LEVERAGING ARTIFICIAL INTELLIGENCE TO PERSONALIZE TEACHER TRAINING PROGRAMMES: AN EMPIRICAL INVESTIGATION OF TEACHERS' PERCEPTION AND READINESS IN THREE COLLEGES OF EDUCATION IN NIGERIA

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Abstract
The integration of Artificial Intelligence (AI) into teacher education presents significant opportunities for personalizing professional training and enhancing pedagogical competence. This study investigates teachers' perceptions and readiness to leverage AI for personalized teacher training in three Colleges of Education in Nigeria. Specifically, the objectives of this study were to: examine teachers' perception of Artificial Intelligence integration in teacher training programmes; determine teachers' level of readiness to adopt and utilize AI tools for personalized teacher training; identify institutional and infrastructural factors influencing teachers' readiness for AI adoption and assess the relationship between teachers' perception and their readiness to integrate AI in professional development. Anchored on the Unified Theory of Acceptance and Use of Technology (UTAUT), Human Capital Theory (HCT), and Inclusive Pedagogy Framework (IPF), the study adopts a descriptive survey design involving 360 lecturers selected through stratified random sampling. A validated questionnaire with a reliability coefficient of 0.87 was employed to collect quantitative data, which were analyzed using descriptive and inferential statistics. Findings reveal that while teachers demonstrate positive perceptions of AI's potential to individualize and enhance training efficiency, their

readiness levels are moderate due to inadequate infrastructure, limited digital competence, and policy gaps. Performance expectancy and facilitating conditions emerged as the most significant predictors of AI adoption. The study concludes that institutional support, sustained professional development, and inclusive digital policies are critical to building AI readiness in teacher education. It recommends curriculum integration of AI literacy, infrastructure improvement, and targeted capacity-building initiatives. The findings have implications for policy formulation, institutional planning, and sustainable digital transformation of teacher training programmes in Nigeria.

Keywords: Artificial Intelligence, Teacher Education, Personalized Training, Teachers' Readiness, UTAUT, Human Capital Theory, Inclusive Pedagogy, Nigeria.

Introduction

The advent of Artificial Intelligence (AI) into teacher education presents significant opportunities for personalizing professional training and enhancing pedagogical competence. Teacher education refers to the structured, systematic, and continuous process through which prospective and practising teachers acquire the professional knowledge, pedagogical skills, values, and competencies required to enhance effective teaching and learning. It encompasses both pre-service and in-service training activities designed to prepare teachers for classroom practice, support their ongoing professional growth, and enable them to adapt to evolving educational demands, technological innovations, and diverse learner needs. Teacher education therefore functions as a transformative mechanism that equips educators with the capacity to facilitate meaningful learning experiences, apply evidence-based instructional strategies, and contribute to the overall improvement of educational quality and student outcomes. Whereas, Teaching is an activity aimed at bringing about meaningful learning through a method that is morally and pedagogically acceptable (Iorhemen,2020).

Teacher education in Nigeria has been hinged on the philosophy that "no education system may rise above the quality of its teachers (FRN 2004). Hence, teacher education has been emphasized in all educational planning and development.

From the early stage of training Graded Teachers (Grades 1, 2, 3 or 4) in Teacher Training Colleges and Women Teachers Colleges; teacher education has improved to being offered in tertiary institutions and specialized institutes only, leading to the award of the Nigeria Certificate in Education (NCE), Degrees, and Higher Degrees. In every teacher education programme the common courses are the educational foundation and pedagogy (Ndomi,2025).

