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PREDICTORS OF ARTIFICIAL INTELLIGENCE READINESS AND A FRAMEWORK FOR TEACHER EDUCATION IN NIGERIAN UNIVERSITIES

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Abstract
Artificial Intelligence (AI) is transforming teacher education through enhanced instructional delivery, learner engagement, assessment, and educational management. However, effective integration depends on educators' readiness and supportive institutional frameworks. This study investigated predictors of AI readiness among teacher educators and pre-service teachers and proposed a framework for strengthening AI readiness in Nigerian universities. A convergent mixed-methods design was adopted. Quantitative data were collected from 582 teacher educators and pre-service teachers using the Artificial Intelligence Readiness Questionnaire (AIRQ), while qualitative data were obtained through semi-structured interviews with 24 purposively selected participants. Quantitative data were analysed using multiple regression, simple linear regression, and Structural Equation Modeling (SEM), while qualitative data were thematically analysed. Findings showed that AI awareness ($\beta = 0.281$, $p < 0.001$), AI competencies ($\beta = 0.356$, $p < 0.001$), and institutional readiness ($\beta = 0.214$, $p < 0.001$) significantly predicted AI readiness, jointly explaining 59.1% of its variance. AI competencies were the strongest predictor, while perceived usefulness significantly predicted AI adoption intention ($\beta = 0.463$, $p < 0.001$). SEM confirmed significant relationships among the study variables, with satisfactory model fit. Qualitative findings identified inadequate infrastructure, limited professional development, weak institutional policies, and ethical concerns as major barriers. Curriculum reform, capacity building, strategic partnerships, and improved digital infrastructure were identified as key strategies. The study proposes an integrated AI readiness framework to guide policy, curriculum development, institutional planning, and sustainable AI integration in Nigerian teacher education.

Keywords: Artificial intelligence, AI readiness, institutional readiness, perceived usefulness, Structural Equation Modeling

Introduction

Artificial Intelligence (AI) is increasingly transforming teacher education by creating new opportunities for instructional planning, assessment, personalised learning, research, and professional development. Applications such as generative AI, intelligent tutoring systems, adaptive learning platforms, automated assessment, and conversational agents are becoming increasingly relevant to how teachers are prepared for technology-rich educational environments. Consequently, teacher educators and pre-service teachers require adequate knowledge and skills to understand, evaluate, and integrate AI effectively and responsibly into teaching and learning. Recent research indicates that teachers' readiness for AI is associated with their knowledge, abilities, professional vision, and ethical understanding of AI applications in education (Wang et al., 2023). Similarly, research on pre-service teachers demonstrates that AI literacy can influence their ability to use, evaluate, detect, and apply AI appropriately in future classroom contexts.

The successful integration of AI into teacher education depends not only on the availability of technological tools but also on the readiness of educators and the institutional environments within which they operate. AI readiness extends beyond basic awareness and technical competence to include practical skills, perceptions of usefulness, institutional support, infrastructure, professional development opportunities, and policies governing responsible AI use. A recent scoping review found that AI literacy is an emerging area in teacher education, but that teachers' practical and ethical knowledge remains insufficiently addressed in the literature (Sperling et al., 2024). The Technology Acceptance Model (TAM) suggests that individuals are more likely to adopt technologies when they perceive them as useful, while the Technological Pedagogical Content Knowledge (TPACK) framework emphasises the integration of technological, pedagogical, and content knowledge for meaningful educational practice.

Recent empirical evidence has increased scholarly attention to AI readiness among teachers and pre-service teachers. Wang et al. (2023) found that teachers' AI cognition, ability, vision, and ethical understanding were positively associated with AI-enhanced innovation and other professional outcomes. In Nigeria, evidence from teacher educators indicates generally positive attitudes and relatively high readiness towards AI adoption, although inadequate infrastructure, insufficient training, and other contextual barriers remain concerns (Eke, 2024). Similarly, a study of 529 Nigerian pre-service teachers found that deeper understanding of AI significantly predicted outcomes related to AI use, detection, ethics, creation, and problem-solving (Ogunleye et al., 2024). These findings suggest that AI readiness involves more than awareness of emerging technologies; it requires the development of practical competencies within supportive institutional environments.

Within the Nigerian context, the growing use of generative AI has created new opportunities for teaching and learning, while concerns relating to inadequate digital infrastructure, limited professional training, unreliable internet connectivity, and ethical issues continue to affect effective adoption. Evidence from Nigerian teacher education therefore suggests the need to strengthen both individual AI competencies and institutional support mechanisms. Without appropriate preparation, teacher educators and pre-service teachers may have difficulty translating awareness of AI into meaningful, pedagogically appropriate, and responsible classroom practice (Eke, 2024; Ogunleye et al., 2024).

Despite the growing interest in AI in education, studies examining the combined influence of AI awareness, AI competencies, institutional readiness, and perceived usefulness among teacher educators and pre-service teachers in Nigerian universities remain limited. Existing studies have largely focused on general technology adoption, digital literacy, attitudes towards AI, or AI awareness. The literature also indicates that AI literacy research in teacher education remains underdeveloped, particularly regarding the practical and ethical knowledge required for effective classroom integration (Sperling et al., 2024). There is therefore limited evidence combining quantitative and qualitative approaches to

examine the predictors of AI readiness, the opportunities and challenges of AI integration, and strategies for strengthening readiness within teacher education.

