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CHALLENGES AND PROSPECTS OF INTEGRATING TECHNOLOGY INTO VOCATIONAL TEACHER EDUCATION IN NIGERIA

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Abstract

This study investigates the challenges and prospects of integrating technology into vocational teacher education in Nigeria. This study adopted a descriptive survey research design. A sample of 240 respondents was selected using stratified random sampling and a structured questionnaire was used to collect data from vocational education lecturers and student-teachers in selected colleges of education. The data were analyzed using descriptive statistics, including mean and standard deviation. Findings revealed that major challenges include insufficient technological infrastructure, limited access to current instructional technologies, poor internet connectivity, and lack of sufficient training for educators. Despite these challenges, significant prospects were acknowledged, such as improved practical skills acquisition, increased learner engagement. The study concludes that effective integration of technology into vocational teacher education can extensively improve teaching and learning outcomes if institutional support and plan frameworks are strengthened. It is as a result that government and educational stakeholders invest in technological infrastructure, offer continuous professional development for teachers, and implement helpful policies to encourage sustainable technology integration in vocational teacher education.

Keywords: *Technology Integration, Teacher Education, Vocational Education, ICT, Nigeria.*

INTRODUCTION

The rapid advancement of technology has transformed education by reshaping teaching, learning, and teacher preparation. In vocational education, technology supports practical skills, technical competence, simulations, multimedia instruction, online collaboration, and digital assessment, linking theoretical knowledge with industrial practice (UNESCO, 2018). In Nigeria, vocational education promotes employability, self-reliance, and national

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development (FRN, 2014). However, technology integration remains constrained by inadequate funding, infrastructure, and teacher preparedness.

A major challenge is the **high cost of acquiring and maintaining technology**. Institutions require sustained investment in computers, specialised software, simulation equipment, internet services, and technical support. Insufficient funding can result in obsolete or inadequate facilities, limiting effective technology use (UNESCO-UNEVOC, 2022). Another concern is **limited digital competence and pedagogical preparation** among teacher educators and student teachers. Effective integration requires appropriate technological, pedagogical, and subject knowledge for lesson planning, practical demonstrations, assessment, and skills development. Inadequate training and professional development may therefore encourage continued reliance on traditional teaching methods (UNESCO, 2023; UNESCO-UNEVOC/Subrahmanyam, 2022).

Resistance to change, limited digital resources, unequal access, and inadequate technical support further hinder technology integration. Teachers may resist adoption because of limited confidence, training, or concerns about using technology for practical instruction. Unequal access to devices, internet, and electricity also creates disparities among institutions, while weak maintenance limits consistent use. In addition, curriculum gaps and weak industry linkages may reduce the relevance of emerging technologies, including digital pedagogy, automation, and artificial intelligence, to labour-market needs.

Despite these challenges, technology offers significant prospects for improving vocational teacher education. Multimedia, simulations, videos, virtual laboratories, computer-aided design, augmented reality, and online resources can enhance instructional effectiveness and

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practical skills development. Technology also supports flexible and blended learning by providing access to digital materials beyond the classroom while strengthening digital competencies and employability skills required in technology-driven workplaces.

Furthermore, digital technologies can improve **assessment, feedback, and professional development** through online tests, electronic portfolios, competency tracking, Open Educational Resources, online courses, webinars, and professional networks. They can also strengthen **industry–institution collaboration** through online seminars, mentoring, demonstrations, curriculum consultations, and professional development. Emerging technologies such as artificial intelligence, robotics, data analytics, and adaptive learning systems provide additional opportunities for lesson planning, assessment, personalised learning, and teacher development. Nigeria's National EdTech Strategy (2025–2030) similarly emphasizes teacher digital competency, sustainable infrastructure, digital assessment, innovation, and responsible AI use.

Overall, technology integration has considerable potential to improve vocational teacher education in Nigeria, but its success depends on adequate infrastructure, sustainable funding, teacher training, relevant digital content, technical support, effective policies, institutional leadership, industry collaboration, and equitable access. Technology integration should therefore be regarded as a systemic educational reform rather than merely the acquisition of digital devices. The present study consequently examines the **challenges and prospects of technology integration in vocational teacher education in Nigeria,** with the aim of identifying barriers and opportunities for effective, sustainable, and relevant technology-supported teacher preparation.

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Statement of the Problem

Despite increasing emphasis on digital transformation, vocational teacher education in Nigeria remains largely reliant on traditional teaching approaches. Many Colleges of Education experience inadequate ICT infrastructure, unreliable electricity and internet connectivity, outdated facilities, and limited access to modern instructional technologies (Adebayo & Adigun, 2020). These challenges hinder effective technology integration in teaching, practical demonstrations, skills development, and assessment. UNESCO-UNEVOC (2022) identifies inadequate infrastructure and resources as major barriers to digitalisation in technical and vocational education.

