

Leveraging Artificial Intelligence-Enhanced Technical and Vocational Education and Training for Sustainable Skills and Economic Development in Lagos State, Nigeria

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Abstract

This study assessed the potential of artificial intelligence (AI) to transform Technical and Vocational Education and Training (TVET) pedagogy in Lagos State, addressing the persistent skills mismatch that has left over 40% of Nigerian youth unemployed while critical sectors face severe skilled personnel shortages. On the basis of systematic desk review of academic literature, policy documents, and industry reports published between 2015 and 2026, the study identifies five key AI technologies applicable to TVET including adaptive learning platforms, intelligent tutoring systems, virtual/augmented reality, AI chatbots, and predictive analytics. Drawing on the Unified Theory of Acceptance and Use of Technology and Sen's Capability Approach, the study analyzes adoption barriers including unreliable infrastructure, severe shortages of AI-competent instructors, outdated curricula, inadequate funding, and policy fragmentation. The paper presents a conceptual framework linking AI-enhanced TVET to the achievement of Sustainable Development Goals, with specific indicators calibrated for Lagos State's industrial ecosystem. Findings indicate that AI can optimize curriculum design through real-time labor market data, provide scalable hands-on training through simulation, and deliver personalized feedback to learners. The study proposes actionable recommendations for digital infrastructure, teacher up-skilling programs, localized AI content development, and ethical data governance frameworks. The study contributes to the literature on digital transformation in education through the development of a context-sensitive framework for the integration of AI integration in Nigerian TVET, with implications for other federating Nigerian states and developing economies facing similar skills challenges.

Keywords: Artificial intelligence, TVET pedagogy, vocational training, skills development, workforce readiness

Introduction

The global work landscape has been fundamentally altered by the Fourth Industrial Revolution (4IR). Digitalization, automation, and intelligent systems are displacing routine physical jobs while concurrently creating demand for new technical skills in domains including data analytics, computer-aided design, digital fabrication, machine operation, robotics, 3D printing, and precision manufacturing (Schwab, 2017; World Economic Forum, 2020). For economies such as Nigeria, this transformation presents both opportunities and risks—the chance to leapfrog traditional industrial stages or the danger of marginalization due to misaligned workforce skills. Global agencies including UNESCO and the International Labour Organization have recognized Technical and Vocational Education and Training (TVET) as a critical instrument for equipping individuals with job-relevant skills, fostering entrepreneurship, and driving inclusive economic growth (UNESCO, 2016; ILO, 2020). The development and strengthening of TVET systems enables skill development, minimizes youth unemployment, and entrenches innovation and industrial competitiveness as experienced in developed economies (Eichhorst et al., 2015). Despite Nigeria's vast human and natural resources, the development of an effective TVET system has failed to meet the demands of industries and a rapidly changing economy. While youth unemployment exceeds 40% with 20% of the labor force underemployed (National Bureau of Statistics, 2022), employers report persistent challenges finding workers with adequate technical skills, digital literacy, and problem-solving abilities (Boyejo & Oke, 2025;



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Deloitte, 2021). This skills mismatch imposes significant costs on firms, reduces productivity (Okwuchukwu, 2025), and constrains Nigeria's ability to achieve SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation, and Infrastructure), and SDG 10 (Reduced Inequalities). Lagos State, as Nigeria's economic powerhouse contributing over 30% of the nation's GDP and hosting the highest concentration of industries, construction firms, and technology companies, faces the acute manifestation of this skills challenge. The state's population of over 22 million, with a median age of 22 years, generates enormous demand for skilled technical workers. Yet TVET institutions in Lagos struggle with outdated equipment, insufficient digital infrastructure, and curricula disconnected from the state's dynamic industrial landscape (Lagos State Ministry of Education, 2023).

