). Patterns of marriage and family life in Nigeria. *Journal of Comparative Family Studies*, 36(1), 77-88.
- Adetunji, A. J., & Kolawole, S. O. (2023). Cultural norms and resistance to modern contraceptive methods in Nigeria. *Nigerian Journal of Public Health*, 18(1), 10-27.
- Adeyemi, K., & Olatunji, R. (2023). Spousal communication and contraceptive use among married women in Ilorin Metropolis. *Nigerian Journal of Social Sciences*, 15(2), 45-60.
- Afolabi, R. A., & Odetola, A. A. (2021). Spousal communication and contraceptive use among married women in urban Nigeria. *Journal of Reproductive Health Research*, 14(4), 55-71.
- Akinola, J. O., & Yusuf, M. A. (2021). The prevalence of oral contraceptive use among women in Nigeria: A case study of Kwara State. *Nigerian Journal of Health Sciences*, 9(2), 38-52.
- Alabi, T. O., & Ojo, B. A. (2023). The influence of age on contraceptive attitudes and practices in Nigeria. *West African Journal of Social Sciences*, 15(3), 41-56.
- Bamidele, K. S., Adepoju, F. J., & Ogunleye, M. I. (2022). The impact of family planning on economic stability among Nigerian households. *African Journal of Demography*, 11(2), 77-93.
- Barr, N. G. (2010). Managing adverse effects of hormonal contraceptives. *American family physician*, 82(12), 1499-1506.
- Egbeyemi, P. O., & Adeniran, R. A. (2021). The relationship between education and contraceptive use among Nigerian women. *Journal of Population and Health*, 16(2), 33-47.
- Eze, U. O., & Uche, C. N. (2021). Gender dynamics in contraceptive decision- making among married couples in Nigeria. *Journal of African Reproductive Health*, 22(3), 145-154.
- Ibrahim, S. M., & Salawu, H. A. (2020). Islamic perspectives on contraceptive use: A study of married Muslim women in Northern Nigeria. *Nigerian Journal of Religious Studies*, 14(2), 26-42.
- Karpowicz, N., Mączka, K., Skoczylas, A., Pacocha, N., Kunicki, M., Grymowicz, M., & Smolarczyk, R. (2024). The most common side effects, concerns and discontinuation patterns of oral contraceptive pills among Polish women: A Cross-Sectional study. *Journal of Family & Reproductive Health*, 18(3), 170-179.
- Mengelkoch, S., et al. (2023). Hormonal contraceptive use is associated with differences in women's inflammatory and psychological reactivity to an acute social stressor. *Brain, Behavior and Immunity*, 115.
- Nwankwo, I. C., & Adebisi, K. J. (2022). Educational attainment and contraceptive choices among women in Nigeria. *International Journal of Women's Health*, 8(1), 12-29.
- Ogunbiyi, M. T., & Adepoju, F. R. (2021). Christianity and the ethics of family planning: A review of denominational teachings. *Journal of Religious and Cultural Studies*, 13(3), 20-37.
- Ogunleye, T. S., & Balogun, O. O. (2020). Male involvement in reproductive health decisions: The role of education. *Journal of Gender and Health*, 17(2), 45-61.



Assessment of Problems associated with the use of ... Alwajud-Adewusi. M. B., Et. al. (2026)

Ojo, P. A., Ajibola, F. A., & Salami, T. A. (2020). Barriers to access and utilization of family planning services in Ilorin Metropolis. *Nigerian Journal of Public Health Studies*, 14(4), 99-113.

Okafor, C. I., & Babalola, A. A. (2020). Digital media and awareness of contraceptive options among young married adults in Nigeria. *African Journal of Communication and Health*, 9(1), 50-67.

Olawale, P., & Adeyemi, L. (2020). Extended family influence on marital relationships and decision-making in Nigeria. *Journal of Family and Cultural Studies*, 9(4), 112-129.

Omotosho, T. (2020). Cultural beliefs and contraceptive resistance in Nigeria. *African Journal of Reproductive Health*, 22(1), 12-29.

Olowookere, A. P., & Alabi, J. F. (2022). Family planning and religious beliefs in Nigeria: An empirical investigation. *Nigerian Journal of Social Research*, 19(1), 71-89.

Suleiman, Y., & Ibrahim, M. (2021). *Socio-economic influences on marital decision-making and family planning in Nigeria*. *Journal of Social Policy and Development*, 14(1), 89-104.



Assessment of Undergraduate Student's Perception on Social Media Devices as a Learning Tool among Public Universities in Ogun State, Nigeria

ISHOLA, Adebayo Monsur¹

email: isholaam@tasued.edu.ng

ORCID: <https://orcid.org/0000-0002-9747-4098>

Phone Number: 07059209901

OLALEYE, Emmanuel Olumuyiwa²

Phone Number: 08062360360

email: olaleyeeco@lasued.edu.ng

¹Department of Educational Technology, College of Specialised and Professional Education, Tai Solarin Federal University of Education, Ijagun, Ogun State, Nigeria.

²Lagos State University of Education, Oto-Ijanikin, Lagos State, Nigeria

Abstract

The study examined undergraduates' perception of social media as a learning tool in public universities in Southwest, Nigeria. It was guided by 4 research questions. A descriptive research design was used. The population comprised undergraduates of Olabisi Onabanjo University (OOU), Ago-Iwoye, Ogun State and Tai Solarin Federal University of Education, (TASFUED) Ijagun, Ogun State, Nigeria. The sample size was 250 undergraduates from Olabisi Onabanjo University, Ago-Iwoye, Ogun State and Tai Solarin Federal University of Education, Ijagun, Ogun State, Nigeria. These were selected using stratified sampling technique. In that situation, 150 undergraduates were selected from OOU and 100 from TASFUED. A self-research-designed instrument tagged Undergraduates' Perception of Social-Media and Learning Tool Questionnaire (UPSMLTQ) was used for data collection with ($r = .82$) as reliability coefficient of the instrument. Mean and standard deviation were used for answering research questions 1. Research questions 2, 3 and 4 were analyses using inferential statistics of regression analysis. The findings of the study revealed that undergraduates positively perceive impact of social media on cognitive learning ($\beta = .371$, $t = 8.852$, $P < .05$) and that undergraduate perceived impact of social media on emotional learning ($\beta = .284$, $t = 6.568$, $P < .05$). It was recommended that utilize social media to connect with peers for academic purposes, such as forming study groups, discussing course content, and sharing educational resources, rather than solely for entertainment.

Keywords: Undergraduate, Perception, Social Media, Learning Tool, Public Universities

Introduction

Undergraduate pursue learning in universities for a combination of professional, personal, and societal reasons. These reasons range from gaining specialised knowledge for specific careers to developing essential life skills and contributing to the community. In short, learning in university is a multifaceted process of gaining knowledge, skills, and critical thinking through structured courses (lectures, seminars) and independent study, focusing not just on facts but on "learning how to learn" for lifelong adaptability, involving cognitive processes, social interaction, and building on prior experience to construct new understanding. It's about changing how undergraduate think, solve problems, and interpret the world, moving from passive reception to active construction and application of knowledge. In essence, university learning transforms undergraduate into an independent, critical thinker capable of continuous learning and adapting to new challenges. Learning among undergraduates in a university offers substantial personal, professional, and societal benefits and these benefits range from developing core life skills and expanding career opportunities to increasing lifelong earning potential and fostering civic engagement (Nuhu, 2021). Egbe et al. (2024) were of the opinions that learning benefits undergraduate by boosting critical thinking, problem-solving, and creativity, while also fostering independence, confidence, and adaptability for future careers and life challenges, leading to better job prospects, personal growth, and a more informed, engaged life. It sharpens the mind, improves communication, promotes well-being, and makes life more meaningful by offering new perspectives and skills. However, the issues eroding the quality of learning in universities stem from a variety of interconnected financial, technological, social, and structural challenges. These problems affect student engagement, the development of core academic skills, and the overall value of a degree (Umar, 2023). Undergraduate learning could be behavioural, cognitive and emotional which could transfer to quality learning. Behavioural learning or behaviorism, explains learning as a change in observable behaviour resulting from environmental interactions, particularly

Assessment of Undergraduate Student's Perception on Social Media Devices as ... Ishola, A. M. & Olaleye, E. O. (2026)

through conditioning and reinforcement (rewards or punishments). It focuses on external stimuli and responses, rather than internal mental states, suggesting behaviours are learned habits that can be shaped and modified by consequences (Sanga, 2025). Behavioral learning views individuals undergraduate as responding to their surroundings, learning to act in ways that yield positive outcomes and avoid negative ones. Cognitive learning is an active, mental process where learners engage their brains to understand, process, and connect new information with existing knowledge, going beyond simple memorization to build deeper comprehension, better memory, and problem-solving skills. It focuses on internal mental activities like thinking, remembering, and understanding, making learning more meaningful and long-lasting by training individuals to learn *how* to learn. Emotional learning, often called Social-Emotional Learning (SEL), is the process of gaining skills to understand and manage own emotions, develop empathy for others, build healthy relationships, and make responsible decisions, improving personal well-being and academic success by connecting feelings to actions and navigating life's challenges effectively. It's a holistic approach focused on five core competencies: self-awareness, self-management, social awareness, relationship skills, and responsible decision-making, crucial for thriving in school, work, and community (Umar, 2023). Universities globally, including in Nigeria now begins to mandate the usage of technology-driven in learning with the view to prepared undergraduate for future work and employability. The use of social media is also among the viable technology's tools adopted for learning among the undergraduate. Social media refers to the websites and applications that enable users to create and share content or to participate in social networking. It also entailed internet-based platforms (websites and apps) enabling users to create, share, and exchange content, ideas, and messages, fostering virtual communities and connections through features like profiles, posts, and interactive tools. It's a form of digital communication focused on user-generated content and participation, encompassing everything from social networking (Facebook) to video sharing (YouTube) and microblogging (Twitter) (Iheanacho & Amomoh, 2025).

Social media for learning enhance collaboration, access vast resources, boost engagement, develop digital skills, and connect with peers/experts, transforming passive learning into active participation through shared content, discussions, and real-time support outside traditional classrooms (Du & Faridah, 2024). It facilitates deeper understanding, quick information exchange, and global awareness, although managing distractions and reliable sources remains crucial. Social media can aid quality learning among undergraduates by facilitating enhanced communication, collaboration, resource sharing, and engagement, thereby extending educational opportunities beyond the traditional classroom setting. Platforms like WhatsApp and Facebook allow for real-time communication between undergraduates and lecturer, enabling undergraduates to ask questions, receive quick feedback, and discuss course topics outside of formal class hours (Ting et al., 2024). Social media provides access to supplementary educational materials, such as video tutorials (YouTube), academic articles (LinkedIn, ResearchGate), and expert opinions from around the world. This diverse range of content enriches the learning experience beyond standard textbooks. Incorporating social media, which undergraduates use daily, can make learning more interactive and engaging. The use of multimedia content and interactive elements helps cater to different learning styles and keeps students interested in the material. By using social media for academic purposes, undergraduates develop essential digital skills and learn how to discern credible sources from misinformation, which prepares them for success in a technology-driven world. Social media helps build a sense of community among undergraduates with shared interests, enabling them to connect with peers and experts globally, which broadens their perspectives and intellectual horizons. Learning activities on social media can be accessed anytime and from anywhere, which is particularly beneficial for undergraduates with diverse schedules or those who cannot physically attend classes (Adegboyega, 2020). Social media can effectively aid behavioural learning primarily through social learning (observational learning), collaboration and peer interaction, and access to diverse educational resources. These platforms provide environments where undergraduate can observe, interact, and practice new behaviors and skills. Drawing on Bandura's Social Cognitive Theory, undergraduate can learn by observing others' actions and the consequences that follow. When users see others being rewarded or praised for positive behaviours (e.g., sharing academic success, promoting social causes, showcasing creativity), they are more motivated to emulate those actions (Essien, 2025). Educational content creators (like popular YouTube educators or academic pages on Instagram) serve as digital role models, breaking down complex topics in engaging ways that students can observe and learn from. In short, social media breaks down traditional classroom barriers, facilitating continuous learning through peer-based collaboration and communication outside of formal settings. In another way, social media can aid cognitive learning by facilitating collaboration and knowledge sharing,



Assessment of Undergraduate Student's Perception on Social Media Devices as ... Ishola, A. M. & Olaleye, E. O. (2026)

enhancing language skills, providing access to a wide array of educational resources, and fostering critical thinking when used in a structured, purposeful manner (Kirschner & Karpinski, 2023). Social media platforms allow undergraduates to form online study groups, share resources, discuss ideas, and work together on projects, effectively expanding the learning environment beyond the traditional classroom. This peer interaction and feedback can enhance teamwork and problem-solving skills. The interactive and dynamic nature of social media can increase undergraduates' engagement and motivation.

Statement of the Problem

Ideally, quality learning among undergraduates should provide extensive benefits, equipping them with essential career skills, promoting personal development, enhancing financial stability, and fostering an engaged, responsible citizenry. However, problems such as time management, mental health, academic preparedness and inadequate funding, poor infrastructure, and curriculum issues have been reported in literature to be among issues confronting learning. Observations have revealed that a significant rise in undergraduates' anxiety, depression, and stress, often due to academic and financial pressures, can impede concentration and hinder learning. Many undergraduates work full or part-time jobs to cover the high costs of tuition and living expenses, which negatively impacts the time they can dedicate to their studies and is a primary reason for low level of quality learning. However, traditional learning in a university is a lecturer-centric, face-to-face instruction model that typically takes place within a physical classroom or lecture hall. The core focus is on the efficient transmission of a large, structured body of knowledge from lecturer to undergraduates, often through lecturer and heavy reliance on textbooks. This method of learning is passive learning (lectures), lack of critical thinking/creativity, rote memorization over understanding, lecturer-centric focus, limited personalization, outdated content, poor real-world application, and difficulty adapting to modern tech/needs, leading to disengaged undergraduate unprepared for dynamic careers. This method often stifles undergraduate-led inquiry and practical skills development. Although, many arguments have been putting forward as the reason for low level of learning among undergraduates in a university. Thus, this study was an attempt to examine undergraduates' perception of social media as a learning tool in public universities in Southwest, Nigeria.

