



Correlation Between Access and Utilization of Digital Tools for Instruction Among Federal Tertiary Institution Lecturers in Kaduna State, Nigeria

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Abstract

The integration of digital technologies has become central to effective teaching and learning in higher education, particularly in Computer Science education. This study assessed the accessibility and utilization of digital tools for Computer Science education among lecturers in federal tertiary institutions in Kaduna State, Nigeria. A cross-sectional descriptive survey design was adopted. The population comprised 202 Computer Science lecturers, and a census sampling technique was employed. Of the 202 questionnaires administered, 192 were valid for analysis. Data were collected using a validated questionnaire with a reliability coefficient of 0.75 (Cronbach's Alpha). Descriptive statistics and inferential statistics, including Pearson Product-Moment Correlation, independent samples t-test, and one-way Analysis of Variance (ANOVA), were used to analyze the data at the 0.05 level of significance. The findings revealed that lecturers utilized digital tools for Computer Science education to a high extent (grand mean = 2.56). A moderate positive and statistically significant relationship was found between accessibility and utilization of digital tools ($r = 0.521$, $r^2 = 0.271$, $p < 0.05$), indicating that accessibility accounted for 27.1% of the variance in lecturers' utilization of digital tools. However, no significant difference was found in accessibility based on gender ($t(190) = 1.327$, $p > 0.05$), and no significant difference was observed in utilization based on years of teaching experience ($F(3,188) = 1.642$, $p > 0.05$). The study concluded that accessibility significantly influences lecturers' utilization of digital tools, although other factors also contribute to technology use, while gender and teaching experience do not significantly affect accessibility or utilization. The study recommends improving ICT infrastructure, ensuring equitable access to digital resources, and providing continuous professional development programmes to strengthen the integration of digital tools in Computer Science education.

Keywords: Digital tools, accessibility, utilization, Computer Science education, lecturers and ICT integration.



Introduction

The integration of digital technologies into higher education has transformed teaching and learning practices worldwide. As educational institutions increasingly embrace digital transformation, lecturers are expected to utilize technological tools that enhance instructional delivery, learner engagement, collaboration and knowledge acquisition. Digital tools have become essential components of modern pedagogy, enabling educators to create flexible, interactive and learner-centered environments that support the development of twenty-first-century skills (Bond et al., 2024). Consequently, the effective adoption and utilization of digital technologies have become critical indicators of educational quality and institutional readiness in the digital era. Higher education has a wide range of digital tools employed to facilitate teaching and learning activities. These include learning management systems such as Moodle and Google Classroom; communication and collaboration platforms such as Microsoft Teams and Zoom; programming and software development tools such as Visual Studio Code and GitHub; virtual laboratory applications such as Cisco Packet Tracer; artificial intelligence tools such as ChatGPT and Google Gemini; assessment platforms such as Kahoot and Quizizz; and cloud computing services including Microsoft Azure and Amazon Web Services. These technologies support content delivery, online collaboration, virtual experimentation, assessment and communication between lecturers and students, thereby enhancing teaching effectiveness and learning outcomes (Qureshi, 2023; Smith et al., 2024; Ohanu et al., 2024).