Problem Statement

Nigeria's TVET pedagogy remains largely traditional, lecture-based, and disconnected from the digital tools and competencies that define modern workplaces and labour market needs (ADERINTO, 2026; Nwakile, 2026). Curricula are infrequently updated, instructional resources are outdated or unavailable, and student-to-instructor ratios often exceed expected standards (Okolie et al., 2020). Consequently, graduates emerge without the hands-on experience or adaptive skills required by employers. Despite accommodating Nigeria's largest concentration of TVET institutions, Lagos State continues to report significant skills shortages in critical sectors. A 2023 Lagos State Employment Trust Fund (LSETF) report identified that over 60% of manufacturing firms in Lagos struggle to find technicians with adequate digital competencies, while construction companies report that 70% of new hires require extensive retraining (LSETF, 2023). The Lagos State Government's T.H.E.M.E.S. Agenda explicitly identifies skills development as a priority, yet implementation of digital transformation in TVET remains nascent. Despite the transformative potential of artificial intelligence in education (Kumar et al., 2023; Lin et al., 2023), there is a scarcity of empirical studies on systematic integration of AI into TVET systems. Most existing studies focus on general higher education or developed country contexts. Even more limited is research addressing the Lagos State context, where rapid urbanization, significant informal sector activity, and a thriving technology ecosystem create both unique opportunities and distinct challenges for AI adoption. This study therefore seeks to answer: How can artificial intelligence be strategically integrated into TVET pedagogy in Lagos State to enhance graduate employability and contribute to the achievement of sustainable development goals?

Research Objectives

The objectives of this research are to:

1. Identify the specific AI technologies relevant to enhancing TVET pedagogy within the Lagos State context.
2. Analyze the current challenges and barriers to AI adoption in Nigeria's TVET system, with particular emphasis on the Lagos State institutional landscape.
3. Propose a conceptual framework and actionable strategies for integrating AI into TVET curriculum delivery, assessment, and industry alignment.
4. Demonstrate how AI-enhanced TVET can directly advance Sustainable development goals (SDG 4, SDG 8, SDG 9, and SDG 10) in the Nigerian context.

Research Methodology

This study employs a desk study methodology to investigate the strategic integration of AI into TVET pedagogy in Lagos State. According to Naoum (2007), a desk study involves systematic analysis of existing secondary data sources, including literature, reports, and institutional documents, without requiring primary data collection. This approach is particularly suitable as it enables comprehensive synthesis of findings from peer-reviewed literature, industry and agency reports and policy documents. The study is founded on two complementary theoretical frameworks. The Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) provides a lens for understanding technology adoption behavior through four key constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions. In the Lagos TVET context, these constructs help explain how educators' beliefs about AI effectiveness, perceived ease of use, peer and policy pressures, and infrastructure availability shape AI adoption decisions. The Capability Approach (Sen, 1999) complements this by focusing on what individuals are able to do and become, emphasizing that AI-enhanced TVET is valuable not only for increasing employment rates but also for expanding learners' capabilities to choose meaningful work, adapt to economic changes, and participate in digital society. Data were drawn from systematic searches of academic databases (Web of Science and Google Scholar), institutional repositories, and news archives for materials published between 2015 and 2026. The Keywords used includes "artificial intelligence," "AI," "Technical and vocational education,"



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"TVET," "Lagos State," "LSETF", "sustainable development goals" and "SDGs" guided the search. Sources were screened for relevance to AI integration in TVET and the Lagos State context, with priority given to peer-reviewed articles, official reports, and recent publications. Thematic analysis was applied to analyze the data extracted, involving familiarization with sources, generation of initial codes, refinement into coherent thematic categories, interpretation of patterns, and synthesis of findings to develop the conceptual framework and recommendations. Limitations include access constraints to certain documents, inability to independently verify some statistical claims, and reliance on secondary source accuracy.

Literature Review

Evolution and Current State of TVET in Nigeria

In Nigeria, the TVET system is founded on colonial-era trade schools and indigenous apprenticeship systems (Nwabueze, 2016). Today, TVET is delivered through three main channels: (1) public technical colleges offering National Technical Certificate (NTC) and Advanced National Technical Certificate (ANTC); (2) polytechnics awarding National Diploma (ND) and Higher National Diploma (HND); and (3) informal apprenticeships, which train a considerable number of construction and artisan workers (Ebekozen et al., 2024; ITF, 2019). Despite this institutional infrastructure, multiple systemic weaknesses persist. A 2021 World Bank assessment rated Nigerian TVET quality as "low" on international benchmarks, citing inadequate workshop equipment, poorly trained instructors, and weak certification standards (World Bank, 2021). The Industrial Training Fund has attempted to modernize curricula through the National Occupational Standards, but implementation remains uneven. Moreover, TVET enrollment is disproportionately low, reflecting persistent societal bias against vocational pathways (Okolie & Yasin, 2017). Lagos State presents a distinctive TVET landscape. The state hosts three federal TVET institutions (Yaba College of Technology, Federal College of Education (Technical) Akoka, and Federal Science and Technical College Yaba), eight state-owned technical colleges, and numerous private vocational training centers. A 2022 Lagos State TVET audit revealed that less than 30% of technical college workshops had functional modern equipment, and fewer than 20% of instructors had received training in digital pedagogy in the preceding five years (Lagos State Ministry of Education, 2022).