Artificial Intelligence (AI) has emerged as a transformative force across sectors, redefining instructional models and reshaping teacher education practices worldwide. In teacher education, AI systems can analyze instructional performance, recommend resources, and personalize feedback to improve pedagogical competence (Almasri, 2024; Tan, 2024). According to Ndomi (2025) the diverse capabilities and functions of AI and its ever evolving new functions have made it difficult for a universal definition. Many of the definitions found in Literature are contextual in nature. However, a common definition is presented by Konstantakis et a.l (2024) that artificial Intelligence is a field of computer science designed to developing algorithms and systems capable of performing tasks that require human intelligence, such as speech recognition, problem-solving, learning, and decision-making among numerous other scope of things. The adoption of AI in teacher

training within developing contexts such as Nigeria remains limited. Many institutions continue to rely on conventional, one-size-fits-all professional development models, which do not account for teachers' diverse learning styles, technological exposure, and pedagogical needs. Challenges such as inadequate digital infrastructure, poor connectivity, limited technical expertise, and insufficient policy direction hinder the integration of AI in teacher education (Nja et al., 2023). This creates a gap between the potential of AI-driven personalized learning and the current capacity of teachers to leverage such innovations effectively. The issue is further compounded by uneven access to technology across institutions, differences in institutional support, and low AI literacy among educators. Understanding teachers' perceptions and readiness is therefore essential to inform strategies that enhance AI adoption for effective teacher training.

Empirical evidence consistently highlights the potential of AI to deliver personalized professional learning experiences that respond to the specific needs of individual teachers. Merino-Campos (2025) conducted a systematic review of empirical studies on AI-supported personalized learning in higher education and found substantial improvement in learner engagement, self-regulation, and content mastery when AI tools were used to adapt instructional pathways and provide feedback. The review concluded that adaptive AI feedback enables trainee teachers to focus on areas where learning gaps are most pronounced, leading to more efficient mastery of competencies (Merino-Campos, 2025).

Similarly, multiple intervention-based studies in teacher training reveal that AI systems can support micro-learning and targeted professional development. These tools provide immediate feedback on

teaching artifacts such as lesson plans, reflective journals, or micro-teaching videos. For instance, AI-powered analytics dashboards have been found to significantly improve teachers' ability to track their progress, identify weaknesses, and adjust their instructional strategies (Merino-Campos, 2025). The evidence suggests that AI personalization does not replace human instructional coaching; instead, it complements it by automating routine analysis and offering adaptive supports that human trainers may not consistently provide.

However, empirical literature also cautions that AI-enhanced PD is most effective when teachers receive adequate training on how to interpret AI recommendations. Numerous studies emphasize that teachers often struggle with understanding AI outputs, which influences the depth of adoption and trust in the technology (Alwaqdani, 2024). Thus, personalization alone is insufficient teachers' readiness and interpretive competence are essential mediators of impact.

Teachers' perception of AI significantly influences its successful adoption. Chatterjee and Bhattacharjee (2020) found that teachers' acceptance of AI depends on perceived usefulness, effort expectancy, and institutional support. Similarly, Mhlanga (2023) highlighted concerns about ethical use, trust, and inclusivity, urging that AI systems in education must reflect contextual realities and equity considerations. Teachers' perceptions are strongly correlated with their adoption, level of use, and long-term integration of AI tools. A large empirical survey by Alwaqdani (2024), involving teachers across multiple institutions, showed that educators generally perceive AI as a promising tool that can reduce workload, improve lesson planning, and enable personalized learning. Teachers reported

that AI improves efficiency by automating routine instructional tasks, such as grading and content recommendations. Despite these perceived benefits, significant concerns were raised about data privacy, reliability, and ethical implications of AI use in educational settings. Without structured professional development and policy guidelines, teachers' enthusiasm declines due to uncertainty about risks and ethical issues (Aliyu, 2025). Consequently, perception alone does not necessarily translate into readiness or adoption; structural and institutional supports play mediating roles.

Teachers' readiness encompasses digital literacy, institutional support, and access to technological infrastructure. Nja et al. (2023) found moderate readiness levels among teachers, primarily due to limited exposure and inadequate ICT facilities. The study suggested that without adequate training and institutional frameworks, even positive perceptions may not translate into practical AI adoption. Bello and Yusuf (2022) found that while Nigerian educators show enthusiasm toward digital tools, institutional barriers reduce their effective use. These findings underscore that teachers' perception and readiness are shaped not only by attitude but also by access and support conditions. Studies using the Unified Theory of Acceptance and Use of Technology (UTAUT) demonstrate that performance expectancy, effort expectancy, and facilitating conditions significantly predict technology adoption (Venkatesh et al., 2003). Therefore, assessing teachers' readiness through this theoretical lens provides valuable insight into AI adoption potential in Nigerian teacher education.