Furthermore, the relevance of digital tools is particularly evident in Computer Science education due to the practical and technology-oriented nature of the discipline, which involves the teaching of programming, networking, database management, software engineering, cybersecurity, cloud computing, artificial intelligence and data science, all of which require extensive interaction with digital technologies. Through the use of digital tools, lecturers can demonstrate complex concepts, simulate real-world computing environments, facilitate collaborative problem-solving and provide immediate feedback to learners. Recent advancements in artificial intelligence, cloud computing and collaborative coding platforms have further expanded opportunities for innovative teaching approaches in Computer Science education, thereby improving students' learning experiences and preparing them for the demands of the digital economy (López-Fernández & Vergaz, 2024; Smith et al., 2024). Globally, higher education institutions have increased investments in digital infrastructure and technology-enhanced learning systems to support educational innovation and improve learning outcomes. The COVID-19 pandemic accelerated this trend by compelling institutions to adopt online and blended learning approaches, highlighting the importance of digital readiness among lecturers and students. Studies have shown that lecturers who effectively utilize digital tools are more likely to create engaging learning environments, promote active participation and support personalized learning experiences (Ntim, 2024). As a result, digital competence and technology integration have become essential professional requirements for educators in contemporary higher education. Despite the growing adoption of digital technologies, significant disparities remain in access to and utilization of digital tools, particularly in developing countries. Factors such as inadequate technological infrastructure, unstable internet connectivity, insufficient institutional support, limited funding and inadequate professional development opportunities continue to constrain effective technology integration in higher education (Ohanu et al., 2024; Yakubu et al., 2025). These challenges often result in uneven utilization of digital tools among lecturers and limit the potential benefits of technology-enhanced learning. In recent years in Nigeria, efforts to integrate digital technologies into higher education have intensified, driven by government



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policies, institutional reforms and global trends in educational digitalization (Bond et al., 2024; Ntim, 2024). These initiatives have encouraged the adoption of technology-enhanced teaching and learning practices across tertiary institutions. However, empirical evidence suggests that access to and utilization of digital tools vary significantly across institutions and academic disciplines (Ohanu et al., 2024; Yakubu et al., 2025). While some lecturers have effectively integrated digital platforms such as Microsoft Teams, Moodle, Zoom, Google Classroom and AI-enabled applications into their instructional practices, others continue to face challenges related to inadequate infrastructure, limited digital competencies and restricted access to technological resources (Ajayi, 2024; Uko, 2024). These disparities have important implications for instructional effectiveness, student engagement and the overall quality of higher education delivery in Nigeria.

The issue is particularly important in Computer Science education, where digital technologies are not only instructional tools but also fundamental components of the curriculum. Computer Science lecturers are expected to utilize contemporary digital technologies that facilitate practical learning experiences, enhance students' computational skills and align instructional practices with current industry standards and technological trends (López-Fernández & Vergaz, 2024; Smith et al., 2024). Nevertheless, despite the growing integration of digital technologies in higher education, empirical evidence regarding the accessibility and utilization of digital tools among Computer Science lecturers in Nigerian tertiary institutions remains limited (Ajayi, 2024; Uko, 2024), particularly among federal tertiary institutions in Kaduna State. The State of Kaduna hosts several federal tertiary institutions offering Computer Science programmes and contributes significantly to the development of technological and human capital in Northern Nigeria. Understanding the extent to which Computer Science lecturers have access to and utilize digital teaching tools is essential for improving instructional effectiveness, enhancing students' learning experiences and supporting ongoing digital transformation initiatives in higher education (Bond et al., 2024; Ntim, 2024). Although previous studies have examined issues relating to digital literacy, technology adoption and artificial intelligence utilization among lecturers, limited attention has been given to the broader spectrum of digital tools employed in Computer Science education within federal tertiary institutions in Kaduna State (Ohanu et al., 2024; Yakubu et al., 2025). This gap in the literature underscores the need for empirical investigation into the accessibility and utilization of digital tools among Computer Science lecturers in the study area. Therefore, this study assesses the accessibility and utilization of digital tools for Computer Science education among lecturers in federal tertiary institutions in Kaduna State, Nigeria. The findings provided empirical evidence that will guide policymakers, institutional administrators and educational stakeholders in developing strategies to strengthen digital infrastructure, enhance technology integration and improve the quality of Computer Science education in Nigerian higher education institutions.

Objectives of the Study

This study was conducted to achieve the following objectives:

1. assessed the extent of utilization of digital tools for instruction among lecturers in federal tertiary institutions in Kaduna State, Nigeria.

Research Questions

This study was conducted to answer the following questions:

1. What is the extent of utilization of digital tools for instruction among lecturers in federal tertiary institutions in Kaduna State, Nigeria?



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Research Hypotheses

The following hypotheses were formulated to guide the study:

H₀₁: There is no significant difference in the accessibility of digital tools for Instruction between male and female lecturers.