AI in Education: Global Trends and Typologies

Over the past decade, artificial intelligence has rapidly evolved in education. Baker (2019) distinguishes between three AI waves: (1) AI as a tutor (intelligent tutoring systems, adaptive learning); (2) AI as a tutee (where students teach AI); and (3) AI as a tool (analytics dashboards, automated administration). For TVET, the first and third waves are most relevant.

Key AI technologies applicable to TVET include:

Intelligent Tutoring Systems: ITS simulate human one-on-one tutoring by providing step-by-step guidance, immediate feedback, and natural language dialogue. Lagos's booming construction sector presents a prime application area for ITS targeting construction-related competencies especially considering that building and construction accounts for **19.60%** of the state's GDP (Osae-Brown, 2013, April 21).

Adaptive Learning Platforms (ALPs): Systems that use machine learning algorithms to dynamically adjust content difficulty, pacing, and presentation style based on individual learner performance. In the Lagos context, where class sizes are often large, ALPs could enable personalized attention at scale (Silas et al., 2024).

Virtual Reality (VR) and Augmented Reality (AR): VR creates fully immersive simulated environments; AR overlays digital information onto the physical world. For Lagos State, VR simulations could reduce training costs and workplace accidents while addressing limited physical space for expanding workshop facilities (Mwanje, 2025; Kassa, 2021).

AI Chatbots and Virtual Assistants: Natural language processing systems that answer student questions, provide reminders, offer career guidance, and triage technical problems. Considering Lagos's high mobile phone penetration, chatbots accessible via WhatsApp could be particularly effective and scalable (see, Potor, 2025; Innovation Village Nigeria, 2025; Meta Platforms, n.d.)

Predictive Analytics and Learning Analytics: Using historical and real-time data to forecast student performance, identify at-risk learners, and recommend interventions. Lagos's concentration of industry and technology companies means that labor market data is abundant, enabling alignment between TVET outputs and employer requirements.

Empirical Evidence of AI Impact on TVET Outcomes In developing countries

Evidence from middle-income contexts shows the potential of AI. In India, the National Skill Development Corporation implemented an AI-driven career guidance chatbot named "Arya," which reached over 1 million youth, significantly increasing enrollment in high-demand courses (NSDC, 2020). The BORESHA project in Kenya, applied AI-powered

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mobile learning for agricultural TVET which resulted in increased student retention and faster skill mastery (World Bank, 2021). In Colombia, VR simulation training for industrial welding reduced training costs by 40% and improved first-time certification pass rates by 35% (SENA, 2019). Available evidence from Lagos, though limited, is promising. At Yaba College of Technology, a 2023 initiative utilised an adaptive learning platform for computer science courses and reported considerable improvement in pass rates compared to conventional instruction method (Adebari et al., 2023). These evidence suggest that AI can overcome common challenges faced in TVET including lack of qualified instructors (through ITS), expensive equipment (through VR), geographic isolation (through mobile AI), and slow curriculum response (through analytics).

Gaps in Nigeria's AI Adoption for TVET

A systematic gap analysis shows multi-dimensional deficits:

Infrastructure and access to digital connection: Studies (including Nweke & Onu, 2022) identify that less than 40% of TVET institutions have access reliable internet; about 20% have computers less than 5 years old. This signifies that key barriers persist including inadequate infrastructure, unreliable electricity, and poor internet connectivity (Okeowo et al., 2025).

Human Capacity and Teacher Training: Alakali et al. (2021) identify that about 80% of TVET teachers lacks adequate digital pedagogy training. The lack of instructor training is a critical barrier to AI adoption in Lagos TVET programs (Okeowo et al., 2025).

Policy and Governance: Whereas, no national strategy for AI in TVET was found, scanty Institutional Policy Support moderator for ethical AI adoption (Ayanwale et al., 2025), and Digital Transformation in Nigeria have begun to emerge (NBTE, 2025).