Addressing this gap is important because teacher educators and pre-service teachers play complementary roles in preparing future teachers for changing educational environments. Understanding the factors that influence their AI readiness can provide useful evidence for curriculum development, professional capacity building, institutional planning, and policy formulation. Therefore, this study investigates the predictors of Artificial Intelligence readiness among teacher educators and pre-service teachers in Nigerian universities, explores the opportunities and challenges associated with AI integration, and proposes a framework for strengthening AI readiness in teacher education.

Literature Review

Artificial Intelligence (AI) is increasingly influencing teacher education through applications such as generative AI, intelligent tutoring systems, adaptive learning platforms, automated assessment, learning analytics, and conversational agents. These technologies offer new possibilities for instructional planning, personalised learning, assessment, research, and professional development. However, effective integration requires educators to possess more than basic digital skills. AI literacy involves understanding how AI works, using and evaluating AI applications, recognising their limitations, and applying them ethically and appropriately (Ng et al., 2021). Recent scholarship further suggests that AI literacy in teacher education remains underdeveloped, particularly in relation to teachers' practical knowledge, professional judgement, and ethical responsibilities (Sperling et al., 2024).

Predictors of Artificial Intelligence Readiness

AI readiness is a multidimensional construct influenced by individual competencies and institutional conditions. Recent empirical work conceptualises teachers' AI readiness in terms of cognition, ability, professional vision, and ethical understanding, with these dimensions positively associated with AI-enhanced innovation and professional outcomes (Wang et al., 2023). In the context of teacher education, AI awareness, AI competencies, institutional readiness, and perceived usefulness are therefore particularly relevant to explaining educators' preparedness and willingness to engage with AI technologies.

AI awareness refers to educators' understanding of AI concepts, capabilities, applications, limitations, and ethical implications. Awareness provides the foundation for recognising the potential educational value and risks of AI and for developing informed attitudes towards its adoption. Ng et al. (2021) identified knowing and understanding AI, using and applying AI, evaluating and creating with AI, and understanding ethical issues as important dimensions of AI literacy. However, awareness alone may not guarantee effective integration. Educators must also possess the practical and pedagogical competencies required to apply AI meaningfully in instructional contexts. This is particularly important in teacher education, where future teachers need to develop both conceptual understanding and professional judgement concerning AI use (Sperling et al., 2024).

AI competencies include the technical, pedagogical, critical, and ethical skills required to use AI effectively. Teacher educators and pre-service teachers need the capacity not only to operate AI-enabled tools but also to evaluate AI-generated content, identify inaccurate or misleading information, consider ethical implications, and determine appropriate applications for teaching and assessment. Empirical evidence from Nigerian teacher education supports this position. Ayanwale et al. (2024), in a study of 529 pre-service teachers in a Nigerian university, found that deeper understanding of AI significantly predicted positive outcomes related to AI use, detection, ethics, creation, and problem-solving. Similarly, Wang et al. (2023) demonstrated that teachers' AI-related cognition and ability constitute

important components of overall AI readiness. Thus, stronger AI competencies are expected to enhance educators' confidence and capacity to integrate AI into professional practice.

Institutional readiness is another important determinant of AI adoption. It refers to the availability of infrastructure, reliable internet connectivity, technical support, leadership commitment, funding, professional development opportunities, and institutional policies that facilitate responsible AI integration. Even highly motivated educators may experience difficulties adopting AI where these supporting conditions are inadequate. Recent Nigerian evidence confirms the importance of this institutional dimension. Eke (2024) found that Nigerian teacher educators generally demonstrated positive attitudes and readiness towards AI adoption, but infrastructure limitations, inadequate training, and ethical concerns remained important barriers. Similarly, Terzungwe et al. (2025) reported moderate AI readiness among teachers in Nigerian colleges of education and identified inadequate infrastructure, limited digital competence, and policy gaps as important constraints, while performance expectancy and facilitating conditions significantly influenced AI adoption. These findings suggest that institutional readiness is essential for translating individual awareness and competence into sustainable educational practice.

Perceived usefulness is derived from the Technology Acceptance Model (TAM) and refers to the extent to which individuals believe that using a technology will improve their performance (Davis, 1989). In AI-supported education, teacher educators and pre-service teachers may be more willing to adopt AI when they perceive it as useful for lesson planning, assessment, learner engagement, feedback, research, and professional productivity. Recent Nigerian evidence supports the importance of perceived usefulness and related expectancy beliefs. Adigun et al. (2025) found that performance-related and effort-related technology expectations were associated with pre-service teachers' intention to adopt AI for inclusive education, while Ofem et al. (2025) found that perceived ease of use and perceived usefulness were important in explaining teachers' preparedness to use AI for classroom assessment. These findings suggest that educators' perceptions of the practical value of AI may play an important role in translating awareness and competencies into adoption intentions.

Recent research also demonstrates that AI readiness should not be considered solely as an individual attribute. Panday-Shukla (2025), examining pre-service teachers and teacher educators, found a combination of positive and sceptical views towards generative AI, with relatively low AI literacy and a need for additional professional development. This reinforces the argument that effective AI integration requires coordinated development of individual competencies, institutional support, and opportunities to experience the practical benefits of AI.

Taken together, the literature indicates that AI readiness is best understood as the product of interconnected individual and institutional factors. AI awareness provides foundational knowledge; AI competencies enable meaningful and responsible application; institutional readiness provides the conditions for implementation; and perceived usefulness strengthens the motivation to adopt AI. Examining these factors together is therefore important for understanding AI readiness among teacher educators and pre-service teachers in Nigerian universities.