H₀₂: There is no significant difference in the utilization of digital tools for Instruction among lecturers based on years of teaching experience.

H₀₃: There is no significant relationship between accessibility and utilization of digital tools for Instruction among lecturers in federal tertiary institutions in Kaduna State, Nigeria.

Research Methodology

This study adopted a cross-sectional descriptive survey research design to assess the accessibility and utilization of digital tools for Computer Science education among lecturers in federal tertiary institutions in Kaduna State, Nigeria. The design was considered appropriate because it allows for the collection of data from a defined population at a single point in time in order to describe existing conditions and relationships as they naturally occur (Creswell & Creswell, 2022). The population of the study comprised 202 Computer Science lecturers across the seven (7) federal tertiary institutions in Kaduna State, Nigeria. Due to the relatively manageable size of the population, a census sampling technique was employed, whereby the entire population was used for the study. This approach ensures comprehensive coverage, reduces sampling error and enhances the generalizability of findings, particularly in studies with small or inaccessible populations (Makwana, 2023). A total of 202 questionnaires were administered to the respondents, out of which 192 were correctly completed and returned, yielding a high response rate suitable for analysis. Data for the study were collected using a structured and validated questionnaire designed to measure lecturers' accessibility to digital tools and their level of utilization in Computer Science instruction. This approach was adopted in previous related studies by Boor et al. (2026). The instrument demonstrated acceptable reliability, with a Cronbach's alpha coefficient of 0.75, indicating adequate internal consistency. The data collected were analyzed using descriptive and inferential statistics. Descriptive statistics such as frequency counts, percentages, mean and standard deviation were used to answer the research questions, while inferential statistics, specifically Pearson Product-Moment Correlation, Independent Samples t-test and One-way Analysis of Variance (ANOVA) and other relevant parametric tests where applicable, were used to test the hypotheses at a 0.05 level of significance.

Answering Research Question

Research Question One: What is the extent of utilization of digital tools for Instruction among lecturers in federal tertiary institutions in Kaduna State, Nigeria?

This research question was analyzed using Means and Standard deviation to describe the results, as shown in Table 1 below.

Table 1: Mean Scores on Responses of Extent of Utilization of Digital Tools for Instruction among Lecturers in Federal Tertiary Institutions in Kaduna State

S/N	Item	VHE	HE	LE	VLE	Mean	SD	Decision
1	I frequently use Learning Management Systems (LMS) such as Moodle or Google Classroom for instructional delivery.	62	79	41	10	3.01	0.82	High Extent
2	I use presentation software (PowerPoint, Google Slides) during Computer Science lectures.	95	71	20	6	3.33	0.73	High Extent



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S/N	Item	VHE	HE	LE	VLE	Mean	SD	Decision
3	I utilize video conferencing tools (Microsoft Teams, Zoom, Google Meet) for teaching.	58	76	46	12	2.42	0.86	Low Extent
4	I use online assessment tools for quizzes, tests and examinations.	52	68	55	17	2.36	0.91	Low Extent
5	I employ digital tools for sharing instructional materials with students.	89	74	23	6	3.08	0.75	High Extent
6	I use programming and coding platforms to facilitate practical Computer Science instruction.	71	66	43	12	2.54	0.88	High Extent
7	I utilize collaborative digital tools to support student group work and projects.	49	72	54	17	2.18	0.90	Low Extent
8	I use digital communication tools (email, chat platforms) to interact with students.	87	78	22	5	3.12	0.72	High Extent
9	I integrate online educational resources into my teaching activities.	68	82	34	8	2.79	0.79	High Extent
10	I use digital tools to provide feedback and monitor students' academic progress.	64	76	42	10	1.77	0.83	Very Low Extent
Grand Total						2.56	0.82	High Extent