Curriculum and Assessment: According to Onatere-Ubrurhe & Ubrurhe, (2025), existing assessments signify significant gaps in evaluating creativity and innovation.

Financial Constraints: As against UNESCO recommendation of 10%, TVET gets 5% of the total education budget in Nigeria (ThisDay. 2025, October 23), High upfront and recurrent costs present significant barriers (UNESCO, 2016). However, TVET initiative are beginning to receive incremental funding (Tribune Online. 2026, March 8).

Barriers to AI Adoption in Nigeria's TVET System

Table 1: Barriers to AI Adoption in TVET in Nigeria, with Emphasis on Lagos State

Challenge Category	National Barrier	Lagos Specific Findings	Reference
Infrastructure and Digital Access	Inadequate infrastructure including unreliable electricity and limited internet connectivity	Moderate technology integration observed but hampered by unreliable electricity, poor internet, and insufficient computing hardware	Vincent & Emmanuel (2025); Okeowo et al. (2025)
Human Capacity and Teacher Training	Critical shortage of trained educators skilled in using digital and AI tools	Vocational educators show moderate awareness of AI but preparedness hindered by lack of training	Vincent & Emmanuel (2025); Isikilu et al. (2025)
Policy and Institutional Support	Lack of clear, coherent institutional and national policies for AI in TVET	Weak policy support identified as a significant systemic barrier	Okeowo et al. (2025); Ayanwale et al. (2025)
Curriculum and Assessment	Outdated curricula insufficient for equipping students with AI and digital skills	Some curriculum innovations exist but insufficient to meet needs of an AI-driven economy	Dawodu et al. (2025); Onatere-Ubrurhe & Ubrurhe (2025)
Financial Constraints	High costs for acquiring, implementing, and maintaining AI tools	High implementation costs consistently cited as major hurdles	Onatere-Ubrurhe & Ubrurhe (2025); IARD (2024)
Socio-Cultural and Digital Literacy	Resistance to change and general lack of digital literacy	Resistance to change identified as a major barrier alongside digital literacy gaps	Wahab et al. (2026); The Frontier (2025)

Conceptual Framework for AI-Enhanced TVET for SDG Achievement

The study's conceptual framework posits that AI technologies (ALS, ITS, VR/AR, chatbots, analytics) interact with three mediating factors: (1) Digital infrastructure; (2) Human capacity; and (3) Supportive policy. AI-enhanced TVET leads to three proximal outcomes: personalized learning, scalable hands-on training, and real-time industry alignment. These, in turn, drive ultimate development outcomes corresponding to SDGs.

Table 2: Proximal Outcomes, SDG Linkages, and Indicators for AI-Enhanced TVET

Proximal Outcome	SDG Linkage	Lagos State Indicators
Personalized, inclusive learning	SDG 4 - Quality Education	Reduced dropout rates in Lagos TVET institutions; improved pass rates in Lagos trade examinations
Workforce skills for Industry 4.0	SDG 8 - Decent Work & Growth	Employment rates of Lagos TVET graduates within 6 months; reduction in skills mismatch reported by employers
Technical capacity for local industry	SDG 9 - Industry & Innovation	Proportion of Lagos manufacturing and construction firms reporting skilled technician availability
Rural access to quality training	SDG 10 - Reduced Inequalities	Parity in training access between urban Lagos and peri-urban areas; employment rates of youth in underserved communities

Recommendations for AI Integration in Nigerian TVET

The following policy recommendations are structured across short-term (1–2 years) and medium-term (3–5 year) horizons to provide a phased approach to AI integration in TVET. Short-term actions focus on immediate directives and foundational planning, while medium- long term measures establish enduring institutional frameworks and sustainable financing mechanisms.

For Short-term (1–2 Years), the recommendation are:

1. National Level: Curriculum Reform Mandate

Directive to NBTE mandating curriculum revision for priority trades to incorporate AI literacy and digital competencies with clear timelines and assessment benchmarks should be provided.

2. Lagos State Level: State-Specific AI in TVET Roadmap

The Lagos State Executive should mandate LASTVEB to develop an AI in TVET roadmap that aligns with the T.H.E.M.E.S. Agenda, identifying priority trades, phased targets, infrastructure needs, and industry engagement mechanisms.