Limited digital competence among vocational teachers also constrains effective technology use. Inadequate digital skills, low confidence, and limited exposure to emerging technologies affect the use of digital tools for instruction, simulations, assessment, and collaboration (UNESCO, 2023; UNESCO-UNEVOC, 2022). Furthermore, inadequate continuous training and professional development limit teachers' ability to adapt to rapidly changing technologies. Although NBTE (2024) has introduced digital competency initiatives, their effectiveness requires further investigation. Therefore, this study examines the challenges and prospects of technology integration in vocational teacher education in Nigeria.

Objectives of the Study

The main objective of this study is to examine the challenges and prospects of integrating technology into vocational teacher education in Nigeria.

Specifically, the study seeks to:

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1. Identify the challenges hindering effective technology integration in vocational teacher education.
2. Determine the prospects of technology integration in vocational teacher education.
3. Examine the perceived benefits of technology use among vocational teacher educators and trainees.
4. Suggest strategies for improving technology integration in vocational teacher education.

Research Questions

The study is guided by the following research questions:

1. What are the challenges facing the integration of technology into vocational teacher education in Nigeria?
2. What prospects exist for technology integration in vocational teacher education?
3. What are the perceived benefits of technology integration in vocational teacher education?
4. What strategies can enhance effective technology integration in vocational teacher education?

Literature Review

Technology integration refers to the purposeful use of digital tools to improve teaching and learning (Ertmer & Ottenbreit-Leftwich, 2013). In vocational teacher education, it supports practical demonstrations, simulations, interactive learning, digital assessment, and exposure to workplace practices, aligning with Nigeria's emphasis on practical competence, entrepreneurship, and industry relevance (FRN, 2014). However, inadequate infrastructure,

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funding, teacher training, internet connectivity, and electricity constrain effective integration (Ololube et al., 2016; Yusuf, 2019). Appropriate technology use can nevertheless promote learner-centred instruction, collaboration, technical competence, and workplace relevance (UNESCO, 2018).

The study is anchored on the **Technological Pedagogical Content Knowledge (TPACK) Framework** developed by Mishra and Koehler (2006), based on Shulman's (1986) concept of Pedagogical Content Knowledge. TPACK emphasizes the interaction of **Content Knowledge (CK), Pedagogical Knowledge (PK), and Technological Knowledge (TK)**. CK concerns subject knowledge, PK relates to teaching methods, and TK involves the ability to use technology effectively. Their interaction produces integrated knowledge domains, culminating in TPACK—the ability to combine technology, pedagogy, and content effectively. The framework is relevant to vocational teacher education because teachers must integrate subject expertise, appropriate pedagogy, and technologies such as simulations, multimedia, computer-aided design, virtual classrooms, and digital assessment.

Empirical studies demonstrate the importance of technology integration in teacher education. Tondeur et al. (2017), in a study involving 931 pre-service teachers and 51 teacher educators, found that teacher educators who modelled technology integration positively influenced pre-service teachers' confidence and competence. The study emphasized institutional support, curriculum redesign, and continuous professional development. Similarly, Koehler et al. (2013) emphasized that effective technology integration requires the combination of technological, pedagogical, and content knowledge rather than technical skills alone. UNESCO (2018) further reported that ICT integration in technical and vocational education

and training can improve instructional quality, innovation, and employability by providing opportunities for simulated and experiential learning.

However, institutional readiness remains a significant concern. Adebayo and Adigun (2020) identified inadequate ICT facilities, insufficient funding, poor maintenance, and unstable electricity as major barriers to ICT integration in Nigerian Colleges of Education. Ololube et al. (2016) and Yusuf (2019) similarly identified infrastructural deficiencies, inadequate training, resistance to change, and unreliable power supply as persistent challenges. These limitations reduce teachers' ability to use digital resources consistently. Tamim et al. (2011), through a meta-analysis of more than 1,000 empirical studies, found a moderate and statistically significant positive effect of technology on student learning, particularly when technology was integrated with sound pedagogy.

Overall, the literature indicates that technology integration can improve instructional effectiveness, practical skills acquisition, learner engagement, collaboration, and workplace relevance in vocational teacher education. However, inadequate infrastructure and funding, unstable electricity, poor internet connectivity, insufficient professional development, and limited institutional support remain major barriers in Nigeria. Although existing studies have examined ICT adoption and technology use in teacher and vocational education, **limited attention has been given to the combined challenges and prospects of technology integration specifically within vocational teacher education in Nigeria**. This gap provides justification for the present study, which seeks to examine these challenges and prospects and provide evidence for sustainable and effective technology integration in vocational teacher education.