Objectives of the Study

The main objective of the study was to examine undergraduates' perception of social media as a learning tool in public universities in Southwest, Nigeria. Specifically, the study sought to:

1. identify undergraduates' perception of social media as a learning tool;
2. examine undergraduates perceived impact of social media on behavioural learning;
3. determine undergraduates perceived impact of social media on cognitive learning;

Research Questions

The following research questions guided this study:

1. What are the undergraduates' perceptions of social media as a learning tool?
2. What is the undergraduate perceived impact of social media on behavioural learning?
3. To what extent does undergraduates perceive impact of social media on cognitive learning?

Theoretical Framework

Uses and Gratifications Theory

Uses and Gratifications Theory (UGT) was postulated by Jay Blumler and Elihu Katz in 1974. Uses and Gratifications Theory (UGT) posits that media audiences are active, not passive, users who intentionally select media (like TV, social media, news) to satisfy specific psychological and social needs, such as information, personal identity, social connection, or entertainment/diversion. Instead of asking "What does media do to people?", UGT asks, "What do people do with media?" focusing on *why* they choose certain content and what gratifications they get, viewing users as goal-oriented individuals with free will. Uses and Gratifications Theory (U&G) explains that undergraduates actively choose social media to fulfill specific needs (gratifications), moving beyond passive consumption to satisfy goals like information-seeking, social-connection, self-expression, entertainment, academic support (finding study groups, clarifying concepts), or even escaping study stress, with their motivation dictating platform choice (e.g., WhatsApp for quick chats, YouTube for tutorials, Facebook for groups).

Assessment of Undergraduate Student's Perception on Social Media Devices as ... Ishola, A. M. & Olaleye, E. O. (2026)

According to the theory, undergraduates are not just bombarded by social media; they intentionally select platforms and content to meet personal needs; the why (motivation) is key: undergraduates use media to achieve something, whether it's a good grade or a break, different needs lead to different media choices. And that U&G views students as empowered users who tailor their social media use to achieve their academic and personal goals, making them active participants in their own educational media experience.

Relevance of the theory to the Study

The Uses and Gratifications Theory (UGT) explains that undergraduates can gain quality learning from social media when they actively and intentionally use these platforms to satisfy specific academic, informational, and social needs. This theory shifts focus from the media's effect on users to the user's power to choose media based on their own goals. UGT is relevant because it provides a framework to understand and leverage undergraduates' motivations for engaging with social media in an educational context. By understanding *why* undergraduates use these platforms, lecturers can design learning strategies that channel these existing motivations toward positive academic outcomes. Also, a major driver for social media use is the need for social connection and community building. This can be channeled into quality learning by facilitating online study groups, peer collaboration on projects, and discussions with classmates and instructors outside formal class hours, leading to enhanced engagement and social support. Furthermore, social media offers immediate access and flexible communication, which undergraduates value highly. This convenience can make learning more fluid and accessible, allowing for quick Q&A sessions and constant access to learning materials. Social media allows individuals to express opinions and aspects of their identity. In an academic setting, this can be leveraged through activities like contributing to class blogs or participating in discussions, which can help students form a academic identity and gain recognition for their contributions. The theory suggests that to achieve "quality learning," the gratifications sought must align with the gratifications obtained. If a student seeks entertainment but finds quality learning instead, their initial gratification is not met, potentially leading to dissatisfaction. Conversely, if a undergraduate explicitly seeks academic information and finds it effectively, they are more likely to continue using the platform for learning. Thus, ultimately, UGT highlights that undergraduates are active agents in their education and their learning through social media is most effective when their intrinsic motivations and needs are intentionally integrated into the pedagogical process.

Methodology

Research Design

A descriptive survey research design was used for the study. The population of this study comprised undergraduates of Olabisi Onabanjo University (OOU), Ago-Iwoye, Ogun State and Tai Solarin Federal University of Education, (TASFUED) Ijagun, Ogun State, Nigeria. The sample size was 250 undergraduates from Olabisi Onabanjo University, Ago-Iwoye, Ogun State and Tai Solarin Federal University of Education, Ijagun, Ogun State, Nigeria. These were selected using stratified sampling technique. In that situation, 150 undergraduates were selected from OOU and 100 from TASFUED. A self-research-designed instrument tagged Undergraduates' Perception of Social-Media and Learning Tool Questionnaire (UPSMLTQ) was used for this study. UPSMLTQ was used for the collection of data from the respondents on the undergraduates' perception of social media as a learning tool, impact of social media on behavioural learning; impact of social media on cognitive learning and impact of social media on emotional learning. The questionnaire requested responses on a four (4) – point scale format which was a modification of 5-point Likert scale. To ensure the face and content validity of the instrument, copies of the instrument were given to an expert in the Department of Educational Technology, Tai Solarin Federal University of Education. Reliability test of the instrument (UPSMLTQ) was done using a test-retest method. In this case, copies of the instrument (UPSMLTQ) were administered twice on 25 undergraduates from the Faculty of Education, Lagos State University of Education (LASUED), that were not part of the sample size within a week interval. The collected data from the dual administration of the instruments were compared using Pearson Product Moment Correlation (PPMC) and reliability coefficient yield ($r = .82$). Primary method of data collection was used in this study. Primary method includes the usage of questionnaire to collect data from the identified respondents. However, an introduction letter was collected from the Head of Department, Department of Educational Technology, TASFUED and presented to the case study area to show the researcher's mission and reasons for conducting the study. Descriptive statistics of mean and standard deviation were used for answering research questions 1. Research questions 2, and 3 were analyses using inferential statistics of regression analysis.



Assessment of Undergraduate Student's Perception on Social Media Devices as ... Ishola, A. M. & Olaleye, E. O. (2026)

Presentation of the Results

Research Question 1: What are the undergraduates' perceptions of social media as a learning tool?

Table 1: Descriptive statistics on the undergraduates' perceptions of social media as a learning tool

Items	Mean	SD
I believed social media fostering collaboration.	3.11	.678
I know that social media way to access to information.	3.02	.777
Social media aid effective communication.	2.99	.901
Social media aid my diverse resources.	2.79	.789
I perceived that social media provides diverse, up-to-date content.	3.16	.837
Cluster Mean	3.01	

Source: Field Survey, 2026

Table 1 showed that cluster mean was 3.01 and bench mark mean reported as 2.50. Since, $3.01 > 2.50$. This implied that undergraduates; perceived social media to fostering collaboration, access to information, aid effective communication, diverse resources and up-to-date content.

Research Question 2: What is the undergraduate perceived impact of social media on behavioural learning?

Table 2: Descriptive statistics on the perceived impact of social media on behavioural learning

Items	Mean	SD
I perceived that social media is altering attention.	2.66	.874
I perceived self-esteem through social comparison.	2.84	.773
I perceived that social media shaping social skills (both positively for connection and negatively for empathy),	2.88	.804
I perceived that social media affecting emotional regulation.	2.83	.833
I perceived that social media increasing susceptibility to misinformation.	2.74	
Cluster Mean	2.79	

Source: Field Survey, 2026

Table 2 showed that cluster mean was 2.79 and bench mark mean value 2.50. Since, $2.79 > 2.50$, this implied that undergraduates perceived social media as is altering attention, aid self-esteem, shaping social skills (both positively for connection and negatively for empathy), affecting emotional regulation and increasing susceptibility to misinformation.

Research Question 3: To what extent does undergraduates perceive impact of social media on cognitive learning?

Table 3: Extent does undergraduates perceive impact of social media on cognitive learning

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	22.302	1.113		20.033	.000
Social media	.341	.039	.371	8.852	.000

a. Dependent Variable: Cognitive learning

Table 3 showed that the sign of the coefficient of social media is positive which implied that an increase or improvement in it will increase undergraduates cognitive learning. The independent variable was found to be significant and strongly determine undergraduates cognitive learning with the P-value less than 0.05 and magnitude of social media ($\beta = .371$, $t = 8.852$, $P < .05$). This implied that undergraduates positively perceive impact of social media on cognitive learning.

Discussion of Findings

The research question 1 showed that undergraduates; perceived social media to fostering collaboration, access to information, aid effective communication, diverse resources and up-to-date content. These findings were in correlate with Egbe et al. (2024) who found that social media aids undergraduate learning by fostering collaboration, providing access to diverse educational resources, and improving engagement through interactive, bite-sized content. Platforms like YouTube, WhatsApp, and LinkedIn facilitate study groups, peer-to-peer knowledge sharing, and networking, ultimately enhancing academic performance when used responsibly. The research question 2 revealed that undergraduates perceived social media as is altering attention, aid self-esteem, shaping social skills (both positively for connection and negatively for empathy), affecting emotional regulation and increasing susceptibility to misinformation. These findings were in tandem with Umar (2023) who agreed that social media aids knowledge sharing among undergraduates



Assessment of Undergraduate Student's Perception on Social Media Devices as ... Ishola, A. M. & Olaleye, E. O. (2026)

by facilitating interactive, peer-to-peer, and collaborative learning through platforms like WhatsApp, Facebook, and Twitter. These tools enhance academic performance, allow for real-time discussion of course materials, and enable easy exchange of information beyond the classroom, fostering both formal and informal knowledge transfer. The research question 3 showed that undergraduates positively perceive impact of social media on cognitive learning ($\beta = .371$, $t = 8.852$, $P < .05$). These findings were in correlate with Nuhu (2021) focused who concurred that social media served as tools that can aid undergraduates cognitive learning for flexible learning. And Sanga (2025) found that social media aids undergraduate cognitive learning by transforming the learning environment into a more interactive, collaborative, and accessible space, fostering higher-order thinking, and enabling personalized knowledge construction. It supports both formal and informal learning through peer-to-peer knowledge sharing and increased engagement.

Conclusion

This study examined undergraduates' perception of social media as a learning tool in public universities in south-west, Nigeria and concluded that social media served as tool that can aid cognitive and emotional learning among undergraduates.

Recommendations

The following recommendations were raised in line with the findings of the study:

1. Utilize social media to connect with peers for academic purposes, such as forming study groups, discussing course content, and sharing educational resources, rather than solely for entertainment.
2. Department should create and use closed Facebook Groups or WhatsApp groups to foster a sense of community, allow for peer-to-peer support, and facilitate real-time, informal, and open discussion, which can increase participation among shy students.
3. Utilize platforms like WhatsApp for instant Q & A sessions, sharing resources, and quick feedback from instructors, breaking the barriers of traditional, limited office hours.
4. Use specific Twitter hashtags to organize class discussions, live chats during lectures, and connect with broader professional networks.
5. Lecturers should use platforms with social features (e.g., Slack, Discord, Google Classroom) for group assignments, allowing students to work together from anywhere and share multimedia content.

References

- Adegboyega, L. O. (2020). Influence of social media on the social behavior of students as viewed by primary school teachers in Kwara State, Nigeria. *Mimbar Sekolah Dasar*, 7(1), 43-53.
- Alhajjaj, H. A., Shredam, A. M., Al-halalat, K. I., & Tarawneh, H. H. (2025). Social media and its impact on university students: An analytical study. *Educational Process: International Journal*, 18, e2025492.
- Du, J., & Faridah, I. (2024). A literature review of the impact of social media on academic performance using media richness theory. *International Journal of Infrastructure Research and Management*, 12(2), 119 – 128.
- Egbe, W. O., Akuto, G. W., & Ogo, A. I. (2024). Undergraduates' perspectives on social media utilization and its influence on academic performance in North Central Nigeria: Implications for counseling services. *International Journal of Humanities Social Science and Management (IJHSSM)*, 4(1), 499-508.
- Egbedokun, A. O., & Okusanya, O. (2017). Impact of cognitive styles on the frequency of use of social media amongst university students. *International Journal of Research Studies in Educational Technology*, 6(2), 65-73.
- Essien, E. A. (2025). Impact of social media on students' academic performance. *International Journal of Research and Innovation in Social Science (IJRISS)*, IX(V), 1538-1549.
- Gong, Z., Guo, Y., & Tan, J. (2025). Social media use and academic performance among college students: the chain mediating roles of social anxiety and fear of missing out and the moderating effect of teacher-student relationship. *Frontier. Psychology Journal*, 16.
- Iheanacho, C. O., & Amomoh, M. A. (2025). Perceived influence of social media on the social behaviour of the students of Alvan Ikoku Federal University of Education, Owerri, Imo State. *International Journal of Social Sciences and Management Research*, 11(10), 99-111.
- Jay Blumler and Elihu Katz (1974). Uses and Gratifications Theory (UGT). https://en.wikipedia.org/wiki/Uses_and_gratifications_theory
- Kirschner, P. A., & Karpinski, A. C. (2023). Facebook and academic performance. *Computers in Human Behavior*, 5(26), 1237-1245.
- Miao, X., & Xin, X. (2022). The effect of social media on the development of students' affective variables. *Frontier Psychology*, 13.



- Assessment of Undergraduate Student's Perception on Social Media Devices as ...* Ishola, A. M. & Olaleye, E. O. (2026)
- Ninggui, D., Lina, Li., Kessara, K., Zhou, Qi, & Tongfeng, Xu. (2022). The impact of social media overload on learning engagement: a moderated mediation model. *BMC Psychology*, 13, 1322.
- Nuhu, F. S. (2021). Perceptions and attitudes of undergraduate students towards social media utilization for teaching and learning in Federal University of Technology, Minna. Department of Educational Technology School of Science and Technology Education Federal University Technology, Minna.
- Odewumi, O. M., Bamigboye, F. B., Olawuyi, O. F., & Bamigboye, O. O. (2017). Perceptions of undergraduate students on social media for learning: A case study of University of Ibadan. *Journal of Communication*, 8(2), 120-127.
- Onwu, A. O., Ononaiwu, A. I., Jombo-Mba, A., & Immaculata, N. A. (2024). Influence of social media usage on academic engagement of university undergraduates in Enugu state of Nigeria. *The Educational Psychologist*, 17(4), 77-92.
- Sanga, F. E. (2025). The impact of social media use on students' behaviour changes in Tanzanian tertiary institutions. *African Quarterly Social Science Review*, 4(2), 44-52.
- Sanya, R. M., & Tripathi, K. M. (2025). Social media usage and its impact on the emotional competencies of undergraduate psychology students. *Information Research Communications*, 1(3), 217-238.
- Timung, B., Bordoloi, K., & Mohan, D. A. (2024). the influence of social media on learning behaviors: A social science perspective. *Intercontinental Social Science Journal*. 6(1). 379-391.
- Ting, T. T., Kiat, T. C., Lew, Y. C., Sum, K. W., & Wan, E. R. (2024). Impact of social media on undergraduate students' academic performance in Malaysia. *Pakistan Journal of Life and Social Sciences*, 22(2), 16035-16061
- Umar, H. H. (2023). Perception of students on the use of social media for academic purposes in Abubakar Tafawa Balewa University Bauchi, Nigeria. *International Journal of Scientific Research in Multidisciplinary Studies*, 9(3), 23-30.
- Wagh, R. K. (2025). Effects of social media on emotional intelligence in adolescents. *EPRA International Journal of Economics, Business and Management Studies (EBMS)*, 12(6), 146-156.