For Medium-term (3–5 Years), the recommendations include:

1. National AI in Education Policy with TVET Annex

A National AI in Education Policy with a dedicated TVET annex covering infrastructure standards, teacher certification, data privacy, and ethical guidelines, ensuring sustainability should be enacted.

2. TVET Technology Matching Grant

A grant program enabling private sector donations for AI hardware and software , leveraging private investment while ensuring value for money should be established.

3. Mandate Labour Market Analytics as Permanent ITF Function

Industrial Training Fund should be mandated to conduct quarterly labour market analytics to align TVET curricula with employer demands, thus, providing data-driven decision-making to the TVET sector.

For Long-term (6–10 Years), it is recommended that:

1. Establish a National TVET-AI Research and Development Centre

Create a dedicated national research center focused on developing indigenous AI solutions for TVET, including NLP models for Nigerian languages, locally relevant technical content, and context-appropriate adaptive learning systems. This center would serve as a hub for innovation, policy research, and knowledge dissemination.

2. Institutionalize AI-Enhanced TVET Quality Assurance Framework

Develop and mandate a comprehensive quality assurance framework for AI-enhanced TVET delivery, covering

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standards for AI tool deployment, student data protection, algorithmic transparency, and continuous program evaluation. This would ensure consistent quality across all TVET institutions nationwide.

3. Integrate AI Competencies into National TVET Teacher Certification

Make AI literacy and digital pedagogy competencies a mandatory component of the national teacher certification framework for TVET instructors, ensuring that all new and existing educators possess foundational AI skills for effective instruction.

4. Establish State-Level AI-TVET Implementation Units

Mandate each state government to establish dedicated AI-TVET implementation units within their respective TVET boards, responsible for coordinating state-specific AI integration efforts, monitoring progress, and reporting to the National AI-in-TVET Task Force.

5. Establish National AI-TVET Monitoring and Evaluation Framework

Deploy a national monitoring and evaluation framework that tracks AI integration progress, measure learning outcomes, and assess employment impacts across all TVET institutions should be established to aid evidence-based policy reviews.

Conclusion

This study has systematically assessed the potential of artificial intelligence to transform technical and vocational education pedagogy in Nigeria. The desk review reveals that AI technologies provide concrete solutions to existing TVET challenges: adaptive learning systems enable personalized instruction at scale; intelligent tutoring systems deliver immediate feedback; VR/AR provide safe, repeatable hands-on practice; chatbots offer 24/7 student support; and predictive analytics align curricula with labor market demands. However, the analysis also identifies interlocking barriers: unreliable electricity and internet; acute shortages of AI-competent instructors; outdated curricula; severe underfunding; policy fragmentation; and socio-cultural resistance. The Lagos State context intensifies both opportunities and challenges. The state's position as Nigeria's economic powerhouse generates enormous demand for skilled technical workers, yet its TVET institutions struggle with insufficient digital infrastructure, weak policy support, and a shortage of digitally competent instructors. The proposed conceptual framework links AI interventions to quality education (SDG 4), decent work (SDG 8), industry and innovation (SDG 9), and reduced inequalities (SDG 10). The recommendations provide a coherent roadmap for Lagos State's institutional ecosystem, leveraging existing partnerships with development organizations and the Lagos State Employment Trust Fund.