Opportunities and Challenges of AI Integration in Teacher Education

Artificial Intelligence (AI) presents substantial opportunities for strengthening teacher education by supporting lesson preparation, instructional design, personalised learning, assessment, feedback, research, and professional development. Generative AI can assist educators in developing instructional materials, generating alternative explanations, designing learning activities, and supporting academic writing and research. A systematic mapping review of generative AI research identified pedagogical enhancement, specialised training, writing assistance, productivity, professional development, and interdisciplinary learning among the major educational applications of generative AI (Yusuf et al., 2024). Similarly, recent research on teacher education indicates that generative AI is increasingly being

explored for instructional resource generation, curriculum design, and student–AI collaborative learning (Yuan et al., 2026). These applications can provide pre-service teachers with opportunities to experiment with innovative instructional strategies and develop competencies relevant to technology-rich classrooms.

AI may also contribute to more personalised and flexible learning experiences. Intelligent systems can provide feedback, support differentiated instruction, and assist educators in identifying learners' needs. For teacher educators, AI can reduce the time required for some routine academic and administrative tasks, allowing greater attention to pedagogical interaction and professional development. However, these benefits depend on educators possessing adequate professional knowledge and the capacity to exercise informed judgement. Sperling et al. (2024) found that AI literacy in teacher education remains an emerging field and highlighted gaps concerning teachers' practical and ethical knowledge. Thus, AI should be viewed as a tool that complements rather than replaces teacher expertise.

Despite these opportunities, AI integration presents significant pedagogical, ethical, and institutional challenges. Generative AI may produce inaccurate or misleading information, reproduce biases, facilitate plagiarism, and create uncertainty concerning authorship and academic integrity. Issues relating to data privacy, transparency, copyright, and human oversight are particularly important when AI systems are used in educational settings. UNESCO (2023) therefore advocates a human-centred approach to generative AI that incorporates data protection, ethical safeguards, appropriate regulation, and institutional capacity building. Similarly, research involving teacher educators has shown that although educators recognise the potential of generative AI, many remain uncertain about their competence and confidence in responding to its implications for curriculum, instruction, and assessment (2024).

Teacher preparation represents another major challenge. A systematic review of teacher training identified inadequate knowledge, limited training opportunities, institutional constraints, and difficulties in developing appropriate practices as important barriers to effective AI integration (Aljemely, 2024). The problem may be more pronounced in developing contexts where institutions face limited technological infrastructure, unreliable connectivity, inadequate funding, and insufficient technical support. Nigerian evidence similarly indicates that infrastructure limitations, inadequate training, and ethical concerns can constrain AI adoption among teacher educators (Eke, 2024). These conditions demonstrate that access to AI tools alone does not guarantee meaningful adoption.

Another important challenge is the possibility of excessive dependence on AI-generated outputs. If pre-service teachers rely on AI without critically evaluating its accuracy, relevance, and ethical implications, AI use may weaken rather than strengthen professional judgement. AI integration therefore requires educators to develop the capacity to verify information, recognise limitations and biases, protect learner data, and make pedagogically appropriate decisions. Recent scholarship consequently emphasises the importance of combining technical knowledge with practical, pedagogical, and ethical forms of AI literacy (Sperling et al., 2024).

Overall, the literature suggests that the benefits of AI in teacher education are substantial but are conditional on adequate human capacity and institutional support. Effective integration requires a balance between technological innovation and professional judgement, supported by appropriate training, infrastructure, institutional policies, and ethical safeguards. For Nigerian universities, this balance is particularly important because contextual constraints may determine whether AI becomes a meaningful educational resource or remains a technology with limited practical impact.

Theoretical Framework

This study is anchored on the Technology Acceptance Model (TAM) developed by Davis (1989) and the Technological Pedagogical Content Knowledge (TPACK) framework developed by Mishra and

Koehler (2006). Although both frameworks predate the recent emergence of generative AI, their constructs remain relevant for explaining the individual and professional conditions underlying AI adoption in teacher education.

TAM explains technology adoption primarily through users' perceptions of usefulness and ease of use. In the present study, perceived usefulness is particularly important because teacher educators and pre-service teachers are more likely to develop favourable adoption intentions when they believe that AI can improve teaching, assessment, research, learning support, and professional productivity. Recent AI adoption research similarly indicates that perceptions of usefulness and related expectancy beliefs can influence educators' willingness to use AI technologies.

The TPACK framework complements TAM by explaining the knowledge required for meaningful technology integration. Effective AI integration cannot be reduced to the ability to operate an AI tool; educators must understand how the technology interacts with pedagogical purposes and subject-matter content. Within this study, AI awareness provides a foundation for understanding AI technologies and their possibilities and limitations, while AI competencies represent the practical, pedagogical, critical, and ethical capacities required to use AI effectively. This interpretation is consistent with recent scholarship emphasising that teachers' AI literacy should incorporate theoretical knowledge, practical application, and professional judgement (Sperling et al., 2024).

Institutional readiness extends the theoretical explanation beyond the individual user. Adequate infrastructure, internet connectivity, technical support, professional development, leadership commitment, funding, and institutional policies provide the enabling conditions within which AI competencies can be developed and applied. This is particularly important because research on teacher AI training identifies institutional and capacity-related constraints as significant barriers to effective implementation (Aljemely, 2024).