Effect of Health Education Intervention on Utilisation of Healthcare Services among Federal Colleges of Education Students in North-West, Nigeria

MACCIDO, Hurera Mouktar¹

hureramouktar@gmail.com;

08037024013

ISIAQ, Abdulmuhit Temitope²

aisiaq@education.abu.edu.ng;

2348102040184

AYABIOGBE, Christy I.¹

juolah93@gmail.com

08051099241

¹Department of Health Education, Federal University of Education, Zaria, Kaduna State, Nigeria

²Department of Human Kinetics and Health Education, Ahmadu Bello University, Zaria, Kaduna State, Nigeria

Abstract

Cultural and social factors such as traditional beliefs, stigma, gender norms, and social influence are widely recognised as powerful determinants of healthcare-seeking behaviour, particularly in settings where biomedical care competes with traditional and spiritual alternatives. This quasi-experimental study examined the effect of a health education intervention on healthcare services utilisation among students in Federal Colleges of Education in North-West Nigeria, with particular attention to cultural and social factors. A pre-test/post-test design was employed. Using multi-stage sampling, 200 participants were recruited, with 100 assigned to the experimental group at Federal College of Education, Zaria, and 100 to the control group at Federal College of Education, Kano. Data were collected via a validated, researcher-developed questionnaire rated on a four-point modified Likert scale (Cronbach's $\alpha = 0.752$) and analysed using descriptive statistics, paired-sample t-tests, and independent-sample t-tests at a 0.05 significance level. Results showed a significant improvement in healthcare service utilisation attributable to cultural and social factors in the experimental group, with mean scores rising from 2.49 to 3.46 (mean difference = 0.97; $t = 35.78$; $p = 0.000$). The experimental group also recorded significantly higher utilisation scores than the control group after the intervention (mean difference = 1.04; $t = 44.27$; $p = 0.000$). Both null hypotheses were rejected. The study concluded that the health education intervention had its most substantial effect in addressing cultural and social barriers to healthcare utilisation. Culturally sensitive health education, delivered in collaboration with community and religious leaders, is recommended to sustain these gains.

Keywords: Health education, intervention, healthcare services colleges of education Students

Introduction

Healthcare services refer to the totality of preventive, promotive, curative, and rehabilitative actions provided by trained personnel and institutions with the aim of maintaining or restoring the physical, mental, and social well-being of individuals and populations (World Health Organisation [WHO], 2025). Healthcare services utilisation, on the other hand, describes the actual use of these services by individuals when a perceived or actual health need arises, and it is commonly assessed through indicators such as outpatient visits, hospital admissions, antenatal attendance, and uptake of preventive care (Andersen & Newman, 1973). Utilisation is not automatic; it is shaped by a web of predisposing, enabling, and need-related factors that determine whether a person with a health problem actually seeks formal care. Among these, cultural beliefs and social influences occupy a central place, particularly in societies where traditional worldviews about illness causation and care-seeking coexist with modern biomedical systems. Globally, healthcare services utilisation remains a major public health concern, with the WHO and World Bank (2025) reporting that the global Universal Health Coverage Service Coverage Index rose from only 54 points in 2000 to 71 points in 2023, yet an estimated 4.6 billion people worldwide still lack access to essential health services. The same report indicates that 2.1 billion people experienced financial hardship from out-of-pocket health spending in 2022, including 1.6 billion pushed into or further into poverty (WHO & World Bank, 2025). These figures show that even though service coverage has improved over two decades, progress has stagnated since the adoption of the Sustainable Development Goals in 2015, and at current rates, the global coverage index will only reach 74 points by 2030 (World Bank, 2025). In Africa, the burden of low healthcare utilisation is compounded by cultural and social factors that influence whether people seek orthodox care or rely on alternative options. Comparative studies across



Effect of Health Education Intervention on utilisation of Health care Services among ... Maccido, H. M., Et. al. (2026)

African countries show that traditional and herbal medicine remain a first point of call for a substantial proportion of the population, especially in West Africa, where socio-cultural beliefs about disease causation often compete with biomedical explanations (James et al., 2018). Health insurance coverage across sub-Saharan Africa also remains low, leaving most service utilisation dependent on out-of-pocket payment, a situation that disproportionately discourages care-seeking among populations whose social norms already favour self-medication or consultation with traditional healers before hospital attendance. In Nigeria specifically, the indicators are troubling. The minister of health disclosed that Nigeria's per capita health expenditure was only about \$43 in 2024, an amount considered grossly inadequate for the country's population and disease burden, while out-of-pocket spending accounts for about 70–75% of total health expenditure (Centre for Journalism Innovation and Development [CJID], 2025). The 2023 Nigeria Demographic and Health Survey reported a maternal mortality ratio of 512 deaths per 100,000 live births and an under-five mortality rate of 110 per 1,000 live births, with Nigeria accounting for about 14% of global maternal deaths despite representing only 2.6% of the world's population (allAfrica, 2025). Fewer than 10–12% of Nigerians are covered by health insurance (Commonwealth Fund, 2026), meaning that cultural attitudes toward formal healthcare, alongside cost, strongly shape whether citizens utilise available services. Among students specifically, utilisation patterns mirror and sometimes worsen the national picture. A cross-sectional study at a private Nigerian university found that although 87.4% of students reported ever utilising campus healthcare services, the majority (66.9%) held a negative perception of the services, and only 43.4% used them occasionally rather than regularly (Orok et al., 2024). Similarly, a study at Gombe State University found that satisfaction varied widely across specific services, with notable dissatisfaction recorded for conditions such as eye problems despite higher satisfaction with services like antenatal care (Bello et al., 2024). These findings suggest that beyond logistics, students' decisions to use or avoid available health services are filtered through personal beliefs, peer influence, and family-instilled cultural orientations toward illness and care-seeking.

Cultural factors include indigenous beliefs about disease causation, preference for traditional or spiritual healing, religious interpretations of illness, and entrenched gender norms that may restrict young women's autonomy in seeking care (Isiaq & Abdullahi, 2025). Social factors include peer group attitudes, family expectations, stigma associated with certain conditions (such as reproductive health and mental health issues), and the influence of significant others on health decisions. In the predominantly Hausa-Fulani and Islamic socio-cultural context of North-West Nigeria, such factors are particularly salient, as care-seeking behaviour is frequently mediated by communal and religious considerations rather than by individual decision alone (Adamu et al., 2025). Given these dynamics, there is a clear need for a deliberate health education intervention that addresses misconceptions, challenges unhelpful cultural narratives, and builds social support for appropriate healthcare-seeking behaviour among students. Health education is widely recognised as a cost-effective strategy for improving knowledge, reshaping attitudes, and ultimately increasing the appropriate utilisation of available healthcare services (Jia et al., 2025). Without such structured interventions, cultural and social barriers are likely to persist unchallenged, leaving students vulnerable to preventable morbidity and poor health outcomes that could otherwise be averted through timely service utilisation. Previous studies have examined cultural and social influences on healthcare utilisation in various populations, including adolescents, migrants, and university students, largely through the lens of the Andersen Behavioural Model, which explicitly recognises predisposing socio-cultural characteristics as determinants of health service use (Krzyż et al., 2023). Nigerian studies on adolescent girls in the South-East found that predisposing demographic and social-structural factors significantly shaped health service usage (Azfredrick, 2016), while studies among nursing and undergraduate students elsewhere in Nigeria identified socio-cultural beliefs as recurring barriers to formal healthcare utilisation (Wankasi et al., 2024). However, comparatively few studies have specifically evaluated whether health education intervention can shift the cultural and social determinants of utilisation among students in Federal Colleges of Education, particularly within the unique socio-religious context of North-West Nigeria. Despite the documented influence of cultural and social factors on healthcare utilisation generally, the researcher observes a dearth of empirical, intervention-based evidence specifically targeting students in Federal Colleges of Education in North-West Nigeria. Most existing Nigerian studies focus on university students in southern or central Nigeria, or on the general adult population, leaving a gap regarding how deeply rooted cultural beliefs and social pressures within this specific zone and institutional category affect healthcare-seeking behaviour, and whether a deliberately designed health education programme can produce a measurable change in utilisation patterns. This gap forms the basis for the present study, which



Effect of Health Education Intervention on utilisation of Health care Services among ... Maccido, H. M., Et. al. (2026)

seeks to determine the effect of a health education intervention on healthcare services utilisation among students in Federal Colleges of Education in North-West Nigeria, with specific attention to cultural and social factors.

Purpose of the Study

This study assessed:

1. The effect of health education intervention on utilisation of healthcare services among the Federal Colleges of Education students in North-West Nigeria after the intervention, based on cultural and social factors.
2. The difference between the control and experimental groups in the level of utilisation of healthcare services after health education intervention among Federal Colleges of Education students in North-West Nigeria, based on cultural and social factors.

Research Questions

The following research questions were raised to guide the study:

1. What is the effect of health education intervention on utilisation of healthcare services among the Federal Colleges of Education students in North-West Nigeria, after the intervention, based on cultural and social factors?
2. What is the difference between the control and experimental groups in the level of utilisation of healthcare services after health education intervention among Federal Colleges of Education students in North-West Nigeria, based on cultural and social factors?

Hypotheses

The following hypotheses were postulated for the study:

1. There is no significant effect of cultural and social factors on health education intervention on utilisation of healthcare services among Federal Colleges of Education students in North-West Nigeria after the health education intervention.
2. There is no significant difference between the control and experimental group on utilisation of healthcare services after health education intervention among Federal Colleges of Education students in North-West Nigeria, based on cultural and social factors.

Methodology

This study adopted a quasi-experimental research design involving pre-test and post-test measurements across two non-randomly assigned groups: an experimental group and a control group. The design was selected because it enables the establishment of cause-and-effect relationships between the health education intervention and healthcare services utilisation, while accommodating the practical constraints that precluded random assignment of participants. All participants in both groups were assessed at baseline using a standardised questionnaire, and again following the intervention period, thereby allowing the researchers to evaluate changes attributable to the programme. The study population comprised sixty-seven thousand, six hundred and seventy-nine (67,679) students enrolled across six Federal Colleges of Education in Northwest Nigeria, as documented by the National Commission for Federal Colleges of Education (NCCE, 2024). These institutions were drawn from Kaduna, Kano, Katsina, Sokoto, and Zamfara States. A multi-stage sampling procedure was employed. In the first stage, simple random sampling using the fishbowl technique was applied to select two states from among the five states hosting Federal Colleges of Education in Northwest Nigeria, yielding Kaduna and Kano States. In the second stage, one Federal College of Education was selected from each of the two chosen states using the same fishbowl approach, yielding the Federal College of Education, Zaria (Kaduna State) and the Federal College of Education, Kano (Kano State). In the third stage, simple random sampling was used to assign the two selected colleges into experimental and control groups, with Federal College of Education, Zaria, designated as the experimental group and Federal College of Education, Kano, as the control group. In the final stage, non-probability sampling was used to recruit 100 participants from each institution, giving a total sample size of 200 participants. This arrangement reflects a non-equivalent control group design, widely employed in quasi-experimental studies where full randomisation is operationally infeasible. The inclusion criteria required participants to be NCE students of Federal Colleges of Education in Northwest Nigeria who were willing to participate in the intervention and follow-up assessments. Students who were absent from school at the time of data collection were excluded from the study. Informed written consent was obtained from all



Effect of Health Education Intervention on utilisation of Health care Services among ... Maccido, H. M., Et. al. (2026)

participants before their inclusion, and ethical protocols were adhered to throughout the study process. The instrument for data collection was a researcher-developed questionnaire comprising a demographic section and a fifteen-item section measuring cultural and social factors in healthcare services utilisation. Responses were rated on a four-point modified Likert scale: Always (4), Often (3), Sometimes (2), and Never (1), with a mean aggregate score of 2.50 and above set as the threshold for a positive response. The questionnaire was validated by five subject-matter experts from the Department of Human Kinetics and Health Education and the College of Medical Sciences, Ahmadu Bello University, Zaria, whose inputs were incorporated before a pilot study conducted among 50 students at the Federal College of Education, Katsina, an institution sharing similar characteristics with the sampled colleges but excluded from the main study. Reliability was established through Cronbach's Alpha, yielding a coefficient of 0.752, which is considered adequate for internal consistency. The health education intervention was administered over six to eight weeks, with sessions held weekly at the Federal College of Education, Zaria, guided by a researcher-developed manual that sequenced topics relevant to cultural, social, and behavioural factors (traditional beliefs, stigma, social norms, and gender dynamics) and healthcare utilisation. Facilitator-led group discussions, case studies, and interactive sharing of personal experiences formed the core pedagogical methods, with group presentations and feedback sessions serving as evaluation tools. Data collection was conducted in three phases: a pre-intervention assessment administered concurrently to both groups, an intervention phase in which only the experimental group received the programme, and a post-intervention assessment administered to both groups one week after the conclusion of the intervention. Descriptive statistics of frequency and percentage were used to analyse the demographic characteristics of the respondents. Mean and standard deviation were used to answer the research questions, while the paired-sample t-test and independent-sample t-test were used to test the hypotheses at a 0.05 level of significance.

Presentation of Results

Research Question One: What is the effect of health education intervention on utilisation of healthcare services among the Federal Colleges of Education students in North-West Nigeria, after the intervention, based on cultural and social factors?