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METHODOLOGY

The study will adopt a **descriptive survey research design** to examine technological infrastructure, teachers' digital competence, teacher training and professional development, and the effectiveness of technology integration in vocational teacher education without manipulating the variables. The study will be conducted in selected Colleges of Education in the **North-East geopolitical zone of Nigeria,** with the population comprising vocational education lecturers and student-teachers. A sample of **240 respondents** will be selected using **stratified random sampling** to ensure adequate representation of both groups.

Data will be collected using a structured questionnaire titled **Technology Integration in Vocational Teacher Education Questionnaire (TIVTEQ),** developed from the research objectives, questions, hypotheses, and relevant literature. The instrument will comprise five sections covering demographic information, technological infrastructure, teachers' digital competence, teacher training and professional development, and effectiveness of technology integration. Responses will be measured on a four-point Likert scale ranging from Strongly Agree (4) to Strongly Disagree (1). Experts in Vocational Teacher Education, Educational Technology, and Measurement and Evaluation will validate the instrument for face and content validity. Reliability will be established through a pilot test, using **Cronbach's Alpha**, with a coefficient of **0.70 or above** considered acceptable.

Questionnaires will be administered with appropriate ethical procedures, including informed participation, confidentiality, and anonymity. Data will be coded and analysed using **descriptive and inferential statistics,** while the research questions will be answered using **mean and standard deviation.**

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Research Question One

What are the challenges of integrating technology into vocational teacher education in Nigeria?

Table 1

S/N	Challenges	M	SD	Decision
1	Inadequate ICT infrastructure	3.62	0.71	Agree
2	Poor funding of vocational institutions	3.58	0.69	Agree
3	Limited access to modern digital tools	3.54	0.73	Agree
4	Lack of teacher training in ICT usage	3.45	0.76	Agree
5	Unstable electricity supply	3.65	0.68	Agree
6	Poor internet connectivity	3.51	0.72	Agree
7	Resistance to change among teachers	3.12	0.81	Agree
	Grand Mean	**3.50**		**Agree**

Source: Field Survey, 2026

Decision Rule: Mean ≥ 2.50 = Agree

Interpretation:

Table 1 shows that all seven identified factors were rated above the criterion mean of **2.50**, indicating that respondents agreed they constitute challenges to technology integration. **Unstable electricity supply** ranked highest ($\bar{x}$ = 3.65), followed by **inadequate ICT infrastructure** ($\bar{x}$ = 3.62) and **poor funding** ($\bar{x}$ = 3.58). Other challenges included limited access to modern digital tools ($\bar{x}$ = 3.54), poor internet connectivity ($\bar{x}$ = 3.51), and inadequate ICT teacher training ($\bar{x}$ = 3.47). **Resistance to change among teachers** recorded the lowest mean ($\bar{x}$ = 3.12), but remained above the criterion mean. The **grand mean of 3.50** indicates that respondents generally agreed that these factors are major challenges to technology integration in vocational teacher education.

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Research Question Two

What are the prospects of technology integration in vocational teacher education in Nigeria?

Table 2

S/N	Prospects	M	SD	Decision
1	Improved teaching effectiveness	3.67	0.64	Agree
2	Enhanced students' practical skills	3.71	0.61	Agree
3	Increased learner engagement	3.63	0.66	Agree
4	Better preparation for modern workplace	3.74	0.59	Agree
5	Promotion of learner-centered pedagogy	3.58	0.70	Agree
6	Improved collaboration and communication	3.55	0.72	Agree
	Grand Mean	**3.65**		**Agree**

Source: Field Survey, 2026

Interpretation:

Table 2 shows that all six identified prospects recorded mean ratings above the criterion mean of **2.50**, indicating respondents' agreement that technology integration offers significant benefits. **Better preparation for the modern workplace** ranked highest (M = 3.74), followed by **enhanced practical skills** (M = 3.71) and **improved teaching effectiveness** (M = 3.67). Other prospects included increased learner engagement (M = 3.63), learner-centered pedagogy (M = 3.58), and improved collaboration and communication (M = 3.55). The **grand mean of 3.65** indicates that respondents generally agreed that technology integration has substantial prospects for improving vocational teacher education in Nigeria.

Research Question Three

What are the perceived benefits of technology integration in vocational teacher education in Nigeria?