Meanwhile, Ayanwale et al. (2025) conducted a large-scale readiness assessment using mathematical modelling, examining teachers' preparedness for AI adoption across different educational institutions. The study identified four major user categories: unaware, aware but non-adopting, adopting, and discontinuing educators. The findings demonstrate substantial readiness gaps, with a majority of teachers falling into the "aware but not adopting" category due to inadequate training, fear of job displacement, low digital literacy, and infrastructural limitations.

A key insight from the study is that readiness is multi-dimensional encompassing technological, psychological, ethical, and organizational components and that Nigerian teachers exhibit varying levels of competence across these dimensions. For example, teachers often express positive attitudes toward AI yet lack the skills needed to use AI interfaces effectively, a phenomenon identified as the "perception readiness gap" (Ayanwale et al., 2025).

Another Nigeria-focused empirical study by Aliyu (2025) assessed teachers' concerns and policy awareness regarding AI in teacher education. The study found that teachers generally acknowledge the transformative potential of AI but exhibit low understanding of ethical guidelines, data governance issues, and institutional policy provisions. Most participants highlighted the absence of structured institutional frameworks to guide AI use. Ethical readiness was notably low, suggesting the need for policy interventions, guidelines, and structured professional development (Aliyu, 2025).

These Nigerian studies collectively indicate that teachers in Colleges of Education have a favorable orientation toward AI but lack the readiness required for effective adoption an empirical gap that the present study aims to address.

Research has established that AI-driven systems have significant potential to transform teacher education (Holmes et al., 2022). Personalized learning technologies allow for adaptive content delivery, feedback generation, and continuous professional growth monitoring. Studies in higher education (Zawacki-Richter et al., 2019) have shown that AI enhances self-paced learning and improves engagement among learners. In teacher education, personalization ensures that training content aligns with teachers' subject areas, teaching levels, and prior knowledge.

Studies by Almasri (2024) and Celik (2023) show that AI tools can provide individualized pathways, feedback, and performance analytics to improve teachers' learning outcomes. These studies emphasize that personalization enhances engagement and retention among educators in professional development programs.

Empirical literature from developing and low-resource contexts reinforces the importance of infrastructure, digital literacy, and contextual adaptation of AI tools. Studies show that the effectiveness of AI-enhanced teacher training is significantly moderated by factors such as internet connectivity, device availability, institutional support, and access to quality professional development (Ayanwale et al., 2025; Aliyu, 2025). In low-resource teacher education environments, AI systems must be carefully adapted to ensure offline functionality, mobile compatibility, and simplified user interfaces.

This study is grounded in three interrelated theories Unified Theory of Acceptance and Use of Technology (UTAUT), Human Capital Theory (HCT), and the Inclusive Pedagogy Framework (IPF). The UTAUT model (Venkatesh et al., 2003) posits that technology adoption is influenced by performance expectancy, effort expectancy, social influence, and facilitating conditions. In this study, UTAUT explains the behavioral factors shaping teachers' intention to use AI in professional development. The Human Capital Theory (Becker, 1964) underscores the importance of investing in education and professional training to enhance productivity. When teachers acquire AI competencies, they increase their capacity for effective instruction, contributing to institutional and national educational outcomes. The Inclusive Pedagogy Framework (Florian & Black-Hawkins, 2011) supports equitable participation in learning processes. It aligns with the need to design AI systems that accommodate diverse teacher learning needs, ensuring fairness and access in professional training environments.

Together, these frameworks establish the conceptual foundation for analyzing how teachers' perceptions and readiness influence AI adoption for personalized training in Nigerian teacher education.