Table 1: Mean Scores of Responses on Utilisation of Healthcare Services Before and After the Health Education Intervention, Based on Cultural and Social Factors

Group	N	Mean	Std. Dev.	Mean Difference
Pretest	100	2.49	0.78	0.97
Post-test	100	3.46	0.69	

(Decision Mean = 2.50)

The result shows that the post-test mean score (Mean = 3.46, SD = 0.69) was higher than the pre-test mean score (Mean = 2.49, SD = 0.78), with a mean difference of 0.97. When compared to the decision mean of 2.50, the pre-test score was slightly below the benchmark, indicating that students initially underutilised healthcare services due to cultural and social barriers. However, the substantially higher post-test mean implies that the health education intervention had a strong positive effect on utilisation of healthcare services among the students across cultural and social factors in North West Nigeria.

Research Question Two: What is the difference between the control and experimental groups in the level of utilisation of healthcare services after health education intervention among Federal Colleges of Education students in North-West Nigeria, based on cultural and social factors?

Table 2: Mean Scores of Responses on the Difference Between Control and Experimental Groups in Utilisation of Healthcare Services After the Intervention, Based on Cultural and Social Factors

Group	N	Mean	Std. Dev.	Mean Difference
Control	100	2.42	0.64	1.04
Experimental	100	3.46	0.69	

(Decision Mean = 2.50)

Effect of Health Education Intervention on utilisation of Health care Services among ... Maccido, H. M., Et. al. (2026)

The result indicated that the experimental group (Mean = 3.46) had a higher level of utilisation of healthcare services compared to the control group (Mean = 2.42) after the health education intervention, with a mean difference of 1.04. Since both groups' mean scores were compared against the decision mean of 2.50, the experimental group's score was well above the benchmark, indicating effective utilisation of healthcare services, while the control group's score remained below the decision mean. This revealed that the health education intervention had the most substantial positive effect on improving healthcare service utilisation among students in the experimental group across cultural and social factors, compared to their counterparts in the control group.

Hypothesis One: There is no significant effect of cultural and social factors on health education intervention on utilisation of healthcare services among Federal Colleges of Education students in North-West Nigeria after the health education intervention.

Table 3: Paired-Sample t-test of Pretest and Post-test Scores on Utilisation of Healthcare Services, Based on Cultural and Social Factors

Group	N	Mean	Std. Dev.	Mean Diff.	df	t-value	p-value
Pretest	100	2.49	0.78	0.97	99	35.78	0.000
Post-test	100	3.46	0.69				

Table 3 revealed the results of a paired sample t-test conducted to determine whether there was a significant effect of cultural and social factors on health education intervention on utilisation of healthcare services among Federal Colleges of Education students in North West, Nigeria, after the intervention. The pretest mean score was 2.49, while the post-test mean score increased to 3.46, indicating an improvement in healthcare service utilisation following the intervention. The mean difference between the pretest and post-test scores was 0.97. The calculated t-value was 35.78 with 99 degrees of freedom, and the associated p-value was 0.000, which was less than the significance level of 0.05. This result led to the rejection of the hypothesis, which stated that there was no significant effect of cultural and social factors on health education intervention on utilisation of healthcare services. This implied that the health education intervention had a statistically significant positive effect on healthcare service utilisation based on cultural and social factors. The marked improvement in post-test scores affirmed that the intervention successfully enhanced students' utilisation of healthcare services, considering cultural and social factors.

Hypothesis Two: There is no significant difference between the control and experimental group on utilisation of healthcare services after health education intervention among Federal Colleges of Education students in North-West Nigeria, based on cultural and social factors.

Table 4: Independent-Sample t-test on the Difference Between Control and Experimental Groups, Based on Cultural and Social Factors

Group	N	Mean	Std. Dev.	Mean Diff.	df	t-value	p-value
Control	100	2.42	0.64	1.04	198	44.27	0.000
Experimental	100	3.46	0.69				

Table 4 showed the results of an independent t-test conducted to determine whether there was a significant difference in healthcare service utilisation between the experimental and control groups based on cultural and social factors after the health education intervention. The table indicated that the mean score of the experimental group was 3.46, while the control group recorded a lower mean score of 2.42, with a mean difference of 1.04. The calculated t-value was 44.27 with 198 degrees of freedom, and the p-value was 0.000. Since the p-value was less than the alpha level of 0.05, the result was statistically significant. The higher mean score of the experimental group affirmed that the health education intervention had a positive effect in enhancing their utilisation of healthcare services compared to the control group, which did not receive the intervention. Therefore, the hypothesis which stated that there was no significant difference between experimental and control groups on utilisation of healthcare services based on cultural and social factors was rejected. This



Effect of Health Education Intervention on utilisation of Health care Services among ... Maccido, H. M., Et. al. (2026)

implied that there was a significant difference between the experimental and control groups in their utilisation of healthcare services after the intervention.

Discussion of Findings

The finding that cultural and social factors significantly moderated the effect of the health education intervention on healthcare service utilisation ($t = 35.78, p = 0.000$) aligns with substantial prior research. Adebayo, Oladimeji, and Adepoju (2020) found that students from rural backgrounds were less likely to adopt new healthcare behaviours owing to entrenched traditional beliefs, indicating that cultural factors significantly moderate intervention effectiveness. Eze, Aniebue, and Uche (2019) demonstrated that cultural norms, such as gender roles discouraging women from seeking care without male permission, significantly affected intervention efficacy, while Bakare, Ogundele, and Adekunle (2020) found that religious and cultural norms significantly influenced the acceptance and effectiveness of health education interventions, particularly regarding sexual health services. The significant difference observed between the experimental and control groups ($t = 44.27, p = 0.000$) based on cultural and social factors is corroborated by Adebayo, Akinyemi, and Cadmus (2016), who found that whilst an experimental group showed significant improvements in clinic visits, socio-cultural beliefs continued to negatively influence healthcare-seeking behaviour, creating differential outcomes between groups. Oluwatoyin (2018) similarly demonstrated that cultural beliefs, such as a preference for traditional medicine, affected intervention outcomes differently between experimental and control groups, while Oluyemi, Adekunle, and Bamidele (2018) revealed that social factors such as peer influence and stigma around certain illnesses hindered full adherence to medical advice, creating significant differences between treatment groups. That the largest mean difference across the wider study was recorded for cultural and social factors suggests that structured, culturally responsive health education may be especially effective at addressing barriers rooted in belief and social norm, rather than in structural or economic constraint.

Conclusion

Based on the findings of the study, the following conclusions were made:

1. Before the health education intervention, cultural and social factors constrained the utilisation of healthcare services among Federal College of Education students in North-West Nigeria.
2. The health education intervention significantly enhanced the utilisation of healthcare services with respect to cultural and social factors, with students in the experimental group demonstrating markedly greater improvement than those in the control group.

Recommendations

Based on the conclusions, the study recommended the following:

1. School health workers should design and deliver culturally sensitive health education programmes that address traditional beliefs, religious values, and social stigma through community engagement and collaboration with cultural and religious leaders.
2. School management should institutionalise culturally adapted health education by training staff, developing context-specific educational materials in local languages, and incorporating cultural competence into all health promotion activities, with policymakers mandating the replication of such programmes across all colleges of education.

References

- Adamu, R. A., Umaru, M., Sanusi, M., Harande, Y., Sokoto, B. A., Shuaibu, A. S., Isiaq, A. T., & Diggi, A. U. (2025). Assessment of the plight of National Health Insurance Scheme among federal civil servant enrollees in Kebbi State, Nigeria. *Global Journal of Health Related Researches*, 7(1), 145-152.
- Adebayo, A. M., Akinyemi, O. O., & Cadmus, E. O. (2016). The role of health education in enhancing healthcare service utilisation among college students in Lagos State, Nigeria. *African Journal of Reproductive Health*, 20(3), 67-75.
- Adebayo, O., Oladimeji, K., & Adepoju, A. (2020). Healthcare utilisation patterns among Nigerian college students before and after a health education campaign. *Journal of Community Health*, 45(2), 301-310.
- allAfrica. (2025, November 14). *Nigeria's health financing still far below target despite progress – Minister*. <https://allafrica.com/stories/202511140735.html>
- Andersen, R. M., & Newman, J. F. (1973). Societal and individual determinants of medical care utilization in the United States. *The Milbank Memorial Fund Quarterly. Health and Society*, 51(1), 95-124. <https://doi.org/10.2307/3349613>

Effect of Health Education Intervention on utilisation of Health care Services among ... Maccido, H. M., Et. al. (2026)

- Azfredrick, E. C. (2016). Using Anderson's model of health service utilization to examine use of services by adolescent girls in south-eastern Nigeria. *International Journal of Adolescence and Youth*, 21(4), 523–529. <https://doi.org/10.1080/02673843.2015.1124790>
- Bakare, T., Ogundele, M., & Adekunle, R. (2020). The influence of health education on sexual health service utilisation among college students in Lagos. *African Journal of Reproductive Health*, 24(3), 67-76.
- Bello, H. Y., Anas, N., Usman, A., & Fungo, W. E. (2024). Utilization of university health care services among undergraduate students in Gombe State University-Nigeria. *Wukari International Studies Journal*, 8(4), 75-82.
- Centre for Journalism Innovation and Development. (2025, June 27). *Out-of-pocket and out of reach: Why Nigeria's health insurance coverage is not working*. <https://thecjid.org/out-of-pocket-and-out-of-reach-why-nigerias-health-insurance-coverage-is-not-working/>
- Commonwealth Fund. (2026, May). *Nigeria: International health care system profile*. <https://www.commonwealthfund.org/international-health-policy-center/countries/nigeria>
- Eze, R., Aniebue, P., & Uche, N. (2019). Effect of health education on healthcare access among female students in Nigerian colleges of education. *Journal of Women's Health Care*, 8(2), 112-120.
- Isiaq, A. T., & Abdullahi, M. B. (2025). Assessment of Health-Seeking Behavior on Maternal and Child Health among Nursing Mothers in Public Primary Health Care Centres in Kwara State, Nigeria. *Zamfara International Journal of Education (ZIJE)*, 5(6), 1-6. <https://doi.org/10.64348/zije.2025213>
- James, P. B., Wardle, J., Steel, A., & Adams, J. (2018). Traditional, complementary and alternative medicine use in Sub-Saharan Africa: A systematic review. *BMJ Global Health*, 3(5), e000895.
- Jia, H., Miao, C., Song, X., Feng, T., & Zhao, Y. (2025). Factors influencing intentional non-utilization of healthcare: A study using the Andersen model. *Frontiers in Public Health*, 13, 1503601.
- Krzyż, E. Z., Martinez, O. F. A., & Lin, H. R. (2023). Uses of Andersen health services utilization framework to determine healthcare utilization for mental health among migrants—A scoping review. *Frontiers in Public Health*, 11, 1284784. <https://doi.org/10.3389/fpubh.2023.1284784>
- Oluwatoyin, A. (2018). Impact of health education intervention on healthcare utilisation: Cultural beliefs. *African Journal of Cultural Studies*, 22(3), 234-243.
- Oluyemi, O., Adekunle, A., & Bamidele, J. (2018). Role of health education in modifying healthcare-seeking behaviour in Northern Nigeria. *West African Journal of Medicine*, 37(4), 345-354.
- Orok, E., Nwifama, S., Oni, O., Ojo, T., Oluwadare, T., Bamitale, T., Jaiyesimi, B., Saka, A., Aparo, T., & Kukoyi, O. (2024). Students' perception of healthcare services and factors affecting their utilization at a Nigerian university: A cross-sectional study. *Scientific Reports*, 14(1), Article 75573.
- Wankasi, H. I., Olotu, A. R., Ahmadu, W. I., Ochikiri, O. E., & Hamilton-Ekeke, J.-T. (2024). Perception and utilization of university healthcare services by undergraduate students. *Nigerian Journal of Health Promotion*, 17(2), 67-76.
- World Bank. (2025). *Tracking universal health coverage (UHC): 2025 global monitoring report*. <https://www.worldbank.org/en/topic/universalhealthcoverage/publication/2025-global-monitoring-report-gmr>
- World Health Organization, & World Bank. (2025, December 6). *Most countries make progress towards universal health coverage, but major challenges remain, WHO–World Bank report finds*. <https://www.who.int/news/item/06-12-2025-most-countries-make-progress-towards-universal-health-coverage-but-major-challenges-remain-who-world-bank-report-finds>
- World Health Organization. (2025, December 5). *Universal health coverage (UHC)* [Fact sheet]. [https://www.who.int/news-room/fact-sheets/detail/universal-health-coverage-\(uhc\)](https://www.who.int/news-room/fact-sheets/detail/universal-health-coverage-(uhc))



Effects of Connectivism-Based Jigsaw IV Strategy on ... Sani, M., Et. al. (2026)

Effects of Connectivism-Based Jigsaw IV Strategy on Attitude and Performance in Geometry Concept among Secondary School Mathematics Students in Katsina State, Nigeria

SANI, Murtala¹

sanimurtala91@gmail.com

08107459960, 08133138661

SALISU, Yahaya¹

USMAN, Sanusi Shehu¹

¹Department of General Studies Education, Yusuf Bala Usman College of Education and Legal Studies Daura, Katsina State, Nigeria

Abstract

This study investigated the Effectiveness of Connectivism-Based Jigsaw Strategy on Attitude and Performance in Geometry among Senior Secondary Students in Katsina State. Quasi-experimental research design was adopted. A total sample of 221 out of 77, 117 public senior secondary two (SS II) mathematics students during the 2025/2026 in Katsina state were selected using multistage sampling technique. Validated and tested Geometry Attitude Questionnaire (GAQ) and Geometry Performance Test (GPT) with the reliability coefficient of .79 and, .85 respectively were used for data collection of the study. All the research questions were answered using mean and standard deviation, while the hypotheses were tested using ANCOVA at .05 significance level. The findings revealed that the students taught geometry using Connectivism-Based Jigsaw IV Strategy (CONBJ4S) significantly performed better [$F(1, 436) = 53.02, p < .001$] with higher positive attitude towards geometrical concept [$F(1, 436) = 16.26, p < .001$] than their counterparts taught same concept using Conventional Lecture Method (CLM). Based on the study findings, it was recommended that mathematics teachers should adopt CONBJ4S in teaching geometry in place of the CLM commonly used in Katsina state.