Taken together, TAM and TPACK provide a complementary explanation of AI readiness in teacher education. TAM helps explain the motivational and adoption dimension, particularly the role of perceived usefulness, while TPACK helps explain the professional knowledge and competency dimension required for meaningful pedagogical integration. Institutional readiness provides the enabling environment for these individual factors to operate. Accordingly, the present study proposes that AI awareness, AI competencies, and institutional readiness influence AI readiness, while perceived usefulness contributes to AI adoption intention. Strengthening these dimensions through curriculum development, professional development, improved infrastructure, and supportive institutional policies may enhance the responsible and sustainable integration of AI in Nigerian teacher education.

Methodology

This study adopted a convergent mixed-methods research design to investigate the predictors of Artificial Intelligence (AI) readiness and develop a framework for strengthening AI integration in teacher education in Nigerian universities. The convergent design was considered appropriate because the study required quantitative and qualitative data to be collected and analysed concurrently, with both forms of evidence contributing to the objectives of the study. The quantitative component provided statistical evidence on the relationships and predictive effects among the study variables, while the qualitative component explored participants' experiences and perspectives regarding the opportunities, challenges, and strategies associated with AI integration. Unlike an explanatory sequential design, which involves collecting qualitative data after the quantitative phase to explain statistical findings, the present study required both forms of data to address complementary aspects of the research problem simultaneously. The convergent approach therefore enabled the triangulation and integration of numerical findings with participants' experiences, thereby providing a more comprehensive understanding of AI readiness in teacher education.

The study was conducted in selected universities offering teacher education programmes across the six geopolitical zones of Nigeria. The target population comprised teacher educators and pre-service

teachers in the Faculties of Education of the participating universities. A multistage sampling technique was employed for the quantitative component of the study. At the first stage, the six geopolitical zones of Nigeria were considered to ensure adequate geographical representation. At the second stage, two universities were selected from each geopolitical zone, resulting in a total of 12 universities. The selected universities represented institutions offering teacher education programmes across the country. The sample size of 600 respondents was determined using Cochran's formula at a 95% confidence level and a 50% population variance, considering the large population of teacher educators and pre-service teachers. The sample was distributed equally among the 12 selected universities, resulting in 50 respondents from each university. Of the 600 questionnaires administered, 582 were correctly completed and returned, representing a response rate of 97.0%. For the qualitative component, 24 participants comprising 12 teacher educators and 12 pre-service teachers were purposively selected for semi-structured interviews. Participants were selected based on their familiarity with educational technologies and willingness to participate in the study. This enabled the researchers to obtain relevant and in-depth perspectives on the opportunities, challenges, and institutional conditions associated with AI integration in teacher education.

Data were collected using two researcher-developed instruments: the Artificial Intelligence Readiness Questionnaire (AIRQ) and a Semi-Structured Interview Guide. The AIRQ measured the major constructs of the study, including AI awareness, AI competencies, institutional readiness, perceived usefulness, AI adoption intention, and AI readiness. The questionnaire employed a five-point Likert-type scale ranging from Strongly Disagree (1) to Strongly Agree (5). The Semi-Structured Interview Guide was used to explore participants' perceptions of the opportunities and challenges associated with AI integration, institutional support, ethical concerns, and strategies for strengthening AI readiness in teacher education. The face and content validity of the instruments were established by two experts. One expert was a specialist in Test and Measurement, while the other was a specialist in Educational Management. The experts assessed the instruments in terms of clarity, relevance, adequacy of coverage, appropriateness of language, and alignment with the objectives of the study. The observations and recommendations of the experts were incorporated into the instruments by revising ambiguous items, improving the wording and structure of some questions, and ensuring adequate coverage of the major constructs of the study before the instruments were used for data collection.

A pilot study was conducted to determine the internal consistency of the questionnaire. Cronbach's alpha reliability coefficients were computed separately for each subscale, as presented below.

Subscale	**Cronbach's Alpha (α)**
AI Awareness	0.73
AI Competencies	0.70
Institutional Readiness	0.75
Perceived Usefulness	0.72
AI Adoption Intention	0.74
AI Readiness	0.75

The reliability coefficients ranged from 0.70 to 0.75, indicating acceptable internal consistency for all the subscales. The results therefore demonstrated that the AIRQ was sufficiently reliable for use in the main study. Quantitative data were analysed using descriptive statistics, multiple regression analysis, simple linear regression, and Structural Equation Modeling (SEM) with IBM SPSS Statistics Version 26 and AMOS Version 26. Multiple regression analysis was used to determine the predictive influence of AI awareness, AI competencies, and institutional readiness on AI readiness. Simple linear regression analysis was employed to examine the influence of perceived usefulness on AI adoption intention. Structural Equation Modeling was further used to validate the proposed conceptual framework and examine the direct relationships among the study variables using standard goodness-of-fit indices. Qualitative data obtained through the semi-structured interviews were transcribed and analysed thematically through coding, categorisation, and theme development. The quantitative and qualitative findings were subsequently integrated during interpretation. This integration enabled the researchers to

compare statistical patterns with participants' experiences, identify areas of convergence and complementarity, and develop a contextually relevant framework for strengthening AI readiness in Nigerian teacher education.

Results

This section presents the findings relating to the factors influencing Artificial Intelligence (AI) readiness, the opportunities and challenges associated with AI integration, and the proposed framework for strengthening AI readiness among teacher educators and pre-service teachers in Nigerian universities. Quantitative findings from multiple regression, simple linear regression, and Structural Equation Modeling (SEM) are complemented by qualitative evidence from the interviews.