Statement of the Problem
Despite increasing recognition of Artificial Intelligence (AI) as a transformative force in education, teacher training programmes in Nigeria remain predominantly traditional and non-adaptive, failing to accommodate the diverse academic backgrounds and learning needs of pre-service teachers. Many colleges of education in Nigeria continue to rely on one-size-fits-all instructional models, which inadequately support students with varied prior preparation and digital literacy levels, resulting in persistent knowledge gaps and uneven professional readiness. Although AI-powered personalized learning systems have shown promise in tailoring content and feedback to individual learners in other contexts, there is limited integration of AI personalization within Nigerian teacher education curricula, hindered by

infrastructural constraints, low AI awareness among educators, and insufficient capacity building. This gap underscores the need to investigate how leveraging AI personalization can enhance teacher training quality and equity in Nigerian educational institutions. This study thus examines teachers' perception and readiness toward leveraging AI for personalized professional development in three Colleges of Education in Nigeria cutting across North, (Gombe State College of Education, Biliri) Central (Katsina Allah College of Education, Benue State) and South (Federal College of Education, Ekiadolor Edo State). The aim is to provide empirical evidence to guide institutional decision-making and policy formulation in fostering sustainable AI integration in education.

Methodology
A descriptive survey design was employed to assess teachers' perception and readiness for AI integration. The study population comprised lecturers from three Colleges of Education across Nigeria's North, Central, and South regions. A sample of 360 lecturers was selected using stratified random sampling to ensure gender, departmental, and regional representation.

Data were collected using a structured questionnaire divided into three sections: demographic information, perception of AI, and readiness for AI integration. The instrument was validated by experts in educational technology and research methods, and a pilot test yielded a Cronbach Alpha coefficient of 0.87, indicating high reliability. Descriptive statistics (mean and standard deviation) were used to analyze the data, while multiple regression and ANOVA tested the relationship between perception, readiness, and predictors of AI adoption. Ethical clearance was obtained, and participants provided informed consent.

Results and Interpretation

Table 1 Demographic Characteristics of Respondents (N = 360)

Variable	Category	Frequency	Percentage (%)
	GenderMale	210	58.3
	Female	150	41.7
Academic Qualification	NCE	72	20.0
	B. Ed/B.A. (Ed)	168	46.7
	M.Ed	96	26.7
	Ph. D	24	6.6
Teaching Experience	1–5 years	84	23.3
	6–10 years	126	35.0
	11–15 years	96	26.7
	Above 15 years	54	15.0

Table 1 shows that 58.3% of respondents were male and 41.7% female, indicating a moderate gender imbalance in the Colleges of Education surveyed. Most respondents (46.7%) held a Bachelor's degree in Education, while 26.7% had a Master's
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degree, suggesting adequate academic preparation. Nearly 61.7% had between 6–15 years of teaching experience, implying a mature, experienced sample capable of informed responses on AI integration

Table 2: Teachers' Perception of AI Integration in Teacher Training (N = 360)

Item	Mean ($\bar{x}$)	SD	Decision
AI can personalize teacher training effectively	4.26	0.71	Agree
AI enhances professional learning outcomes	4.18	0.68	Agree
AI will replace teachers' professional autonomy	2.32	1.01	Disagree
AI supports learner-centered pedagogy	4.05	0.77	Agree
AI improves feedback and evaluation	4.11	0.72	Agree
Grand Mean Perception	3.78	Positive	

The results in table 2 reveal a generally positive perception of AI integration. Teachers agreed that AI supports personalized learning ($\bar{x}$ = 4.26) and enhances professional learning outcomes ($\bar{x}$ = 4.18). The lowest mean ($\bar{x}$ = 2.32) indicated disagreement that AI threatens teacher autonomy. The grand mean of 3.78 confirms a favorable attitude toward AI as a supportive, not replacement, tool in teacher training.