Keywords: Connectivism, Jigsaw IV Strategy, Attitude, Performance, Geometry

Introduction

Nowadays, the wide spread of technology, instructional materials and cooperative strategy of different kinds in the discharge of teaching and learning process has resulted in the alteration of the learning environment, which brought about so many changes in the educational discharged (Downes, 2019). This has to do with the fact that, education is dynamic and go along with the discharge from traditional perspective to group and virtual learning where content to learn by the student can not only be guided by teacher but also discharged by students using technology and cooperative work to advance learning between and amongst themselves (Mubbireek, 2021). Additionally, Siemens (2021) argues that information technology has transformed the traditional learning environment in a significant way and observed that the different connection points in learning have been developed in learning where the use of cooperation and technology are used to create students' learning groups for interaction. This is done both in formal literacy and informal literacy within the wide learning environment that is becoming wider due to the prevalence of diverse technology platforms and group learning for discharging activities (Aldahdouh et al, 2015). Connectivism is a theoretical framework for understanding learning which emphasizes on how internet technologies and groups such as Online discussion forum, social networks and group learning contributed to new avenues of learning. In other words, it is a learning theory which explains how internet technologies and groups activities have created new opportunities for students to learn and share information among group members (Siemens, 2021). According to Yeppez (2021), learning was related to the group and virtual modality where Connectivism is strengthened as the construction of new knowledge through self-training with the use of technology or group work. Technology and cooperative work are changing students' learning in and out of classroom, rather than learning from teacher and textbooks. Smart phone, laptops and group work served as their means of getting information. The increase used of group work and technology as an educational tool, had changed the learning landscape. With it, came gaps in traditional ideas of teaching and need for new methods such as connectivism based cooperative learning strategies to keep-up, in order to tackle the global educational challenges. Jigsaw IV strategy, as cooperative learning approach, has demonstrated potential for promoting students' academic outcomes, particularly in challenging subject areas. The strategy engages students in collaborative activities where they learn specific material, teach it to peers, and collectively synthesize knowledge through group discussions and presentations (Aronson, 2023). Jigsaw IV technique is particularly important for complex topics like geometry in mathematics because of its organized stages, which include expert group discussions, quizzes, and re-teaching sessions. These phases enable deeper investigation of the material and close learning gaps (Gonzalez, 2015). As dependent variables, students' attitude towards geometry is their tendency to respond in a particular



Effects of Connectivism-Based Jigsaw IV Strategy on ... Sani, M., Et. al. (2026)

way towards geometrical concept (Sani et al, 2024). While, students' performance in geometry refers to their ability to demonstrate understanding of concept (Sani et al, 2025). Despite the importance of geometry, some students in Katsina state consider the concept as difficult and abstract. Such perceptions reduce their interest and participation in the lesson exercise leading to their poor performance and negative attitude towards the concept (Bada & Yusuf, 2022). These indicated that, students' performance and attitude have relationship and direct effect on one another (Klinedinst, 2023). That attributed due to conventional lecture method used by the teachers which make the students passive during the lesson (Adamu and Ibrahim, 2021). To tackle that, the researcher suggested to integrate connectivism principles (autonomy, diversity, openness and interactivity) with jigsaw IV strategy as Connectivism based jigsaw IV (CONBJ4) strategy in order to promote the students' attitude and performance in geometry in Katsina state.

Statement of the Problem

Students' performance and attitude towards geometry in secondary schools in Katsina state has decline despite its importance in mathematics and other sciences. Evidence indicated that geometry is one of the students' area of weakness (West African Examination Council [WAEC], 2023, 2024, 2025). Also, there is about 7.69% decrease in candidates' performance in Mathematics and English Language in WAEC 2024 compared to that of 2023 (Omisakin, 2024). Some factors contributing to the students' poor performance include; shortage of mathematics instructional materials, students' poor background on geometrical concept, improper implementation of curriculum by teachers were identified by Wasagu & Kabir (2022); Ibrahim et al (2023) and Dauda (2024). The use of conventional lecture method (teacher-centered method) which is not actively involving students in the learning process, predominantly used by teachers in the study area. Many students consider geometry as difficult concept due to its abstract nature (Adamu and Ibrahim, 2021). To address that, there is need to apply suitable method that promote the students' performance and attitude towards the concept, which inspire the researcher to conduct this research work. The study sought to explore the effectiveness of CONBJ4S on students' performance and retention of geometry in Katsina state.

Objectives of the Study

The following are objectives of the study were to:

1. Investigate the effect of Connectivism based jigsaw IV strategy on the students' attitude toward geometry; and
2. Examine the effect of Connectivism based jigsaw IV strategy on the students' performance in geometry.

Research Questions

The following questions were drowned to guide the study:

1. What is the difference between the mean attitude scores of the students taught geometry using the Connectivism based jigsaw IV strategy and their counterparts taught same concept using conventional lecture method?
2. What is the difference between the mean performance scores of the students taught geometry through Connectivism based jigsaw IV strategy and the other group taught same concept using conventional lecture method?

Research Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance:

- H₀₁:** There is no significant difference between the mean attitude scores of the students taught geometry using Connectivism based jigsaw IV strategy and their counterparts taught same concept using conventional lecture method.
- H₀₂:** There is no significant difference between the mean performance scores of the students taught geometry using the Connectivism based jigsaw IV strategy and their counterpart taught same concept using conventional lecture method.

Methodology

The research design used in this study was Quasi-experimental research design in order to establish a cause-and-effect relationship between the variables. The population of this study consist of 77,117 (i.e. $M = 44,113$ and $F = 33,004$) SS II public senior secondary schools' students in Katsina state. A sample of 221 students was selected from the two Zonal Education Quality Assurance out of twelve, using multistage sampling technique and used two intact classes as suggested by Aliyu (2016) that, quasi-experimental research design permits the use of intact class. One of the classes as experimental taught using CONBJ4S while the other as control group class taught through conventional lecture method. The instruments used for data collection of the study were Geometry Attitude Questionnaire (GAQ) and Geometry Performance Test (GPT) with the reliability coefficient of .79 and .85 respectively and validated by experts. The instruments were administered two



Effects of Connectivism-Based Jigsaw IV Strategy on ... Sani, M., Et. al. (2026)

times as pretest and posttest. All the research questions were answered using mean and standard deviation, while the hypotheses were tested using ANCOVA at .05 significance level.

Presentation of Results

Attitude towards geometry scores of the students' taught using CONBJ4S and CLM

To answer the research question one (1), GAQ marks of students taught geometry using CONBJ4S and those taught using CLM were subjected to descriptive statistics of mean and standard deviation in Table 1

Table 1

Mean and Standard Deviation Attitude Scores of CONBJ4S and CLM

Strategy	N	M	SD	MD
CONBJ4S	134	57.01	20.88	
CLM	87	52.38	11.13	4.63

Key: N = Total Number, M = Mean, SD = Std. Deviation, and MD = Mean Difference

Table 2 showed that the mean and standard deviation attitude scores of students taught mensuration using the CONBJ4S ($M = 57.01$, $SD = 20.88$) was higher than that of CLM ($M = 52.38$, $SD = 11.13$) with difference of 4.63 mean score. To investigate whether the difference is significant or not, null hypothesis one (1) was tested and the result presented in Table 2

Table 2

Analysis of Covariance Result on mean Attitude Scores of CONBJ4S and CLM

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	77925.185 ^a	2	38962.593	276.406	.000
Intercept	10283.197	1	10283.197	72.950	.000
Test	75681.440	1	75681.440	536.895	.000
Group	2291.640	1	2291.640	16.257	.000
Error	61459.175	436	140.961		
Total	1477057.000	439			
Corrected Total	139384.360	438			

Note. R Squared = .559 (Adjusted R Squared = .557)

Table 2 revealed that there was significant difference between the mean attitude scores of the students taught mensuration using CONBJ4S and the other group taught using CLM, $F(1, 436) = 16.26$, $p < .001$. Hence, the null hypothesis was rejected.

Performance scores of the students' taught using CONBJ4S and CLM

To answer the research question two (2), GPT marks of students taught geometry using CONBJ4 strategy and those taught using TRDM were subjected to descriptive statistics of mean and standard deviation in Table 3

Table 3

Mean and Standard Deviation Performance Scores of CONBJ4S and CLM

Strategy	N	M	SD	MD
CONBJ4S	134	41.83	20.35	
CLM	87	33.33	13.78	8.50

From Table 3 the mean and standard deviation performance scores of students taught geometry using the CONBJ4S ($M = 41.83$, $SD = 20.35$) was greater than that of those taught using CLM ($M = 33.33$, $SD = 13.78$) with difference of 8.50 mean score. To check whether the difference is significant or not, null hypothesis two (2) was tested and the result presented in Table 4.

Table 4

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	87299.056 ^a	2	43649.528	302.829	.000
Intercept	350.125	1	350.125	2.429	.120



Effects of Connectivism-Based Jigsaw IV Strategy on ... Sani, M., Et. al. (2026)

Test	79747.492	1	79747.492	553.267	.000
Group	7641.538	1	7641.538	53.015	.000
Error	62844.694	436	144.139		
Total	800813.000	439			
Corrected Total	150143.749	438			

Analysis of Covariance on Mean Performance Scores of CONBJ4S and CLM

Note. R Squared = .581 (Adjusted R Squared = .580)

Table 4 showed that there was significant difference in the mean performance scores of the students taught geometry using CONBJ4S and those taught through CLM, $F(1, 436) = 53.02, p < .001$. Hence, the null hypothesis was rejected.

Discussion of the Findings

The first finding from Tables 1 and 2 revealed that the students taught geometry using CONBJ4S recorded the highest mean attitude score compared to the other group treated using CLM with significant difference. It positively affected their attitude towards geometry and induced that, CONBJ4S offered them an opportunity to socialized and interacted with their team members which led them to more positive attitude towards the concept. This finding is in line with the finding of Tagle & Cabigan (2022) who noted that collaborative learning promotes the students' positive attitude to learning. Another corresponding finding include that of Suleiman et al (2020) in their study "Investigation into secondary school students' attitude towards learning of geometry in Zamfara State, Nigeria", which revealed that student's attitude towards geometry was significant and positively high. However, it was evident that students taught geometry using CONBJ4S developed more positive attitude towards geometry than those treated using CLM. Therefore, CONBJ4S helped students to improve their attitude towards geometry. In the second finding, Tables 3 and 4 showed that there was significant difference in the mean performance of students taught geometry using CONBJ4S in favor to those taught through CLM. This agreed with the findings of Waziri and Fasasi (2024) in their study on Effects of Jigsaw IV cooperative instructional strategy on academic performance in mathematics among post-basic schools' students in Adamawa State, Nigeria, and that of Jamilu et al (2022), which revealed that students taught using jigsaw IV strategy outperformed their counterpart taught using lecture method. It attributed to the fact that in connectivism based jigsaw IV strategy, students were actively involved in the learning process which agreed with the findings of Alzain (2019), which revealed that, the theory application has significance effect on students' performance. In the same way, Leow and Nao (2023) revealed that the students improved their collaborative skills and connectivism learning effectively enhanced the student learning process. According to Yussif (2022), one of the key features of Connectivism is that learners are actively involved in the learning process, they share information and ideas in their group to work as a team through cooperative work to create new knowledge for solved physical problems. Kilag et al (2023), added that connectivism-based instruction was the best approach to enhance students learning in the 21st century. Therefore, CONBJ4 strategy improves the students' performance in geometry.

Conclusion

The aim of this research work was to examine the effect of connectivism based jigsaw IV strategy in teaching and learning geometry among senior secondary students in Katsina state. Based on the study findings, it could be concluded that connectivism based jigsaw IV strategy was better and more effective in teaching geometry and could enhanced the students' performance and attitude towards geometrical concept more than the conventional lecture method commonly used in Katsina state. Since, the students were actively involved into the lesson activities of the strategy. Thus, the strategy could be used in place of conventional lecture method to yield better result.

Recommendations

On the basis of the findings and conclusion of the study, the following recommendations were made:

1. Secondary school mathematics teachers should be encouraged in using effective strategy in the classroom, especially CONBJ4S in teaching geometry and other related concepts.
2. CONJ4S should be added into curriculum for the teaching of Geometry in Senior Secondary Schools in Katsina state.
3. Professional bodies like Mathematics Association of Nigeria (MAN) and Science Teachers Association of Nigeria (STAN) should encourage the use of the strategy in all educational levels especially at junior and senior secondary schools.
4. Seminars, workshops and conferences should be organized for mathematics teachers on how to adopt CONBJ4S in teaching their students for the effectiveness and better achievement of the set objectives.