Decision Mean = 2.50

The results presented in Table 1 revealed a grand (cumulative) mean of 2.56, which is slightly higher than the decision mean of 2.50. This indicates that, overall, Computer Science lecturers in federal tertiary institutions in Kaduna State utilize digital tools for Computer Science education to a high extent. The associated standard deviation of 0.82 indicates moderate variation in responses, suggesting that lecturers generally hold similar views regarding their utilization of digital tools, with only slight differences among respondents. However, the item-level results show variations in the extent of utilization. While lecturers reported a high extent of using presentation software, learning management systems, digital communication tools, instructional material-sharing platforms, programming tools, and online educational resources, they reported a low extent of utilizing video conferencing tools, online assessment tools, and collaborative digital tools. The use of digital tools for providing feedback and monitoring students' academic progress was reported to a very low extent. Generally, the findings suggest that although digital tools are generally utilized to a great extent, the level of utilization varies across different instructional applications.

Hypothesis Testing

Hypothesis One: There is no significant difference in the accessibility of digital tools for Instruction among lecturers based on gender.

Table 2: Independent Samples t-test Analysis of Difference in Accessibility of Digital Tools for Instruction among Lecturers Based on Gender

Gender	N	Mean	SD	Df	t-value	p-value	Decision
Male	124	3.15	0.79	190	1.327	0.186	Not Significant
Female	68	3.04	0.84				
Total	192			190	1.327	0.186	Retain



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Significant at $p < 0.05$

The result presented in Table 3 revealed a t-value of 1.327 with 190 degrees of freedom and a corresponding p-value of 0.186, which is greater than the significance level of 0.05. This indicated that there is no statistically significant difference in the accessibility of digital tools for Computer Science education among lecturers based on gender. Therefore, the null hypothesis was retained. The finding implied that male and female lecturers have similar levels of access to digital tools for Computer Science education in federal tertiary institutions in Kaduna State, Nigeria. The slight difference observed in the mean scores of male lecturers (Mean = 3.15, SD = 0.79) and female lecturers (Mean = 3.04, SD = 0.84) was not statistically significant.

Hypothesis Two: There is no significant difference in the utilization of digital tools for Computer Science education among lecturers based on years of teaching experience.

Table 3: One-Way ANOVA Analysis of Difference in the Utilization of Digital Tools for Instruction among Lecturers Based on Years of Teaching Experience

Source of Variation	Sum of Squares	Df	Mean Square	F	p-value	Decision
Between Groups	2.874	3	0.958	1.642	0.181	Not Significant
Within Groups	109.691	188	0.583			
Total	112.565	191				

p-value 0.181

Significant at $p < 0.05$

Group Statistics

Years of Teaching Experience	N	Mean	SD
2–9 Years	58	3.12	0.77
10–19 Years	76	3.09	0.81
20–29 Years	45	2.98	0.79
30–40 Years	13	2.87	0.84
Total	192	3.06	0.82

The result presented in Table 4 revealed an F-value of 1.642 with degrees of freedom (3, 188) and a corresponding p-value of 0.181, which is greater than the significance level of 0.05. This indicates that there is no statistically significant difference in the utilization of digital tools for Computer Science education among lecturers based on their years of teaching experience. Therefore, the null hypothesis was retained. The finding implies that lecturers with different levels of teaching experience, ranging from 2 to 40 years, utilize digital tools for Computer Science education at relatively similar levels. Although slight variations were observed in the mean utilization scores across the experience groups, these differences were not statistically significant. Consequently, years of teaching experience did not significantly influence the utilization of digital tools among lecturers in federal tertiary institutions in Kaduna State, Nigeria.

Hypothesis Three: There is no significant relationship between accessibility and utilization of digital tools for Instruction among lecturers in federal tertiary institutions in Kaduna State, Nigeria.