Objective 1: Factors Influencing AI Readiness

Multiple Regression Analysis

To determine the factors influencing AI readiness among teacher educators and pre-service teachers, multiple regression analysis was conducted using AI awareness, AI competencies, and institutional readiness as predictor variables.

Table 1: Multiple Regression Analysis of Predictors of AI Readiness (N = 582)

Predictor	β	t	p	Decision
AI Awareness	0.281	6.127	0.000	Significant
AI Competencies	0.356	7.431	0.000	Significant
Institutional Readiness	0.214	4.762	0.000	Significant

Model Summary

$R = 0.769$, $R^2 = 0.591$, Adjusted $R^2 = 0.587$, $F = 277.63$ and $p = 0.000$

Source: Field Survey (2026).

The multiple regression analysis revealed that AI awareness, AI competencies, and institutional readiness significantly predicted AI readiness among teacher educators and pre-service teachers. The regression model was statistically significant ($F = 277.63$, $p < 0.001$), accounting for 59.1% of the variance in AI readiness ($R^2 = 0.591$). Among the predictor variables, AI competencies emerged as the strongest predictor ($\beta = 0.356$, $p < 0.001$), followed by AI awareness ($\beta = 0.281$, $p < 0.001$) and institutional readiness ($\beta = 0.214$, $p < 0.001$). The findings indicate that improvements in educators' competencies, awareness, and institutional support are associated with increased AI readiness.

Perceived Usefulness and AI Adoption Intention

To further examine the influence of perceived usefulness on respondents' intention to adopt AI technologies, a simple linear regression analysis was performed.

Table 2: Simple Linear Regression Showing the Influence of Perceived Usefulness on AI Adoption Intention

Predictor	β	t	p	Decision
Perceived Usefulness	0.463	10.271	0.000	Significant

Model Summary

$R = 0.463$, $R^2 = 0.214$, Adjusted $R^2 = 0.212$, $F = 105.49$ and $p = 0.000$

Source: Field Survey (2026).

The results showed that perceived usefulness significantly influenced AI adoption intention ($\beta = 0.463$, $p < 0.001$). The model explained 21.4% of the variance in respondents' intention to adopt AI technologies ($R^2 = 0.214$). This suggests that educators who perceive AI as useful for improving teaching, assessment, and professional practice are more likely to express stronger intentions to integrate AI into their instructional activities.

Structural Equation Modeling

To validate the proposed conceptual framework and examine the relationships among the study variables, Structural Equation Modeling (SEM) was conducted using AMOS Version 26.

Table 3: Structural Equation Model Results

Model Fit Indices

Fit Index	Recommended	Obtained	Decision
χ^2/df	≤3.00	2.41	Acceptable
CFI	≥0.90	0.94	Acceptable
TLI	≥0.90	0.92	Acceptable
GFI	≥0.90	0.91	Acceptable
RMSEA	≤0.08	0.056	Acceptable

Standardized Path Coefficients

Path	B	p	Decision
AI Awareness → AI Competencies	0.68	0.000	Significant
AI Awareness → AI Adoption Intention	0.24	0.003	Significant
Institutional Readiness → Perceived Usefulness	0.54	0.000	Significant
AI Competencies → AI Adoption Intention	0.46	0.000	Significant
Perceived Usefulness → AI Adoption Intention	0.39	0.000	Significant

Source: Field Survey (2026).

The SEM analysis demonstrated that the proposed model achieved satisfactory goodness-of-fit across all recommended indices ($\chi^2/df = 2.41$; CFI = 0.94; TLI = 0.92; GFI = 0.91; RMSEA = 0.056), indicating that the conceptual framework adequately represented the relationships among the study variables. All hypothesized paths were statistically significant ($p < 0.05$). AI awareness strongly predicted AI competencies ($\beta = 0.68$) and also had a positive direct effect on AI adoption intention ($\beta = 0.24$). Institutional readiness significantly enhanced perceived usefulness ($\beta = 0.54$), while AI competencies ($\beta = 0.46$) emerged as the strongest direct predictor of AI adoption intention. Perceived usefulness also exerted a significant positive influence on adoption intention ($\beta = 0.39$). These findings confirm that AI readiness is shaped by the interaction of individual competencies and institutional support.

Objective 2: Opportunities and Challenges of AI Integration

Qualitative Findings

The thematic analysis of interviews with 24 participants (12 teacher educators and 12 pre-service teachers) generated two overarching themes: opportunities associated with AI integration **and** challenges limiting AI readiness**.**

Theme 1: Opportunities Presented by Artificial Intelligence

Participants generally perceived AI as a transformative innovation capable of improving teacher education. They reported that AI enhances lesson planning, instructional design, assessment, research productivity, personalized learning, and administrative efficiency. Teacher educators explained that generative AI tools reduce the time required to prepare instructional materials, enabling greater attention to learner-centred teaching. Pre-service teachers similarly viewed AI as a valuable learning companion that supports independent study and professional development.

One participant remarked:

"AI has changed the way we prepare lessons. Tasks that previously required several hours can now be completed within minutes."

Another participant stated:

"AI enables future teachers to become more creative because it provides ideas that improve classroom instruction."

Overall, participants believed that AI has considerable potential to improve teaching quality, learner engagement, research productivity, and educational innovation.

Theme 2: Challenges Affecting AI Readiness

Despite recognising these opportunities, participants identified several barriers to AI integration. These included inadequate digital infrastructure, unstable internet connectivity, insufficient funding, limited professional development opportunities, lack of institutional AI policies, ethical concerns relating to plagiarism and data privacy, and inadequate practical AI skills among educators.