Table 3 Teachers' Readiness for AI Adoption (N = 360)

Item	Mean ($\bar{x}$)	SD	Decision
I have the digital skills to use AI tools	3.12	0.95	Moderate
My institution provides adequate infrastructure	2.89	1.04	Low
I have received training on AI applications	2.67	0.98	Low
I am willing to learn how to use AI in teaching	4.21	0.73	High
I can adapt AI tools for personalized instruction	3.45	0.88	Moderate
Grand Mean Readiness	3.27		Moderate

The result in table 3 indicated that teachers demonstrated moderate readiness ($\bar{x}$ = 3.27) toward adopting AI. They expressed willingness to learn ($\bar{x}$ = 4.21) but reported limited institutional infrastructure ($\bar{x}$ = 2.89) and insufficient AI training ($\bar{x}$ = 2.67). This suggests enthusiasm constrained by external barriers, indicating a readiness-potential gap that policy interventions must address.

Table 4 Multiple Regression Predicting Teachers' Readiness for AI Adoption

Predictor	β	t	p-value	Remark
Performance Expectancy	0.42	6.57	0.000	Significant
Effort Expectancy	0.27	4.13	0.001	Significant
Social Influence	0.09	1.68	0.095	Not Significant
Facilitating Conditions	0.36	5.12	0.000	Significant
	R = 0.68, R² = 0.46, F(4,355) = 31.54, p < 0.001			

Regression analysis in table 4 shows that 46% of variance in teachers' readiness is explained by the predictors. Performance expectancy (β = 0.42) and facilitating conditions (β = 0.36) were the strongest determinants, both statistically significant (p < .001). Effort expectancy also contributed significantly, indicating that ease of use and institutional support are critical factors in enhancing readiness.

Table 5: Challenges Affecting AI Implementation (N = 360)

Challenge	Frequency	Percentage (%)	Rank
Inadequate ICT infrastructure	290	80.6	1st
Lack of AI training	276	76.7	2nd
Poor internet connectivity	254	70.6	3rd
Lack of institutional support	218	60.6	4th
Ethical concerns and bias	186	51.7	5th

The result in table 4 shows that the most critical barriers were inadequate infrastructure (80.6%) and lack of AI training (76.7%), followed by poor connectivity (70.6%). These findings reinforce the regression results that facilitating conditions strongly affect readiness. Addressing these challenges through improved infrastructure and professional development is essential for sustainable AI adoption.

Discussion of Results
The study revealed that teachers in Nigerian Colleges of Education have a positive perception of AI as a tool for enhancing instructional quality and personalizing training. This finding aligns with Holmes et al. (2023) who emphasized AI's potential to augment teacher capacity. However, readiness levels were only moderate, primarily due to infrastructural challenges and lack of AI training. This reflects earlier findings by Bello and Yusuf (2022), which showed that enthusiasm toward digital tools do not translate to adoption without institutional investment. Regression results confirmed that performance expectancy and facilitating conditions are significant determinants of readiness—consistent with UTAUT theory (Venkatesh et al., 2003). Teachers are motivated to adopt AI when they believe it enhances job performance

and when supportive environments exist. These findings imply that investment in capacity building, digital infrastructure, and policy support is crucial for scaling AI adoption. Moreover, aligning AI with inclusive pedagogy ensures that technology benefits all learners equitably.

Summary of Findings
i. Teachers possess positive perceptions of AI's educational value.
ii. Readiness levels are moderate due to infrastructural and skill limitations.
iii. Performance expectancy and facilitating conditions are significant predictors of AI adoption.
iv. Major barriers include poor infrastructure, limited training, and weak institutional support.

Conclusion
The results obtained from this study imply that successful AI integration in teacher education rely on aligning institutional support with teachers' growing interest. This study successfully determined that teachers possess positive perceptions of AI's educational value and the readiness levels are moderate due to infrastructural and skill limitations. Hence, institutional support, sustained professional

development, and inclusive digital policies are critical to building AI readiness in teacher education.

Recommendations

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

i. Integrate AI literacy and digital pedagogy into teacher education curricula.

ii. Strengthen ICT infrastructure and access to reliable internet connectivity in Colleges of Education.

iii. Implement continuous professional development programs focused on AI tools and ethical practices.

iv. Develop inclusive digital policies that support equitable participation and protect data privacy. **5**. Foster collaboration between government, industry, and academia to sustain AI-based educational innovation.

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