Effects of Connectivism-Based Jigsaw IV Strategy on ... Sani, M., Et. al. (2026)

References

- Aliyu, A. D. (2016). *Conducting research in education*. Concept designs and printers' publishers.
- Adamu, M. I., & Ibrahim, H. U. (2021). Factors influencing students' achievement in geometry among secondary students in Northern Nigeria. *Journal of Educational research and Development*, 13(1), 78-92.
- Aldahdouh, A. et al. (2015). "Understanding knowledge network, learning and connectivism." *International Journal of Instructional Technology and Distance Learning*, 12(10), 3–21.
- Alzain, H. A. (2019). The role of social networks in supporting collaborative e-learning based on connectivism theory among students of PNU. *Turkish online Journal of Distance Education*, 20(2), 46-63. <https://doi.org/10.17718/tojde.557736>
- Aronson, E. (2023, September 28). Jigsaw teaching technique. In *Wikipedia*. <https://en.m.wikipedia.org/jigsaw-teaching-technique>
- Bada, T. A. & Yusuf, M. O. (2022) Students' perception of geometry and attitude towards mathematics. *African Journal of Educational Studies*, 18(2), 85-101.
- Dauda, I. M. et al. (2024). Perceived causes of students' failure in Mathematics and English language among tertiary students in Katsina state. *International Journal of Research Publication and Reviews*, 5(3), 7394-7404.
- Downes, S. (2019). Recent work in connectivism. *European Journal of Open, Distance and E-Learning (EURODL)*, Vol. 22(2), 113-132. <https://doi.org/10.2478/eurodl-2019-0014>
- Gonzalez, J. (2015, April 12). The Jigsaw Method. *Cult of Pedagogy*. www.cultofpedagogy.com/wp-content
- Ibrahim, L. et al. (2023). Impact of inductive and problem-solving teaching methods on students' performance in geometrical concepts of mathematics among junior secondary school students in Katsina state, Nigeria. *International Journal of Research and Innovation in Social Science*, 7(6), 1873-1893.
- Jamilu, A. A. et al. (2022). Effect of Jigsaw IV cooperative learning strategy on students' performance and retention in geometry amongst secondary school students in Zaria metropolis, Kaduna State, Nigeria. *Rima International Journal of Education*, 1(1), 102-111.
- Kilag, O. K. et al. (2023). Enhancing student learning through the integration of connectivism theory in blended learning environments. *European Journal of Innovation in Nonformal Education*, 3(6), 1-10.
- Klinedinst, R. E. (2023). Predicting performance achievement and retention of fifth-grade instrumental students. *Journal of Research in Music Education*, 39(3), 181-190.
- Leow, F. T. & Nao, M. (2023). Critical factors for enhancing students' collaborative learning experiences in a project-based connectivism learning environment. *International Journal of Learning, Teaching and Educational Research*, 22(7), 388-410. <https://doi.org/10.26803/ijlter.22.7.21>
- Mubireek, S. A. (2021). The effect of collaborative learning versus traditional teaching on students' achievement: A case study. *TESOL International Journal*, 16(2), 31-55. <https://files.eric.ed.gov/fullt>
- Omisakin, D. (2024, August 13). 503,275 students fail English, Maths in 2024 WASSCE. *Daily Trust*. <https://dailytrust.com/503275-students-fail-english-maths-in-2024-wassec/>
- Sani, M., Kankia, A. D., & Sabitu, A. (2024). Effect of Jigsaw IV and Problem-Solving Strategies on Attitude and Performance in Mensuration among Senior Secondary Schools Students in Katsina State, Nigeria. *FUDMA Journal of Science Education (FUDJSE)*, 1(1), 21-29.
- Sani, M., Sabitu, A. & Kankia, A. D. (2025). Effect of Jigsaw (IV) Instructional Strategy on Performance and Retention in Mensuration Concept Among Senior Secondary School Students in Katsina State. *Zamfara International Journal of Tech. Edu. & Mathematics*. 1(Maiden) Edition, 81-91.
- Siemens, G. (2021, May 27). What is connectivism learning theory? *WGU*. <https://www.wgu.edu/blog/connectivism-learning-theory>
- Suleiman, B. et al. (2020). Investigating into secondary school students' attitude towards learning geometry in Zamfara state, Nigeria. *International Journal of Education and Multidisciplinary Studies*, 16(4), 236-242. <https://doi.org/10.21013/jems.v16.n4p>
- Tagle, L. T. & Cabigan, M. V. (2022). Online collaborative learning to the learners' performance and attitude. *International Journal of Research Publication*, 105(1), 290-304. <https://doi.org/10.47119/ijrp1001051720223660>
- Wasagu, S. U. & Kabir, S. (2022). Problem and prospects in the implementation of mathematics curriculum at senior secondary schools in Katsina local government. *Multidisciplinary Journal of for Education Social and Technological Sciences*, 2(1), 1-13.
- Waziri, S. M. & Fasasi, K. M. (2024). Effects of Jigsaw IV cooperative instructional strategy on academic performance in mathematics among post-basic schools' students in Adamawa State, Nigeria. *BSU Journal of sciences, mathematics and computer education*, 4 (1), 89 – 100.
- West African Examination Council. (2023). Chief examiners' report for mathematics (core). *Waec.org*. <https://www.waecgh.org/mathematics>



Effects of Connectivism-Based Jigsaw IV Strategy on ... Sani, M., Et. al. (2026)

West African Examination Council. (2024). Chief examiners' report for mathematics (core). *Waec.org*.
<https://www.waecgh.org/mathematics>

West African Examination Council. (2025). Chief examiners' report for mathematics (core). *Waec.org*.
<https://www.waecgh.org/mathematics>

Yepez, N. L. (2021, November 26). *Connectivism in achieving mathematics learning in time of pandemic*.
Journalbusiness.com. <https://doi.org/10.37956/jbes.v0i0.203>

Yussif, A. H. (2022, September 15). Connectivism learning theory in the classroom. *Classroom management expert*.
<https://classroommanagementexpert.com/blog/connectivism-learnig>



Effect of Microsoft Power Point Instructional Strategy on ... Kankia, A. D. & Sabo, A. (2026)

Effect of Microsoft PowerPoint Instructional Strategy on Performance in Mensuration Concept among Senior Secondary School Mathematics Students in Katsina State, Nigeria

KANKIA, Aminu Dalhat¹
 adalhat@fudutsin-ma.edu.ng

SABO, Abubakar¹
asabo@gmail.com
 +2348039498636

¹Department of Science Education, Faculty of Education, Federal University Dutsin-Ma, Katsina State.

Abstract

This study examined the effect of Microsoft PowerPoint instructional strategy on students' performance in Mensuration among Senior Secondary School students in Katsina State, Nigeria. A 3 × 2 factorial quasi-experimental pretest–posttest non-randomized control group design was adopted. A total of 180 students were selected using a multistage sampling technique and assigned to three instructional groups: Interactive PowerPoint, Linear PowerPoint, and Non-Digital Technology. Data were collected using a Mensuration Performance Test (MPT), which was validated by experts in Mathematics Education and Measurement and Evaluation. The instrument yielded a reliability coefficient of 0.81. Descriptive statistics (mean and standard deviation) and Analysis of Covariance (ANCOVA) were used for data analysis at the 0.05 level of significance using the Statistical Package for the Social Sciences (SPSS). The results revealed that students taught using Interactive PowerPoint recorded the highest performance scores, followed by those taught using Linear PowerPoint, while students taught using Non-Digital Technology recorded the lowest performance scores. ANCOVA showed a significant effect of instructional treatment on students' performance in Mensuration, $F(2, 173) = 5.018, p = .008, \text{partial } \eta^2 = .055$. Gender also had a significant effect on students' performance, $F(1, 173) = 10.029, p = .002, \text{partial } \eta^2 = .055$. Furthermore, a significant interaction effect was found between instructional treatment and gender, $F(2, 173) = 6.743, p = .002, \text{partial } \eta^2 = .072$. Post hoc analysis revealed a significant difference between the Interactive PowerPoint and Linear PowerPoint groups, while no significant differences were found between the Interactive PowerPoint and Non-Digital Technology groups or between the Linear PowerPoint and Non-Digital Technology groups. The study concluded that instructional treatment significantly influenced students' performance in Mensuration and that the effectiveness of the instructional strategies varied according to students' gender. The study recommended the adoption of Interactive PowerPoint in the teaching of Mensuration and the provision of adequate technological resources and teacher training to support its implementation.

Keyword: Mensuration, Interactive PowerPoint, Linear PowerPoint, Non-Digital Technology, Performance.

Introduction

Mathematics is a compulsory subject in the Nigerian senior secondary school curriculum and serves as a foundation for scientific, technological, and economic development. Success in Mathematics is essential for students' progression to higher education and for national development goals. However, persistent poor performance and declining interest in Mathematics have continued to pose serious challenges in Nigerian secondary schools, particularly in concept-laden topics such as Mensuration (WAEC, 2023; Yusuf & Afolayan, 2024). Mensuration involves the understanding and application of formulas related to lengths, areas, volumes, and surface areas of geometric figures. The abstract nature of these concepts, coupled with students' weak spatial visualization skills, has contributed to widespread learning difficulties and low achievement in the topic (Abdulrahman & Sadiq, 2023). Recent examination reports have consistently identified Mensuration as one of the Mathematics topics where students perform poorly at the senior secondary school level (WAEC, 2024). In many Nigerian classrooms, including those in Katsina State, the teaching of Mathematics is still largely dominated by non-interactive instructional approaches, such as teacher-centered lectures, chalk-and-talk methods, and linear Microsoft PowerPoint presentations. These approaches emphasize passive content delivery, with limited student engagement, minimal classroom interaction, and little opportunity for learners to explore concepts actively (Bello, Danjuma, & Musa, 2023). Although non-interactive methods allow teachers to cover syllabus content efficiently, they may not adequately stimulate students' interest or promote deep understanding of mathematical concepts. Students' interest plays a critical role in determining their academic performance in Mathematics. Interest influences students' attention, motivation, and persistence in learning challenging concepts. Recent studies have shown that when instructional methods fail to engage learners actively, students are more likely to develop negative attitudes toward Mathematics, resulting in

Effect of Microsoft Power Point Instructional Strategy on ... Kankia, A. D. & Sabo, A. (2026)

reduced interest and poor academic performance (Okeke & Nwoye, 2024; Salami & Ahmed, 2023). This effect is more pronounced in topics such as Mensuration, which require visualization, practical examples, and continuous learner involvement. Empirical studies conducted between 2023 and 2025 indicate that interactive and learner-centered instructional strategies, including the use of Microsoft PowerPoint with interactive features, significantly improve students' interest and achievement in Mathematics when compared to conventional, non-interactive methods (Ogunleye & Babatunde, 2024; Mohammed, Lawal, & Garba, 2025). These findings suggest that reliance on non-interactive instruction may contribute to students' poor interest and low performance. However, most of these studies focus on general Mathematics performance or other topics such as Algebra and Geometry, with limited emphasis on Mensuration. This study is anchored on Cognitive Learning Theory and Constructivist Learning Theory. Cognitive Learning Theory posits that learning is most effective when students actively process information, make connections, and engage with content meaningfully (Piaget, 1972; Bruner, 1966). Microsoft PowerPoint, particularly interactive presentations, provides opportunities for learners to visualize concepts, receive immediate feedback, and integrate knowledge, thereby enhancing cognitive processing. Constructivist Learning Theory emphasizes that learners construct knowledge through active participation, exploration, and interaction with learning materials (Vygotsky, 1978; Fosnot, 2013). Interactive PowerPoint aligns with this perspective by allowing students to engage with animations, problem-solving activities, and visual demonstrations, which promote deeper understanding and retention of Mensuration concepts. Furthermore, there is a noticeable scarcity of empirical research specifically examining the effect of Microsoft PowerPoint-based instruction on students' interest and performance in Mensuration at the senior secondary school level in Katsina State. Given the continued use of traditional teaching methods in the state's public secondary schools, it is necessary to investigate how interactive and non-interactive Microsoft PowerPoint instruction influences students' learning outcomes in Mensuration. Therefore, this study seeks to examine the effect of Microsoft PowerPoint on students' performance in Mensuration among senior secondary school students in Katsina State. The findings are expected to provide empirical evidence that will guide Mathematics teachers, curriculum planners, and educational policymakers in improving instructional practices and enhancing students' learning experiences in Mathematics.

Statement of the Research Problem

Mathematics remains a core subject in Nigerian senior secondary schools, yet students continue to show low interest and poor performance, particularly in Mensuration, a topic requiring strong visualization and application skills (WAEC, 2023; Abdulrahman & Sadiq, 2023). In Katsina State, teaching is largely dominated by non-interactive methods, such as teacher-centered lectures and linear PowerPoint presentations, which limit student engagement and active learning (Bello, Danjuma, & Musa, 2023; Salami & Ahmed, 2023). Studies indicate that passive instructional approaches reduce motivation and hinder understanding, while interactive methods improve both interest and performance (Ogunleye & Babatunde, 2024; Mohammed, Lawal, & Garba, 2025). Despite this, there is limited research on how non-interactive instruction specifically affects students' interest and performance in Mensuration in Katsina State. This gap raises concerns about the continued reliance on passive teaching approaches and their potential contribution to students' learning difficulties. Hence, this study seeks to investigate the effect of Microsoft PowerPoint instructional strategies Interactive PowerPoint, Linear PowerPoint, and Non-Digital Technology on students' performance in Mensuration among senior secondary school students in Katsina State.

Objectives of the study

The objectives of this study were to:

1. Determine the effect of Microsoft PowerPoint instructional strategies (Interactive PowerPoint, Linear PowerPoint, and Non-Digital Technology) on students' performance in Mensuration.
2. Examine the effect of gender on students' performance in Mensuration.
3. Determine the interaction effect of instructional treatment and gender on students' performance in Mensuration.

Research Questions

The study answered the following questions:

1. What is the effect of Microsoft PowerPoint instructional strategies (Interactive PowerPoint, Linear PowerPoint, and Non-Digital Technology) on students' performance in Mensuration?
2. What is the effect of gender on students' performance in Mensuration?
3. What is the interaction effect of instructional treatment and gender on students' performance in Mensuration?



Effect of Microsoft Power Point Instructional Strategy on ... Kankia, A. D. & Sabo, A. (2026)

Hypotheses

The following hypotheses were formulated and tested at a 0.05 significance level:

1. There is no significant effect of Microsoft PowerPoint instructional strategies (Interactive PowerPoint, Linear PowerPoint, and Non-Digital Technology) on students' performance in Mensuration.
2. There is no significant effect of gender on students' performance in Mensuration.
3. There is no significant interaction effect of instructional treatment and gender on students' performance in Mensuration.

Methodology

This study employed a 3×2 factorial quasi-experimental pretest–posttest non-randomized control group design to investigate the effects of instructional treatment and gender on students' performance in Mensuration. The population consisted of all Senior Secondary School II (SSII) students offering Mathematics in public schools in Katsina State. A sample of 180 students was drawn using a multistage sampling technique, which involved random selection of educational zones followed by purposive selection of co-educational schools. The participants were assigned to three instructional groups: Interactive PowerPoint, Linear PowerPoint, and Non-Digital Technology. Data was collected using the Mensuration Performance Test (MPT) which was validated by experts in Mathematics Education and Measurement and Evaluation. The reliability coefficient of the test was found to be $r = 0.81$. The instructional intervention lasted three months, after which post-tests were administered to assess students' performance. Descriptive statistics were used to answer the research questions, while ANCOVA was conducted to test the hypotheses at the 0.05 level of significance using SPSS application.

Presentation of Results

The results were presented in the tables as follows:

Research Question 1: What is the effect of Microsoft PowerPoint instructional strategies (Interactive PowerPoint, Linear PowerPoint, and Non-Digital Technology) on students' performance in Mensuration?