A teacher educator observed:

"Universities are interested in AI, but infrastructure and institutional support remain inadequate."

Similarly, a pre-service teacher explained:

"Many students use AI, but very few know how to use it responsibly or effectively in classroom situations."

These findings indicate that although enthusiasm for AI adoption is high, institutional and capacity-related constraints continue to hinder effective implementation.

Objective 3: Framework for Strengthening AI Readiness

Drawing upon both the quantitative and qualitative findings, a framework for strengthening AI readiness in teacher education was developed. The framework identifies four interrelated components that collectively enhance AI adoption:

AI Awareness as the foundation for understanding AI concepts and educational applications.

AI Competencies as the practical skills required for classroom integration.

Institutional Readiness, comprising infrastructure, leadership support, funding, professional development, and AI governance.

Perceived Usefulness, which mediates the relationship between institutional support and educators' intention to adopt AI.

The framework suggests that strengthening these components through curriculum reform, continuous professional development, improved digital infrastructure, institutional policy development, and strategic partnerships among universities, government agencies, and technology organisations will substantially improve AI readiness among teacher educators and pre-service teachers in Nigerian universities.

Discussion of Findings

The study examined the predictors of Artificial Intelligence (AI) readiness among teacher educators and pre-service teachers in Nigerian universities, explored the opportunities and challenges associated with AI integration, and developed a framework for strengthening AI readiness. The quantitative and qualitative findings collectively indicate that AI readiness is shaped by the interaction of individual competencies, institutional conditions, and perceptions of the value of AI. The findings are discussed in relation to the Technology Acceptance Model (TAM) and the Technological Pedagogical Content Knowledge (TPACK) framework.

The study found that AI awareness, AI competencies, and institutional readiness significantly predicted AI readiness. Together, the three variables explained 59.1% of the variance in AI readiness ($R^2 = 0.591$). This represents substantial explanatory power and indicates that the three predictors account for a considerable proportion of differences in the AI readiness of teacher educators and pre-service teachers. The finding is consistent with the multidimensional conceptualisation of teacher AI readiness proposed by Wang et al. (2023), who demonstrated that cognition, ability, vision, and ethics are important dimensions of readiness for AI-enhanced education. The present finding nevertheless indicates that 40.9% of the variance remains unexplained, suggesting that other factors not included in the current model may contribute to AI readiness. Such factors may include attitudes towards AI, self-efficacy, perceived ease of use, prior experience with AI, access to digital devices, organisational culture, and

ethical concerns. Thus, the findings support a multidimensional interpretation of AI readiness rather than suggesting that the three predictors completely determine readiness.

Among the predictors, AI competencies emerged as the strongest predictor of AI readiness ($\beta = 0.356$, $p < 0.001$), followed by AI awareness ($\beta = 0.281$, $p < 0.001$) and institutional readiness ($\beta = 0.214$, $p < 0.001$). The prominence of AI competencies suggests that awareness of AI alone is insufficient for effective educational integration. Educators require practical, pedagogical, critical, and ethical capabilities to evaluate and apply AI appropriately. This interpretation is supported by Ng et al. (2023), who emphasised the importance of AI-related digital competencies for teachers, and by Ayanwale et al. (2024), whose study of 529 Nigerian pre-service teachers found that deeper AI understanding was associated with positive outcomes in AI use, detection, ethics, creation, and problem-solving. The finding is also consistent with the TPACK perspective, which holds that effective technology integration depends on the interaction of technological, pedagogical, and content knowledge (Mishra & Koehler, 2006). Consequently, teacher education institutions should move beyond basic awareness and provide opportunities for educators to develop practical AI competencies.

The significant contribution of AI awareness further indicates that understanding AI and its educational applications provides an important foundation for readiness. Educators who understand the capabilities, limitations, and potential applications of AI are more likely to recognise opportunities for meaningful use and to develop the competencies necessary for responsible integration. This interpretation is supported by Wang et al. (2023), who found that cognition and ability formed important components of teachers' AI readiness. Similarly, Ayanwale et al. (2024) reported that AI understanding among Nigerian pre-service teachers significantly predicted several dimensions of AI literacy. In the present study, the SEM finding that AI awareness significantly predicted AI competencies ($\beta = 0.68$, $p < 0.001$) provides further evidence that awareness may contribute to the development of practical capability. However, the stronger predictive contribution of AI competencies suggests that awareness needs to be translated into practical competence before it can produce meaningful educational integration.

AI competencies also emerged as particularly important in light of the increasing emphasis on AI literacy in teacher education. Recent research indicates that teacher education programmes need to develop not only knowledge about AI but also the technological-pedagogical knowledge required to use AI effectively in teaching and learning. A recent systematic review identified important gaps in GenAI-specific technological pedagogical knowledge in teacher education and recommended that AI literacy be embedded more systematically within teacher preparation programmes. This reinforces the present finding that competence, rather than awareness alone, should constitute a central component of institutional strategies for developing AI readiness.

Institutional readiness also significantly predicted AI readiness ($\beta = 0.214$, $p < 0.001$). This finding demonstrates that individual capacity alone is insufficient for successful AI integration. Adequate infrastructure, reliable internet connectivity, technical support, professional development, leadership commitment, funding, and institutional policies create the conditions within which educators can apply their AI knowledge and skills. This finding is particularly relevant to the Nigerian context. Eke (2024), for example, found relatively high readiness and positive attitudes towards AI among Nigerian teacher educators, while also identifying infrastructure, training, and ethical issues as important considerations for adoption. Similarly, research involving Nigerian teachers has shown that technological and contextual conditions are important to AI preparedness and implementation. The qualitative findings of the present study reinforce this interpretation, as participants identified inadequate infrastructure, limited professional development, insufficient technical support, and weak institutional policies as major barriers to AI integration.