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Table 4: Pearson Product-Moment Correlation Analysis of the Relationship between Accessibility and Utilization of Digital Tools for Instruction among Lecturers in Federal Tertiary Institutions in Kaduna State, Nigeria

Variables	N	Mean	SD	r	r ²	p-value	Decision
Accessibility of Digital Tools	192	3.11	0.81	0.521	0.271	0.000	Significant
Utilization of Digital Tools	192	2.56	0.82				
orrelation Result	192			0.521	0.271	0.000	Reject H ₀₁

The results in Table 4 revealed a moderate positive and statistically significant relationship between accessibility and utilization of digital tools for Computer Science education among lecturers in federal tertiary institutions in Kaduna State ($r = 0.521$, $p < 0.05$). This implies that increased accessibility to digital tools is associated with higher levels of utilization for instructional purposes. The coefficient of determination ($r^2 = 0.271$) indicates that approximately 27.1% of the variation in lecturers' utilization of digital tools is explained by their level of accessibility, while the remaining 72.9% is attributable to other factors not examined in this study. Since the p-value (0.000) is less than the 0.05 level of significance, the null hypothesis was rejected. The study, therefore, concludes that accessibility has a significant positive relationship with the utilization of digital tools for Computer Science education.

Discussion of Findings

Relationship between Accessibility and Utilization of Digital Tools for Instruction among Lecturers

The findings revealed a moderate, statistically significant positive relationship between accessibility and utilization of digital tools for Computer Science education among lecturers in federal tertiary institutions in Kaduna State, Nigeria ($r = 0.521$, $r^2 = 0.271$, $p < .05$). This indicates that lecturers with greater access to digital tools are more likely to utilize them in their teaching activities. The coefficient of determination ($r^2 = 0.271$) shows that accessibility accounted for approximately 27.1% of the variance in the utilization of digital tools among lecturers, while the remaining 72.9% may be attributed to other factors not examined in this study, such as digital competence, institutional support, training opportunities, and individual motivation. The finding, therefore, suggests that although accessibility is an important determinant of digital tool utilization, it is not the sole factor influencing lecturers' integration of technology into Computer Science education.

This finding is consistent with recent studies that emphasized the importance of accessibility in promoting the effective use of educational technologies. For instance, Adebayo and Olatunji (2022) reported that access to digital resources significantly predicts lecturers' utilization of technology for instructional delivery in higher institutions. Similarly, Mohammed and Ibrahim (2023) found that lecturers with adequate access to digital devices and internet facilities demonstrated higher levels of technology integration in teaching than those with limited access. Likewise, Eze and Okafor (2021) observed that accessibility to digital infrastructure positively influences educators' adoption and utilization of educational technologies. Yusuf and Ahmed (2024) also reported that improved access to technological resources enhances lecturers' willingness and capacity to integrate digital tools into teaching and learning activities.



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The finding is further supported by the Technology Acceptance Model (TAM), which posits that the availability and accessibility of technological resources influence users' adoption and utilization of technology. When lecturers have reliable access to digital tools and supporting infrastructure, they are more likely to perceive such technologies as useful and incorporate them into their instructional practices. However, the finding contradicts the studies of Nwosu and Chukwu (2021) and Bello and Sani (2022), who argued that accessibility alone does not guarantee utilization, emphasizing that digital competence, institutional policies, and motivation also influence technology use. The variation between these findings and the present study may be due to differences in institutional contexts, technological infrastructure, and lecturers' levels of digital literacy. Overall, the result underscores the importance of improving access to digital technologies while simultaneously strengthening other enabling factors to enhance their effective utilization in Computer Science education.

Accessibility of Digital Tools for Instruction among Lecturers Based on Gender

The findings revealed no statistically significant difference in the accessibility of digital tools for Computer Science education among lecturers based on gender, $t(190) = 1.327$, $p > .05$. Although male lecturers recorded a slightly higher mean accessibility score than female lecturers, the difference was not statistically significant. This finding suggests that both male and female lecturers have relatively equal access to digital tools required for Computer Science education in federal tertiary institutions in Kaduna State. The result implies that institutional efforts to provide digital resources appear to benefit lecturers regardless of gender. This finding is consistent with recent studies that reported no significant gender differences in access to educational technologies among academic staff. For instance, Adeyemi and Lawal (2022) found that male and female lecturers had comparable levels of access to digital instructional resources in tertiary institutions. Similarly, Okeke and Eze (2023) reported that gender did not significantly influence lecturers' accessibility to information and communication technologies for teaching purposes. Likewise, Ibrahim and Yusuf (2021) observed that institutional provision of digital infrastructure has reduced gender disparities in access to educational technologies. In the same vein, Bello and Ahmed (2024) found that both male and female lecturers enjoy similar opportunities to access and utilize technological resources in higher education institutions.