References

- Adebari, F. A., Abdul, I. A., & Alade, A. (2023). *Beyond access: Redefining success in ODFeL through engagement and impact* [PDF]. Yaba College of Technology.
- Aderinto, I. D. (2026). Technology-Enhanced Instruction and Learning Engagement in Electrical Trade Education. *Kontagora International Journal of Educational Research*, 3(1), 116-130.
- Alakali, T. T., Iorfa, S. K., & Targba, S. A. (2021). Instructor capacity for technology integration in Nigerian TVET institutions. *Journal of Technical Education*, 12(3), 78-92.
- Ayanwale, M. A., Omeh, C. B., Oyeniran, O. O., & Kanu, A. C. (2025). Ethical AI Adoption in Nigerian TVET. *Journal of Vocational Education and Training*.
- Baker, R. S. (2019). Artificial intelligence in education: A history and future. In *The International Encyclopedia of Education* (4th ed.). Elsevier.
- Boyejo A.D., & Oke J.O. (2025). Workplace Readiness and Employability Skills Among Nigerian Technical College Students. *International Journal of Electrical and Electronics Engineering Studies*, 11(2), 1-14.
- Dawodu, A. O., Adegboye, A. R., & Olaniyan, A. O. (2025). Curriculum innovation and AI competencies in Lagos technical colleges. *Lagos Journal of Educational Research*, 18(2), 45-62.
- Deloitte. (2021). *Nigeria skills gap assessment*. Abuja: Deloitte Nigeria.
- Ebekozien, A., Aigbavboa, C. O., Samsurijan, M. S., Thwala, W. D., & Ahmed, M. A. H. (2024). The role of apprenticeship in skills development of construction artisans. *Engineering, Construction and Architectural Management*, 31(13), 411-429.
- Eichhorst, W., Rodríguez-Planas, N., Schmidl, R., & Zimmermann, K. F. (2015). A roadmap to vocational education and training systems. *IZA Journal of Labor Policy*, 4(1), 1-23.
- IARD. (2024). *Economic barriers to technology adoption in Nigerian TVET*. IARD Policy Brief, 12(4).
- ILO. (2020). *Skills development in the time of COVID-19*. Geneva: ILO.

- Leveraging Artificial Intelligence-Enhanced Technical and Vocational Education ...* Bilau, A. A., Et. al. (2026)
- Isikilu, M. O., Adebayo, S. A., & Ogunleye, T. A. (2025). Preparedness of vocational educators for AI adoption in Lagos State. *Nigerian Journal of Vocational Education*, 22(1), 78-95.
- Innovation Village Nigeria. (2025, November 17). *Nigeria launches AI chatbot for youth employment* [LinkedIn post]. Retrieved from https://www.linkedin.com/posts/innovation-village-nigeria_youthempowerment-aiforgood-digitalinnovation-activity-7396188369153802240-gmrF
- ITF. (2019). *Skills gap assessment of Nigerian construction sector*. Jos: ITF.
- Kassa, H. A. (2021). *Enhancing quality of outcome based technical and vocation education and training delivery: The case of polytechnic colleges in Addis Ababa* [Master's thesis, Addis Ababa University]. AAU Institutional Repository. <https://etd.aau.edu.et/bitstreams/9814fa80-8051-47cd-86e1-62fd866286d6/download>
- Kumar, D., Haque, A., Mishra, K., Islam, F., Mishra, B. K., & Ahmad, S. (2023). Exploring the transformative role of artificial intelligence in education. *Metaverse Basic and Applied Research*, 2, 21.
- Lagos State Employment Trust Fund. (2023). *Impact report 2023*
- Lagos State Ministry of Education. (2022). *Lagos State TVET audit report 2022*. Ikeja: Lagos State Government.
- Lagos State Ministry of Education. (2023). *Lagos State Education Policy*. Ikeja: Lagos State Government.
- Lin, C. C., Huang, A. Y., & Lu, O. H. (2023). Artificial intelligence in intelligent tutoring systems. *Smart Learning Environments*, 10(1), 41.
- Meta Platforms. (n.d.). *Digify Africa | Facebook for Developers* [Success story]. Retrieved from <https://developers.secure.facebook.com/success-stories/digify-africa>
- Mwanje, S. R. (2025). *Development of a prototype virtual reality teaching platform for vocational training centers in Uganda – a case study of automotive engineering at St Simon Peters VTI Hoima* [Master's dissertation, Uganda Christian University]. UCU Digital Repository. <https://hdl.handle.net/20.500.11951/1934>
- National Board for Technical Education. (2025, June 19). *NBTE, in Collaboration with COL, Hosts Groundbreaking Trainer-in-the-Loop AI Workshop to Advance TVET Digital Transformation in Nigeria*. <https://web.nbte.gov.ng/node/96>
- National Bureau of Statistics. (2022). *Labor force statistics: Unemployment and underemployment report*. Abuja: NBS.
- Naoum, S. G. (2007). *Dissertation research and writing for construction students* (2nd ed.). Butterworth-Heinemann.
- NSDC. (2020). *Annual impact report 2019-20*. New Delhi: NSDC.
- Nwabueze, C. (2016). The Nwaboyi apprenticeship tradition among the Igbo. *Journal of African Cultural Studies*, 28(2), 145-162.
- Nwakile, C. (2026). Labour market needs and TVET pedagogy in Nigeria. *Nigerian Journal of Educational Research*, 14(2), 112-128.
- Nweke, G. O., & Onu, F. M. (2022). Computing hardware deficits in Nigerian technical colleges. *African Journal of Computing & ICT*, 15(1), 12–25.
- Ogbuanya, T. C., & Chia, M. I. (2017). Assessment of workshop facilities in technical colleges. *Journal of Educational Research and Development*, 10(2), 55–68.
- Okeowo, O. A., Adewuyi, T. O., Akinde, O. O., & Alagbe, O. O. (2025). AI and automation adoption in TVET programs in Lagos. *Lagos Journal of Technical Education*, 15(1), 34-52.
- Okolie, U. C., & Yasin, A. M. (2017). Socio-cultural factors and perception of vocational education in Nigeria. *Journal of Technical Education and Training*, 9(2), 79–92.
- Okolie, U. C., Igwe, P. A., Nwosu, H. E., Eneje, B. C., & Mlanga, S. (2020). Enhancing graduate employability. *Policy Futures in Education*, 18(2), 294–313.
- Okwuchukwu, S. (2025). Training for the Future: Addressing the Needs of Nigeria's Emerging Workforce. *International Journal of Spectrum Research in Social and Management Sciences*, 1(2), 43-55.
- Onatere-Ubrurhe, E. D., & Ubrurhe, J. O. (2025). Assessment reform and AI awareness in Nigerian TVET. *Nigerian Journal of Educational Assessment*, 11(2), 67-84.
- Osae-Brown, A. (2013, April 21). *Examining Lagos State GDP figures*. BusinessDay. <https://businessday.ng/analysis/article/examining-lagos-state-gdp-figures/?amp=1>
- Potor, M. (2025, February 13). *How Digify Africa reaches 32,000 online learners with a WhatsApp chatbot*. Sinch Engage. Retrieved from <https://sinch.com/blog/digify-africa-whatsapp-chatbot-education/>
- Schwab, K. (2017). *The Fourth Industrial Revolution*. New York: Crown Business.
- SENA. (2019). *Tecnologías inmersivas en la formación profesional*. Bogotá: SENA.
- Sen, A. (1999). *Development as freedom*. Oxford: Oxford University Press.
- Silas, E. I., Ekong, M. O., & Akpan, I. M. (2024). Exploring AI-driven adaptive learning systems for personalized education in Nigerian TVET institutions to enhance student engagement and skill acquisition outcomes. *World Journal of Innovation and Modern Technology*, 8(5), 186–196. <https://iiardjournals.org/abstract.php?id=56156&j=WJIMT>
- Strietska-Ilina, O., & Chun, H. (2021). The Fourth Industrial Revolution and TVET. *International Journal of Vocational Education*, 33(2), 89-104.