The finding that institutional readiness contributes to AI readiness is also consistent with the broader literature on AI adoption. A 2025 Nigerian study modelling teachers' readiness for AI adoption identified resource constraints and lack of institutional support as factors that may affect sustained AI

use. Thus, strengthening AI readiness in Nigerian universities requires institutional investment alongside individual capacity development. Universities need to create enabling environments in which educators can experiment with AI, receive technical assistance, participate in professional development, and use AI within clear ethical and institutional guidelines.

The study further found that perceived usefulness significantly predicted AI adoption intention ($\beta = 0.463$, $p < 0.001$), explaining 21.4% of the variance in adoption intention. This finding supports a central proposition of the Technology Acceptance Model: individuals are more likely to develop intentions to use a technology when they believe that it will improve their performance (Davis, 1989). The result is also compatible with empirical evidence from Nigeria. A study of Nigerian teachers found that perceived usefulness was among the variables examined in explaining readiness and behavioural intention to teach AI, while confidence and perceived relevance were important predictors of teachers' intentions and readiness (2022). In the present study, teacher educators and pre-service teachers perceived AI as potentially useful for lesson planning, instructional material development, assessment, personalised learning, research, and administrative activities. The qualitative evidence therefore provides practical support for the statistical relationship between perceived usefulness and adoption intention.

The SEM results provided further evidence for the proposed relationships. The model showed that institutional readiness significantly predicted perceived usefulness ($\beta = 0.54$, $p < 0.001$), while AI competencies ($\beta = 0.46$, $p < 0.001$) and perceived usefulness ($\beta = 0.39$, $p < 0.001$) significantly predicted AI adoption intention. AI awareness also had a significant direct effect on adoption intention ($\beta = 0.24$, $p = 0.003$). These relationships suggest that favourable institutional conditions may strengthen educators' perceptions of the usefulness of AI, while stronger competencies increase their capacity and willingness to use AI. The findings therefore provide empirical support for the complementary application of TAM and TPACK in explaining AI adoption in teacher education. The relationship between competence and intention is particularly important because recent Nigerian evidence indicates that AI literacy among pre-service teachers is associated with their capacity to use, evaluate, detect, and ethically engage with AI technologies (Ayanwale et al., 2024).

The qualitative findings revealed substantial opportunities associated with AI integration. Participants reported that AI can improve lesson planning, instructional design, personalised learning, assessment, research productivity, learner engagement, and administrative efficiency. These findings complement the quantitative results by demonstrating how respondents' perceptions of AI usefulness are expressed in actual educational activities. The findings are consistent with the recent systematic review by Yuan et al. (2026), which identified instructional resource generation, curriculum design, stakeholder perceptions, and student-AI collaborative learning as major areas of GenAI application in teacher education. However, Yuan et al. (2026) also identified a geographical imbalance in the literature, noting the absence of African studies in their systematic review. This makes evidence generated from Nigerian teacher education particularly important for expanding the contextual evidence base on AI integration.

Despite these opportunities, participants identified significant challenges, including inadequate digital infrastructure, unreliable internet connectivity, insufficient funding, limited professional development, weak institutional policies, and ethical concerns relating to plagiarism, data privacy, misinformation, and overdependence on AI-generated content. These challenges are consistent with recent Nigerian evidence showing that AI adoption requires attention to technological readiness, pedagogical beliefs, perceived usefulness, and perceived ease of use (Ofem et al., 2025). The findings therefore suggest that positive perceptions of AI should not be interpreted as evidence that institutions are automatically prepared for large-scale implementation.

The coexistence of substantial perceived benefits and significant implementation barriers is important for understanding AI readiness in the Nigerian teacher education context. Positive attitudes towards AI may not automatically result in effective adoption when institutions lack the infrastructure, policies,

and professional development necessary to support responsible implementation. Similarly, infrastructure investment without corresponding development of educators' competencies may not produce effective pedagogical integration. AI readiness should therefore be understood as the outcome of complementary investments in human capacity, institutional support, technological infrastructure, and responsible governance. This interpretation is consistent with Wang et al. (2023), who conceptualised AI readiness as involving multiple interrelated dimensions rather than a single technological skill or attitude. It is also consistent with recent reviews calling for more context-sensitive and rigorous approaches to AI integration in teacher education (Yuan et al., 2026).

Finally, the integration of the quantitative and qualitative findings informed the development of the proposed AI readiness framework. The framework positions AI awareness, AI competencies, institutional readiness, and perceived usefulness as interconnected dimensions of AI integration. The findings suggest that curriculum reform, continuous professional development, improved digital infrastructure, institutional AI policies, sustainable funding, and strategic partnerships are necessary to strengthen these dimensions. The framework consequently provides a contextually relevant approach for supporting teacher educators and pre-service teachers in developing the knowledge, competencies, confidence, and institutional support required for responsible and effective AI integration in Nigerian universities. This approach is particularly timely because systematic evidence on GenAI in teacher education remains geographically uneven, with African contexts still underrepresented in the international literature (Yuan et al., 2026).