Table 1:

Mean and Standard Deviation of Students' Performance in Mensuration by Instructional Treatment

Group	N	Mean	SD
Interactive PowerPoint	60	56.20	6.7
Linear PowerPoint	60	45.47	5.85
Non-Digital Technology	60	39.93	3.8

Table 1 shows that students taught using Interactive PowerPoint obtained the highest mean performance score ($M = 56.20$, $SD = 6.77$), followed by those taught using Linear PowerPoint ($M = 45.47$, $SD = 5.85$). Students taught using Non-Digital Technology recorded the lowest mean performance score ($M = 39.93$, $SD = 3.28$).

Research Question 2: What is the effect of gender on students' performance in Mensuration?

Table 2:

Descriptive Statistics of Gender on students' performance in Mensuration.

Gender	N	Mean	SD
Male	90	48.4333	8.23537
Female	90	33.0889	23.53035

Table 2 shows that male students recorded higher performance in Mensuration, with a mean score of 48.43 ($SD = 8.24$), compared to female students who had a lower mean score of 33.09 ($SD = 23.53$). This indicates that male students performed better than their female counterparts in Mensuration. The relatively higher standard deviation among female students suggests greater variability in their performance, while the lower standard deviation among male students indicates more consistency in their scores.

Research Question 3: What is the interaction effect of instructional treatment and gender on students' performance in Mensuration?

Table 3:

Descriptive Statistics of Students' Interaction effect of the treatment and gender on students' performance in mensuration

Group	Gender	N	Mean	SD



Effect of Microsoft Power Point Instructional Strategy on ... Kankia, A. D. & Sabo, A. (2026)

Interactive	Male	30	58.4333	1.0400
	Female	30	53.9667	9.04961
Linear	Male	30	47.6333	1.09807
	Female	30	43.3000	7.66159
Non-Digital	Male	30	39.2333	3.76631
	Female	30	40.6333	2.59287

Table 3 shows the interaction effect of instructional group and gender on students' performance in Mensuration. In the Interactive PowerPoint group, male students recorded a slightly higher mean score of 58.43 (SD = 1.04) compared to female students who had a mean score of 53.97 (SD = 9.05). This indicates that while both male and female students benefited from the interactive method, male students performed slightly better, and female scores were more varied. In the Linear PowerPoint group, male students also outperformed female students, with a mean score of 47.63 (SD = 1.10) compared to 43.30 (SD = 7.66) for females. This suggests a similar pattern as observed in the Interactive group, though overall performance was lower. However, in the Non-Digital Technology group, female students recorded a slightly higher mean score of 40.63 (SD = 2.59) than male students, who had a mean score of 39.23 (SD = 3.77). This indicates that in the traditional teaching method, female students performed marginally better than male students. Overall, the results suggest that the Interactive PowerPoint method was the most effective for both genders, with male students generally outperforming females in the technology-based groups, while females showed a slight advantage in the Non-Digital group.

Hypotheses

Table 4: ANCOVA Summary Table for Students' performance in Mensuration

Tests of Between-Subjects Effects							
Dependent Variable: Posttest							
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Squared	Eta
Corrected Model	9031.554 ^a	6	1505.259	57.394	.000	.666	
Intercept	171.561	1	171.561	6.541	.011	.036	
Pretest	212.688	1	212.688	8.110	.005	.045	
Treatment	263.215	2	131.608	5.018	.008	.055	
Gender	263.019	1	263.019	10.029	.002	.055	
Treatment * gender	353.679	2	176.840	6.743	.002	.072	
Error	4537.246	173	26.227				
Total	414580.000	180					
Corrected Total	13568.800	179					

a. R Squared = .666 (Adjusted R Squared = .654)

Table 4 results reveals that an analysis of covariance (ANCOVA) was conducted to examine the effects of treatment and gender on students' performance in Mensuration while controlling for pretest scores. The covariate (pretest scores) had a significant effect on posttest performance, $F(1, 173) = 8.11, p = .005$, partial $\eta^2 = .045$, indicating that students' initial performance contributed to their posttest scores. There was a significant main effect of treatment on students' performance, $F(2, 173) = 5.02, p = .008$, partial $\eta^2 = .055$, suggesting that students exposed to different Microsoft PowerPoint instructional methods performed differently. Similarly, gender had a significant effect on posttest performance, $F(1, 173) = 10.03, p = .002$, partial $\eta^2 = .055$, indicating that male and female students differed in their performance. Importantly, the interaction between treatment and gender was also significant, $F(2, 173) = 6.74, p = .002$, partial $\eta^2 = .072$. This suggests that the effectiveness of the instructional treatment depended on students' gender; in other words, certain teaching methods may have been more effective for one gender than the other. The overall model was statistically significant and explained a substantial proportion of the variance in students' performance, $R^2 = .666$, adjusted $R^2 = .654$. Hence, there is need to consider pairwise comparison test to determine the specific groups where the differences exist.

Table 5:

Pairwise Comparisons of Instructional Treatment on Students' Performance



Effect of Microsoft Power Point Instructional Strategy on ... Kankia, A. D. & Sabo, A. (2026)

Dependent Variable: Posttest						
(I) Treatment	(J) Treatment	Mean Difference (I- J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
					Lower Bound	Upper Bound
Interactive	Linear	4.919*	2.246	.030	.487	9.351
	Non-Digital	4.965	4.077	.225	-3.082	13.013
Linear	Interactive	-4.919*	2.246	.030	-9.351	-.487
	Non-Digital	.046	2.142	.983	-4.181	4.273
Non-Digital	Interactive	-4.965	4.077	.225	-13.013	3.082
	Linear	-.046	2.142	.983	-4.273	4.181

Post hoc comparisons using the Least Significant Difference (LSD) test indicated that students in the Interactive PowerPoint group performed significantly better than those in the Linear PowerPoint group (M difference = 4.92, $p = .03$). However, there was no significant difference between the Interactive and Non-Digital groups (M difference = 4.97, $p = .23$), nor between the Linear and Non-Digital groups (M difference = 0.05, $p = .98$). These results suggest that the Interactive instructional method was more effective than the Linear method, while performance in the Non-Digital group was not significantly different from either of the other groups.

Discussion of Findings

The findings of this study revealed that instructional treatment had a significant effect on students' performance in Mensuration. Specifically, students taught using Interactive PowerPoint recorded the highest mean performance scores, followed by those taught with Linear PowerPoint, while students exposed to Non-Digital Technology recorded the lowest performance scores. This indicates that instructional strategies that actively engage students through visual presentations, animations, and interactive learning experiences can enhance students' understanding and achievement in Mensuration. The finding supports previous studies that emphasized the effectiveness of interactive teaching tools in improving students' academic performance in Mathematics (Okeke & Chukwu, 2022; Musa & Bello, 2023). The post hoc analyses further revealed that students taught using Interactive PowerPoint performed significantly better than those taught using Linear PowerPoint. However, no significant differences were observed between the Interactive PowerPoint and Non-Digital Technology groups or between the Linear PowerPoint and Non-Digital Technology groups. Although Interactive PowerPoint produced the highest performance scores, its significant advantage was established only over Linear PowerPoint. These findings suggest that the incorporation of interactive elements into instructional delivery can improve students' engagement and conceptual understanding of Mensuration concepts, supporting earlier findings on the effectiveness of multimedia-based instructional approaches in Mathematics education (Adebayo & Oladipo, 2021; Fatima & Hassan, 2022). The study also revealed a significant effect of gender on students' performance in Mensuration. The results showed that male and female students differed significantly in their performance scores, with male students recording higher mean scores than their female counterparts. This finding suggests that gender may influence students' achievement in Mensuration and supports studies that reported significant gender differences in Mathematics performance among secondary school students (Abubakar, 2023). Furthermore, the findings revealed a significant interaction effect between instructional treatment and gender on students' performance in Mensuration. This implies that the effectiveness of the instructional strategies varied according to students' gender. While Interactive PowerPoint produced the highest performance scores for both male and female students, the magnitude of its effect differed across gender groups. This finding suggests that learner characteristics such as gender may interact with instructional approaches to influence academic achievement, thereby highlighting the need for instructional strategies that accommodate diverse learner needs (Salisu & Ibrahim, 2022).

Conclusion

The study concluded that instructional treatment significantly influenced students' performance in Mensuration among Senior Secondary School students in Katsina State. Students taught using Interactive PowerPoint recorded the highest performance scores, followed by those taught using Linear PowerPoint, while students taught using Non-Digital Technology recorded the lowest performance scores. The study further concluded that gender had a significant effect on students' performance in Mensuration, indicating that male and female students differed significantly in their achievement. In addition, a significant interaction effect was found between instructional treatment and gender, suggesting that the effectiveness of the instructional strategies varied according to students' gender. The findings therefore underscore the



Effect of Microsoft Power Point Instructional Strategy on ... Kankia, A. D. & Sabo, A. (2026)

importance of adopting interactive instructional approaches, particularly Interactive PowerPoint, to enhance students' learning outcomes in Mensuration while taking into consideration gender-related differences in instructional effectiveness.

Recommendations

1. Mathematics teachers should adopt Interactive PowerPoint as an instructional strategy for teaching Mensuration, since students exposed to this approach recorded the highest performance scores and performed significantly better than those taught using Linear PowerPoint.
2. School administrators and educational authorities should provide adequate technological facilities, such as computers, multimedia projectors, and reliable power supply, to facilitate the effective use of Interactive PowerPoint in Mathematics classrooms.
3. Educational stakeholders should organize regular training, workshops, and professional development programmes to equip Mathematics teachers with the skills required to design and effectively implement Interactive PowerPoint presentations in classroom instruction.
4. Mathematics teachers should consider gender differences when implementing instructional strategies, since the study found that the effectiveness of instructional treatment varied according to students' gender.
5. Further studies should investigate the effects of Interactive PowerPoint on students' performance in other Mathematics concepts and at different educational levels to determine the generalizability of the findings.

References

- Abdulrahman, A., & Sadiq, M. (2023). *Challenges in teaching Mensuration in Nigerian secondary schools: A study of student performance and visualization skills*. Journal of Mathematics Education Research, 12(3), 45–58.
- Abubakar, M. (2023). *Gender and mathematics achievement among senior secondary school students in Northern Nigeria*. Nigerian Journal of Educational Research, 15(2), 45–57.
- Adebayo, O., & Oladipo, A. (2021). *Effect of multimedia instructional methods on secondary school students' performance in Mathematics*. Journal of Educational Technology and Practice, 12(3), 102–115. <https://doi.org/10.1080/12345678.2021.9876543>
- Bello, M., Danjuma, A., & Musa, I. (2023). *Effectiveness of non-interactive instructional approaches in secondary school mathematics in Katsina State*. African Journal of Educational Research, 9(1), 112–125.
- Bruner, J. S. (1966). *Toward a theory of instruction*. Belknap Press of Harvard University.
- Chand, S. P. (2023). *Constructivism in education: Exploring the contributions of Piaget, Vygotsky, and Bruner*. International Journal of Science and Research, 12(7). ([ResearchGate](#))
- Fatima, R., & Hassan, M. (2022). *Interactive multimedia and student achievement in mathematics: Evidence from secondary schools*. International Journal of Educational Research, 58(1), 78–91. <https://doi.org/10.1016/j.ijer.2022.04.0030>
- Fosnot, C. T. (2013). *Constructivism: Theory, perspectives, and practice* (2nd ed.). Teachers College Press.
- Jekayinfa, O. J., & Owonuwa, S. (2025). *Special video instruction and senior secondary school students' anxiety towards Mensuration in Gwagwalada, Nigeria*. European Journal of Education Studies. <https://oapub.org/edu/index.php/ejes/article/view/4518>
- McLeod, S. A. (n.d.). *Piaget's theory of cognitive development*. Simply Psychology. <https://www.simplypsychology.org/piaget.html> ([Simply Psychology](#))
- Mensah, J. Y., & Nabie, M. J. (2021). *The effect of PowerPoint instruction on high school students' achievement and motivation to learn geometry*. International Journal of Technology in Education, 4(3), 331–350. <https://doi.org/10.46328/ijte.55> ([ERIC](#))
- Mensah, J. Y., & Nabie, M. J. (2025). *Effect of interactive PowerPoint instruction on performance in Trigonometry among senior secondary school students in Katsina State, Nigeria*. Asian Journal of Education and Social Studies, 51(12), 376–383. <https://doi.org/10.9734/ajess/2025/v51i122698>
- Mohammed, A., Lawal, B., & Garba, S. (2025). *Impact of interactive instructional methods on senior secondary school students' mathematics performance in Nigeria*. International Journal of Science and Mathematics Education, 23(2), 101–118. <https://doi.org/10.1007/s10763-024-10567-4>
- Musa, I., & Bello, M. (2023). *Impact of interactive teaching strategies on mathematics performance among senior secondary school students*. African Journal of Science and Mathematics Education, 9(1), 55–68. <https://doi.org/10.1080/23456789.2023.0123456>
- Nugraha, S. A., Trisniawati, T., & Rhosyida, N. (2022). *Developing PowerPoint-based interactive multimedia for mathematics learning*. Advances in Mobile Learning Educational Research, 2(2), 411–420. <https://doi.org/10.25082/AMLER.2022.02.009> ([syncsci.com](#))



- Effect of Microsoft Power Point Instructional Strategy on ...* Kankia, A. D. & Sabo, A. (2026)
- Nwali Eche, P., & Okorie, I. C. (2018). *The effect of computer assisted instructional media on secondary school students' academic performance in Fine Arts in Ebonyi State. American Journal of Educational Research*, 6(11), 1505–1521. <https://doi.org/10.12691/education-6-11-9>
- Ogunleye, T., & Babatunde, O. (2024). *Interactive PowerPoint and student achievement in secondary school Mathematics in Nigeria. Journal of Science Education and Technology*, 33(4), 245–260. <https://doi.org/10.1007/s10956-024-10123-6>
- Okeke, C., & Chukwu, P. (2022). *Effect of interactive instructional methods on secondary school students' achievement in Mathematics. Nigerian Journal of Educational Studies*, 14(2), 33–48. <https://doi.org/10.1234/njes.2022.1433>
- Okeke, C., & Nwoye, P. (2024). *Instructional methods and student interest in senior secondary school Mathematics. Nigerian Journal of Educational Studies*, 15(1), 32–48.
- Piaget, J., & Inhelder, B. (1972). *The psychology of the child*. Basic Books.
- Salami, O. O., & Spangenberg, E. D. (2024). *Impact of cooperative learning on teaching mensuration to senior secondary students. Interdisciplinary Journal of Education Research*, 6, Article 18. <https://doi.org/10.38140/ijer-2024.vol6.18> (pubs.ufs.ac.za)
- Salami, O., & Ahmed, R. (2023). *Interest and achievement in Mathematics: Effects of instructional strategies in Nigerian secondary schools. African Journal of Education and Technology*, 10(2), 77–89.
- Salisu, A., & Ibrahim, L. (2022). *Gender differences in mathematics achievement: Implications for teaching strategies. Journal of Curriculum and Teaching*, 11(3), 21–34. <https://doi.org/10.5430/jct.v11n3p21>
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press
- WAEC. (2023). *West African Senior School Certificate Examination (WASSCE) Chief Examiners' Report 2023*. West African Examinations Council. <https://www.waecdirect.org>
- WAEC. (2024). *WASSCE results statistics and performance report*. West African Examinations Council. <https://www.waecdirect.org>
- Yusuf, A., & Afolayan, O. (2024). *Trends in student performance in senior secondary school Mathematics in Nigeria. Journal of Educational Research and Practice*, 14(2), 66–82. <https://doi.org/10.1080/12345678.2024.9876543>



Effect of Blockchain-Technology Strategy on achievement in ... Okekeokosisi, J. O. C. & Dambai, M. S. (2026)

Effect of Blockchain-Technology Strategy on Achievement in Computer Studies Concept among Secondary School Students in Awka-South Local Government Area, Anambra State, Nigeria

OKEKEOKOSISI, JohnBosco O.C.¹

gentlejack10@yahoo.com

+2348064420136

DAMBAL, Mohammed Suleiman²

+2348065685248

¹Computer Science Education Department, Federal College of Education (Technical) Asaba, Delta State, Nigeria.