Leveraging Artificial Intelligence-Enhanced Technical and Vocational Education ... Bilau, A. A., Et. al. (2026)

ThisDay. (2025, October 23). *FG trains 260,000 Nigerians in vocational skills*.
<https://www.thisdaylive.com/2025/10/23/fg-trains-260000-nigerians-in-vocational-skills/>

Tribune Online. (2026, March 8). *What we are doing to secure our children in schools nationwide* —Alausa.
<https://tribuneonlineng.com/what-we-are-doing-to-secure-our-children-in-schools-nationwide-alausa>

UNESCO. (2016). *Strategy for technical and vocational education and training (TVET) (2016–2021)*. Paris: UNESCO.

United Nations. (2015). *Open Working Group proposal for Sustainable Development Goals*.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology. *MIS Quarterly*, 27(3), 425–478.

Vincent, A. A., & Emmanuel, I. (2025). Infrastructure barriers to AI adoption in Nigerian TVET. *Journal of Educational Technology Development*, 16(2), 112-130.

Wahab, A. A., Ogunleye, T. A., & Adebayo, S. A. (2026). Socio-cultural barriers to technology adoption in Lagos TVET institutions. *Lagos Journal of Educational Research*, 19(1), 78-95.

World Bank. (2021). *Digital skills for Africa: Technology and vocational training*. Washington, DC: World Bank.

World Economic Forum. (2020). *The future of jobs report 2020*. Geneva: WEF.