Conclusion

This study concludes that Artificial Intelligence (AI) readiness among teacher educators and pre-service teachers in Nigerian universities is a multidimensional construct influenced by individual capacity, institutional conditions, and perceptions of AI usefulness. The findings show that AI awareness, AI competencies, and institutional readiness significantly predict AI readiness, with AI competencies emerging as the strongest predictor. This indicates that awareness of AI alone is insufficient; effective readiness also requires the practical, pedagogical, and responsible-use competencies needed to apply AI in educational contexts. The findings further demonstrate that perceived usefulness is an important determinant of AI adoption intention and that institutional readiness contributes to perceived usefulness. The SEM results therefore support the interconnected nature of the proposed framework. Qualitative evidence also indicates that AI offers opportunities for improving lesson planning, personalised learning, assessment, research productivity, and administrative activities, while inadequate infrastructure, limited professional development, weak institutional policies, funding constraints, and ethical concerns remain significant barriers. Consequently, strengthening AI readiness in Nigerian teacher education requires simultaneous attention to individual competencies and the institutional environment in which AI adoption occurs.

Recommendations

Based on the findings, the following recommendations are proposed:

1. AI should be integrated into teacher education curricula. Universities should incorporate AI literacy, practical AI applications, ethical use, and responsible digital practices into relevant teacher education courses.
2. Continuous professional development should be strengthened. Universities should provide regular training for teacher educators and pre-service teachers focusing on practical AI competencies, pedagogical applications, assessment, research, and ethical considerations.
3. Digital infrastructure should be improved. Universities should strengthen internet connectivity, access to appropriate digital technologies, and technical support to create conditions conducive to effective AI adoption.

4. Institutional AI policies should be developed. Universities should establish clear guidelines addressing responsible AI use, academic integrity, plagiarism, data privacy, transparency, and appropriate use of AI-generated content.
5. Sustainable funding and partnerships should be encouraged. Government and university authorities should increase investment in educational technologies and promote partnerships with technology companies and professional organisations to support capacity building, curriculum innovation, and research.
6. AI readiness should be continuously evaluated. Teacher education institutions should periodically assess the AI competencies, institutional conditions, and adoption experiences of educators and pre-service teachers so that training and institutional support can be adjusted to emerging needs.

References:

Aljemely, Y. A. (2024). Challenges and best practices in training teachers to utilize artificial intelligence: A systematic review. *Frontiers in Education, 9*, 1470853. https://doi.org/10.3389/feduc.2024.1470853

Artificial intelligence in teacher education: Opportunities and challenges. (2023). *Shodh Utkarsh, 1*(2), 69–70.

Ayanwale, M. A., et al. (2022). Teachers' readiness and intention to teach artificial intelligence in schools. *Computers and Education: Artificial Intelligence, 3*, 100099. DOI: 10.1016/j.caeai.2022.100099

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319–340.

Eke, O. (2024). Assessing the readiness and attitudes of Nigerian teacher educators towards adoption of artificial intelligence in educational settings. *Journal of Educational Technology and Online Learning, 7*(4), 473–487. https://doi.org/10.31681/jetol.1503305

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017–1054.

Ng, D. T. K., Leung, J. K. L., Su, J., Ng, R. C. W., & Chu, S. K. W. (2023). Teachers' AI digital competencies and twenty-first century skills in the post-pandemic world. *Education Technology Research and Development, 71*, 137–161. DOI: 10.1007/s11423-023-10203-6

Ofem, U. J., Orim, F. S., Edam-Agbor, I. B., Amanso, E. O. I., Eni, E., Ukatu, J. O., Ovat, S. V., Osang, A. W., Dien, C., & Abuo, C. B. (2025). Teachers' preparedness for the utilization of artificial intelligence in classroom assessment: The contributory effects of attitude toward technology, technological readiness, and pedagogical beliefs with perceived ease of use and perceived usefulness as mediators. *Frontiers in Education, 10*, 1568306. DOI: 10.3389/feduc.2025.1568306

Ogunleye, B., et al. (2024). Examining artificial intelligence literacy among pre- service teachers for future classrooms. *Computers and Education Open, 6*, 100179. https://doi.org/10.1016/j.caeo.2024.100179

Sperling, K., Stenberg, C.-J., McGrath, C., Åkerfeldt, A., Heintz, F., & Stenliden, L. (2024). In search of artificial intelligence (AI) literacy in teacher education: A scoping review. *Computers and Education Open, 6*, 100169. https://doi.org/10.1016/j.caeo.2024.100169

The effects of generative AI on initial language teacher education: The perceptions of teacher educators. (2024). *System, 122*, 103290. https://doi.org/10.1016/j.system.2024.103290

UNESCO. (2023). *Guidance for generative AI in education and research*. UNESCO.

Yusuf, A., Noor, N. M., et al. (2024). Generative AI in education and research: A systematic mapping review. *Review of Education*. https://doi.org/10.1002/rev3.3489

Yuan, L., Abdul Razak, R., Kamsin, A., & Abdul-Rahman, S.-S. (2026). Generative AI in teacher education: A systematic review. *International Journal of Evaluation and Research in Education, 15*(2). https://doi.org/10.11591/ijere.v15i2.37225

Wang, X., Li, L., Tan, S. C., Yang, L., & Lei, J. (2023). Preparing for AI-enhanced education: Conceptualizing and empirically examining teachers' AI readiness. *Computers in Human Behavior, 146*, 107798. https://doi.org/10.1016/j.chb.2023.107798