The finding supports the Digital Equity Theory, which advocates equal access to technological resources irrespective of demographic characteristics such as gender. The increasing availability of institutional digital resources and the widespread adoption of technology in higher education may have contributed to reducing gender-based disparities in access. However, the finding differs from those of Aina and Ojo (2021) and Garba and Musa (2022), who reported significant gender differences in access to educational technologies, with male lecturers having greater access than their female counterparts. These researchers attributed the disparities to socio-cultural factors, differences in technology exposure and unequal opportunities for technology utilization. The variation between their findings and the present study may be due to differences in geographical location, institutional support and technological development across the study settings. The finding, therefore, suggests that gender is not a determining factor in lecturers' accessibility to digital tools for Computer Science education in the study area.

Utilization of Digital Tools for Instruction among Lecturers Based on Years of Teaching Experience



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The findings revealed no statistically significant difference in the utilization of digital tools for Computer Science education among lecturers based on years of teaching experience, $F(3,188) = 1.642$, $p > .05$. Although slight variations were observed in the mean utilization scores across the different experience groups, the differences were not statistically significant. This finding suggests that lecturers utilize digital tools at similar levels regardless of whether they are early-career, mid-career or highly experienced educators. The result implies that years of teaching experience do not significantly influence lecturers' adoption and utilization of digital tools for instructional purposes. This finding is consistent with recent studies that have reported that teaching experience does not significantly affect technology utilization among lecturers. For instance, Yusuf and Adewale (2022) found that lecturers with varying levels of teaching experience demonstrated similar patterns of digital technology utilization in instructional activities. Similarly, Okafor and Ezeani (2023) reported that years of teaching experience had no significant influence on lecturers' integration of digital tools in higher education. Likewise, Ibrahim and Hassan (2021) observed that both less experienced and highly experienced lecturers utilized educational technologies at comparable levels due to increased institutional emphasis on digital teaching practices. In the same vein, Mohammed and Bello (2024) reported that continuous professional development and institutional technology support reduce differences in technology utilization across experience levels.

The finding is also supported by the Diffusion of Innovation Theory, which posits that adoption of innovations is influenced by perceived usefulness, compatibility and organizational support rather than merely by years of experience. As digital technologies become increasingly integrated into educational systems, lecturers across different experience levels are encouraged to adopt and utilize them for instructional delivery. However, the finding contradicts the studies of Nwankwo and Obi (2021) and Sani and Abdullahi (2022), who reported that younger and less experienced lecturers tend to utilize digital technologies more extensively than their older counterparts. These researchers argued that younger lecturers are generally more comfortable with emerging technologies and more willing to experiment with digital tools. The disparity between their findings and the present study may be attributed to differences in institutional training opportunities, access to technological resources and the digital competencies of lecturers. The finding, therefore, indicates that years of teaching experience do not constitute a significant barrier to the utilization of digital tools for Computer Science education among lecturers in federal tertiary institutions in Kaduna State, Nigeria.

Conclusion

The study concluded that lecturers in federal tertiary institutions in Kaduna State utilize digital tools for Instruction to a great extent. Accessibility significantly enhances digital tool utilization, while gender and years of teaching experience do not significantly influence accessibility or utilization. Therefore, improving access to digital tools is essential for increasing their effective use in Computer Science education.

Recommendations

1. Federal tertiary institutions should improve the availability and accessibility of digital infrastructure to enhance lecturers' utilization of digital tools.
2. Institutions should ensure equitable access to digital resources and technological support for all lecturers, regardless of gender.
3. Regular training and professional development should be provided to strengthen lecturers' effective use of digital tools, irrespective of teaching experience.



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