Table 3

S/N	Benefits	M	SD	Decision
1	Improves lesson delivery	3.69	0.63	Agree
2	Enhances students' motivation	3.61	0.65	Agree

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3	Promotes interactive learning	3.66	0.62	Agree
4	Supports practical demonstrations	3.76	0.60	Agree
5	Encourages independent learning	3.58	0.68	Agree
	Grand Mean	**3.65**		**Agree**

Source: Field Survey, 2026

Interpretation:

Table 3 indicates that all five identified benefits recorded mean scores above the **criterion mean of 2.50,** showing respondents' agreement with the benefits of technology integration. **Support for practical demonstrations** ranked highest (M = 3.72), followed by **improved lesson delivery** (M = 3.69) and **interactive learning** (M = 3.66). Respondents also agreed that technology enhances student motivation (M = 3.61) and encourages independent learning (M = 3.58). The **grand mean of 3.65** indicates that technology integration provides substantial benefits for improving vocational teacher education in Nigeria.

Research Question Four

What strategies can be adopted to enhance technology integration in vocational teacher education in Nigeria?

Table 4

S/N	Strategies	M	SD	Decision
1	Increased funding for ICT facilities	3.74	0.58	Agree
2	Regular teacher training workshops	3.69	0.61	Agree
3	Provision of stable electricity	3.77	0.56	Agree
4	Reliable internet connectivity	3.72	0.59	Agree
5	Government–industry partnerships	3.64	0.66	Agree
	Grand Mean	**3.71**		**Agree**

Source: Field Survey, 2026

Interpretation:

Table 4 shows that all five strategies recorded mean scores above the **criterion mean of 2.50**, indicating respondents' agreement with their effectiveness in enhancing technology

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integration. **Provision of stable electricity** ranked highest (M = 3.77), followed by **increased ICT funding** (M = 3.74) and **reliable internet connectivity** (M = 3.72). Regular teacher training (M = 3.69) and government–industry partnerships (M = 3.64) were also supported. The **grand mean of 3.71** indicates that respondents generally agreed that these strategies are appropriate for improving technology integration in vocational teacher education in Nigeria.

Discussion of Findings

The findings of the study reveal that technology integration in vocational teacher education in Nigeria presents significant opportunities but remains constrained by inadequate infrastructure, insufficient funding, unstable electricity, poor internet connectivity, limited technological facilities, and inadequate teacher training. Although computers, mobile devices, multimedia resources, and internet facilities are being used, their application is not yet widespread or systematic. This supports Ololube et al. (2016) and Yusuf (2019), who emphasized that effective technology adoption depends on institutional capacity, available facilities, and teachers' technological competence.

The findings further show that technology can improve instructional delivery, learner engagement, access to current information, practical skills acquisition, creativity, and problem-solving. Multimedia demonstrations, simulations, and online resources can complement practical activities and expose learners to contemporary industrial practices, consistent with UNESCO (2018).

For sustainable integration, the study highlights the need for increased funding, adequate infrastructure, reliable electricity, improved internet connectivity, regular maintenance, and continuous professional development. Collaboration among government, vocational

institutions, industries, and technology organizations is also essential for providing modern equipment and technical expertise.

Overall, the findings support the TPACK framework of Mishra and Koehler (2006), which emphasizes the integration of technological, pedagogical, and content knowledge. Therefore, successful technology integration requires more than providing digital devices; it requires competent teachers, supportive infrastructure, sustainable funding, technical support, appropriate policies, and industry collaboration to improve the quality and relevance of vocational teacher education in Nigeria.

Summary of Key Findings

Findings revealed that:

- Major challenges include inadequate infrastructure, poor funding, limited teacher training, and unreliable electricity.
- Prospects include improved teaching quality, enhanced practical skills, better learner engagement, and improved employability.
- Respondents strongly agreed that technology integration enhances teaching effectiveness and learner motivation.

Conclusion

This study concludes that technology integration is essential for improving the quality, effectiveness, and relevance of vocational teacher education in Nigeria. Despite challenges such as inadequate infrastructure, insufficient funding, unstable electricity, poor internet connectivity, limited technological facilities, and inadequate teacher training, technology

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offers significant opportunities to improve instructional delivery, learner engagement, practical skills acquisition, independent learning, and industry relevance

Effective technology integration requires more than providing equipment; it demands sustainable funding, reliable electricity, adequate digital infrastructure, regular maintenance, continuous professional development, and strong institutional support. Government and educational institutions should therefore prioritize technology integration through appropriate policies, strategic planning, and adequate resource allocation.

Stronger collaboration among government, vocational institutions, industries, and technology providers is also necessary to provide access to current technologies and workplace practices. Teachers should be equipped with the technological, pedagogical, and content knowledge required for effective technology use. Ultimately, sustained investment, policy commitment, institutional support, and continuous capacity building are essential for preparing vocational teachers with the digital, practical, and occupational competencies needed in the twenty-first-century workplace.

Recommendations

1. Government should increase funding for ICT infrastructure.
2. Continuous professional development programs should be organized for vocational educators.
3. Stable electricity and internet services should be provided.
4. Institutions should partner with industries for technology support.
5. Policy frameworks should emphasize digital transformation in vocational teacher education.

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