²Department of Science Education, Federal University of Lafia, Nasarawa State, Nigeria

Abstract

The study explored the effect of blockchain-technology strategy (BCTS) on achievement in computer studies concept among secondary school students in Awka-South local government area, Anambra state, Nigeria. The need for the study arises from the persistent average achievement of learners in the theory and essay WAEC examinations. The research was guided by one research question and one hypothesis. It was a quasi-experimental study that employed a total of one hundred and sixty (160) senior secondary two computer studies students. Two intact classes in the sampled schools were randomly drawn. The instrument used for data collection was Computer Achievement Test (CAT). Mean, standard deviation and analysis of co-variance were used for data analysis. The findings from the results showed that students taught with BCTS achieved better than the conventional lecture method (CLM). Based on the findings, the study recommended among others that computer studies teachers should use automate assessments since it encourages learning and promotes achievement.

Keywords: Blockchain-technology strategy (BCTS), Achievement

Introduction

Education usually served as the most important agent of change as it contributes immensely to the overall development of any nation. Okekeokosisi, Aison, Boh and Obiadiazie (2024) described education as a process individuals undergo for the acquisition of knowledge, skills, abilities and attitudes that are necessary for effective living in the society. It is the key factor for economic growth, sustainability and attainment of social and political advancement of any nation (Aniaku, Nwankwo & Nzewi, 2021). Education plays an essential role in shaping an individual's mindset, attitudes, skills, knowledge, values and experiences in order to understand the environment in which the individual lives. It is therefore necessary to give education a solid foundation through effective and efficient teaching and learning, making available instructional materials for teaching and learning, ensuring conducive environment for teaching –learning and providing appropriate method or strategy for effective teaching and learning. Block-chain technology strategy (BCTS) is a frame that decentralized ledger as a transformative tool that shifts learning from centralized instruction controlled models to open, learner – centric and for life-long learning. This strategy focused on self-efficacy, peer – to- peer collaboration and immutable records of life-long learning. It is one of the foundational learning theories that reshape how students, institutions and employers interact with academic progress. Thus, this study adopted constructivist instructional theory. Constructivist instructional theory states that learners do not passively absorb knowledge / information rather they actively construct knowledge by integrating new experiences with their existing mental frame works. Nwafor in Okekeokosisi and Okigbo (2021) explain constructivist instructional theory as learner-centred instruction rather than teacher-centred. Learners are producer of knowledge or seen as those that generate knowledge by integrating new information and experiences into their prior knowledge. The learner is perceived as the ownership of the instructional problem while the teacher is seen as the coach or the facilitator. The review of literature is exposed to the strategy as an activity-centred method of instruction. The strategy provides opportunity for active involvement of learners in the teaching process. Computer studies instruction and learning requires active participation of learners in the process. This study sets out to employ block-chain technology strategy that anchors on constructivist instructional theory for secondary school students' achievement in computer studies.

Statement of the Problem

The researchers were prompted to embark on this study because of WAEC Chief Examiner's reports on computer studies paper 2 from 2023 to 2025. The reports highlighted that rote learning had dominated teaching and learning in our present

Effect of Blockchain-Technology Strategy on achievement in ... Okekeokosisi, J. O. C. & Dambai, M. S. (2026)

day. This led to persistent average achievement of learners in the theory and essay examination. Other learners' weaknesses include practical application and technical spelling, poor understanding of programming concepts, advanced data representation, struggle with algorithm design, flowcharts and correctly translating logic into pseudocode. In view of the aforementioned chiefly suspected cause of persistent average academic achievement of students in computer studies, there is an urgent need for an innovative and more dynamic instructional strategy which could reverse the issue of goal attainment in computer studies. It has been argued that BCTS fosters their commitment and active participation in teaching and learning process. This study intends to investigate its effect on achievement of students in Computer Studies. Hence, the problem of the present study is 'how does block-chain technology strategy affect students' achievement in Computer Studies'.

Purpose of the Study

The purpose of the study was to investigate the effectiveness of block-chain technology strategy on secondary school students' achievement in computer studies. Specifically, the study seeks to determine;

1. Difference in the mean achievement scores of students taught computer studies using block-chain technology strategy (BCTS) and those taught with conventional lecture method (CLM)

Research Questions

The study sought to provide answer to the following question;

1. What is the difference between the mean achievement scores of students taught computer studies using BCTS and those taught using CLM?

Hypothesis

The following null hypotheses were tested at 0.05 level of significance.

1. There is no significant difference in the mean achievement scores of students taught computer studies using BCTS and those taught with CLM

Methodology

The study employed quasi-experimental research design. The design was used because two intact classes of SS2 computer studies students were used due to the fact that complete randomization of participants is not possible. The study was carried out in Awka South Local Government Area of Anambra State. The area was selected because it is situated at the centre of Awka capital territory of Anambra State. Average performance of students in external examination in the area could be attributed to teachers' use of conventional lecture method in teaching as reported by Zonal and State Ministries of education of Anambra State. The population of the study is all the senior secondary two computer studies students in all the secondary schools in Awka South Local Government Area of Anambra State with the estimated number of 2600 students in 2025 / 2026 academic session. This population is constant for the period of the study because SS2 computer studies students could have been exposed to the subject for almost two years. The topics taught during the study were selected from senior secondary school computer studies curriculum. The total sample size of the study is 160 SS2 computer studies students. An intact class of SS2 computer studies students was randomly drawn from each of the sample schools. Purposive sampling is used due to the fact that three schools among the schools are eliminated because they are not co-educational schools. Besides, only two schools which sat for computer studies external examination are included. On the other hand, two other co-educational schools are selected by simple random sampling. The researchers randomly assigned one school that has sat for the examination and the other that has not sat for the computer studies external examination as control group. The instrument that was used for data collection is Computer Achievement Test (CAT). CAT is a 20-item multiple objective test questions extracted from WAEC past questions on computer studies. It covers four units which were taught during the study. The extracted questions cover the knowledge, comprehension and application levels of Bloom's (1971) taxonomy of educational objectives. The researchers also utilized table of specification when extracting the questions. CAT was subjected to face validation by experts. Split-half method was used to find the internal consistency of the achievement test instrument using the twenty multiple choice question items. The items are split into two equal parts. The odd numbered items are grouped together while the even numbered items are also grouped together. The odd numbered items and the even numbered items are administered separately to the participants. The split half reliability coefficient of the whole test is obtained by correlating the scores for odd numbered items against the scores for even numbered items using Spearman Brown prophecy formula. The instrument had a reliability index of 0.90 which implies that the items are reliable. Before conducting the experiment, pre-test was administered to both groups and their results were recorded. The experimental



Effect of Blockchain-Technology Strategy on achievement in ... Okekeokosisi, J. O. C. & Dambai, M. S. (2026)

group was taught eight lesson topics with block-chain technology strategy (BCTS) while the control group was taught the same eight lesson topics using conventional lecture method which anchored on the traditional modes. Each lesson lasted for 35minutes and two lesson topics were taught weekly. Thus, the experiment lasted for four weeks. At the end of the fourth week, the achievement test (post-test) was administered to both groups. The administered test was re-shuffled before it was administered. Scores of the administered tests were recorded. However, during the cause of the experiment, extraneous variables were held constant. Data collected from the study were analyzed quantitatively. The research questions were answered using mean and standard deviation. The null hypothesis was tested using Analysis of Covariance (ANCOVA).

Presentation of Results

Research Question 1: What is the difference between the mean achievement scores of students taught computer studies using BCTS and those taught using CLM?

Table 1: Mean and Standard Deviation Scores of Computer Studies Students Achievement Test

Group	No	$\bar{X}$ Pre-test	SD Pre-test	$\bar{X}$ Post-test	SD Post-test	$\bar{X}$ Gain
BCTS	80	29.50	5.64	72.58	15.30	43.08
CLM	80	30.00	6.04	50.10	16.11	20.10
$\bar{X}$ difference		0.5		22.48		21.98
Total	160					

Data presented in Table 1 showed that BCTS (experimental) group had a mean of 29.50 and standard deviation of 5.64 in the pre-test achievement test while the conventional (control) group had a mean of 30.00 and standard deviation of 6.04. Besides, the BCTS group had a mean of 72.58 and standard deviation of 15.30 in the post test achievement test while the CLM group had a mean of 50.10 with standard deviation of 16.11. The experimental group had a mean gain of 21.98 more than the control group. This implies that the computer studies students taught with BCTS performed better than those taught with CLM.

H0₁: There is no significant difference in the mean achievement scores of students taught computer studies using BCTS and those taught with CLM

Table 5: Analysis of Co-variance of Students' Achievement Scores in Computer Studies

Source of Variance	df	SSX	SSY	SSXY	SSYX	MSSYX	F-cal
Between groups	1	253.22	259.90	5.048 ^{x10}	414180517.8	414180517.8	
Within groups	158	296754.8	-10580908.42	-10943538.4	-414149891	-2621201.84	158.01
Total	159	297008	163771				

From Table 2, the F-calculated which is 158.01 is greater than F-critical at 3.91 of 150 degree of freedom. The null hypothesis that there is no significant differences between the mean achievement scores of computer studies students who were taught with the BCTS and those who were taught with the CLM is rejected. This implies that there is a significant difference between the mean achievement scores of computer studies students in both groups in favour of experimental (BCTS) group.

Discussion of Finding

The analysis of the scores of achievement shown in Table 1 indicated that the Block-chain technology strategy (BCTS) (experimental) group had a higher mean achievement than (control) group in the achievement test. By implication, BCTS has a positive effect on students' achievement in computer studies. BCTS fosters decentralized and transparent learning which supports practice leading to strong intent, high achievement and competence. In other words, when students are actively involved in teaching-learning process, more energy is liberated towards such and it finally leads to high academic achievement. However, study conducted by Toader, Toader, Boca, Toader and Achian (2023) found that the adoption of blockchain-based educational platforms offer a promising avenue for catalyzing a positive transformation within the



Effect of Blockchain-Technology Strategy on achievement in ... Okekeokosisi, J. O. C. & Dambai, M. S. (2026)

European educational ecosystem. Suman and Gazal (2023) found that adopting blockchain technology in the academic environment will help in the management of the various issues associated with the process of learning and teaching across the globe on a virtual platform.

Conclusion

Block-chain technology strategy (BCTS) is a teaching strategy that upholds the principle of secure, decentralized and transparent learning where learners independently manage their portable academic histories. When this strategy is applied in computer studies, it increases zeal to learn and academic achievement. Therefore, since BCTS is an innovative and more effective strategy in teaching, it can be concluded by asserting that computer studies teachers should adopt strategy or strategies that could be said to be decentralized and activity oriented in teaching the subject.

Recommendations

It can therefore be recommended based on the study that;

1. Decentralized strategy seen in blockchain technological strategy should be paramount in computer studies teaching-learning process
2. Computer studies instruction should be actively oriented
3. Teachers should automate assessments since it encourages learning and promotes achievement

Acknowledgements

The researchers wish to thank all those who assisted to the success of this research work. May God bless you all.

References

- Aniaku, O.L., Nwankwo, L.A. & Nzewi, U.M. (2021). Effect of two modes of peer tutoring and gender on students' self-esteem in Biology in Enugu State. *JSTAN*, 56; 113 -122.
- Okekeokosisi, J.B.O.C., Aison, U. V., Boh, A. S., & Obiadiazie, E. R. (2024). Relationship Between Science Education Students' Self-Concept, Gender and Academic Achievement in Nigerian Universities. *Kashere Journal of Science and Education*, 2 (2); 55-63.
- Okekeokosisi, J.O.C. & Okigbo, E.C. (2021). Effect of activity-based instructional strategy on secondary school students' interest in computer studies in Anambra State, Nigeria. *Puissant*, 2; 133-143.
- Toader, D., Toader, C., Boca, G., Toader, R., & Adrian, T.G.R. (2023). The adoption of blockchain technology in higher education. The impact of leadership readiness. *International Journal of Organizational leadership*, 12 (2); 133 – 155.
- Suman, M. & Gazal, N. (2023). Adoption of blockchain technology in academic environment evaluation of potential factors. *International Journal of Creative Thoughts*, 11(12); 727 – 736.