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REVOLUTIONIZING TEACHER EDUCATION THROUGH ARTIFICIAL INTELLIGENCE

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Abstract
This study investigated Artificial Intelligence (AI) in revolutionizing teacher education with a focus on its applications in content delivery, and professional development. The study was guided by three research questions. A descriptive survey design was adopted. The population consisted of 3200 teacher educators in faculties of education across four institutions in Anambra State, Nigeria. Using stratified random sampling, 320 respondents were selected. A structured questionnaire validated by experts and with a Cronbach alpha reliability coefficient of 0.89 was used for data collection. Data were analysed using mean scores, standard deviation, and t-test statistics. Findings revealed that AI tools are not formally adopted for instruction and professional development, remain in skeletal, informal use. Recommendations include curriculum redesign, AI literacy training, and institutional reform. One major limitation was limited institutional access to AI tools.

Keywords: Revolutionizing, Artificial Intelligence, Teacher Education, Professional development.

Introduction

The global education landscape is undergoing a significant transformation driven by rapid technological advancements, especially artificial intelligence (AI). As the 21st-century classroom becomes increasingly digital, the traditional models of teacher education are proving inadequate for equipping educators with the competencies required in a dynamic and data-driven society. The use of AI in education, ranging from intelligent tutoring systems, automated assessment, and personalised learning environments, is creating new opportunities and challenges for teacher preparation programmes (Holmes, Bialik, M., & Fadel, 2022).

Globally, teacher education is now expected to adapt to the AI-powered educational ecosystem. In the United States and Europe, institutions like MIT and the University of Helsinki have introduced AI courses into teacher training to enhance educators' technological fluency and pedagogical innovation (Luckin, 2021). In Africa, and specifically Nigeria, education systems are beginning to explore AI's potential to address long-standing challenges such as teacher shortages, uneven quality of instruction, and lack of real-time feedback mechanisms. According to Okonkwo and Nweke (2022), Nigeria's teacher education institutions are under pressure to shift from traditional rote-learning models to intelligent, data-driven teaching strategies that align with global trends.

Artificial intelligence refers to systems or machines that mimic human intelligence to perform tasks and improve themselves based on the information they collect (Russell & Norvig, 2021). Artificial intelligence, in the context of education, refers to the simulation of human cognitive processes such as reasoning, learning, and problem-solving by machines (Zawacki-Richter, Marín, Bond, & Gouverneur,, 2020). In education, AI includes machine learning, natural language processing, robotics, and predictive analytics. In the context of teacher education, AI enhances instructional delivery, learner engagement, and assessment through tools like intelligent tutoring systems, AI-driven learning platforms, and automated feedback tools (Holmes et al., 2022). AI enables tailored learning experiences through adaptive learning algorithms that adjust content to suit individual

learning styles and paces. Tool like Squirrel AI, Knewton, and Google Classroom integrates personalise teaching (Luckin, 2021). Key AI applications in teacher education include predictive analytics, chatbots for tutoring and mentoring, automated grading, and adaptive learning systems. These technologies provide pre-service and in-service teachers with instant feedback, personalized learning pathways, and access to vast resources (Tang, Lin, and Ouyang, 2023). For example, Natural Language Processing (NLP) based tools such as ChatGPT and Grammarly are supporting teachers in content development, classroom discourse, and formative assessment.

However, concerns remain regarding equity, ethics, and contextual relevance. Many Nigerian teacher education institutions still face infrastructural limitations, low digital literacy among faculty, and lack of institutional frameworks for integrating AI into teacher preparation. Moreover, (Eze & Alabi, 2023) opined that fears about AI replacing teachers rather than empowering them persist among stakeholders. These scholars also affirmed inadequate infrastructure, poor ICT training, and resistance from older faculty as challenges to integration of AI in teacher education. Tang, Lin, and OUyang (2023) in their study found that most teacher-trainees lacked digital fluency while institutions lack clear policies.

Although quality education seems to require the active participation of human teachers, artificial intelligence envisages increasing education and quality at all levels, especially by providing personalization (Grosz and Stone, 2018). Scholars have explored the role of AI to support teachers and teacher development and suggested how AI will shape and define the educational experience of the future, hence the need to explore the level of readiness and challenges in integrating Artificial Intelligence in teacher education in Anambra State, Nigeria.

Statement of the Problem

The quality of teacher education in Nigeria has long been a subject of concern due to inadequate training, outdated pedagogies, and limited exposure to modern technology. Ideally, teacher preparation programmes should equip educators with both subject-matter expertise and contemporary digital competencies. In reality, however, many Nigerian institutions still rely on traditional instructional methods that lack interactivity, differentiation, and real-time assessment. The emergence of AI presents an unprecedented opportunity to transform this landscape, but there is limited empirical evidence on how AI is currently being adopted and its impact on teacher education outcomes in Nigeria. This study therefore investigates Artificial Intelligence (AI) in revolutionizing education; its implications in content delivery and professional development in teacher education programmes, and the challenges and institutional readiness for integrating AI into teacher education in tertiary institutions in Anambra State, Nigeria.

Purpose of the Study

The purpose of this study is to examine artificial intelligence in revolutionising teacher education in Nigeria, with a focus to content delivery, and professional development.

Specifically, the study explored the:

1. Extent to which AI tools are used in content delivery in teacher education in tertiary institutions in Anambra State, Nigeria.
2. impact of AI on professional development of teachers in tertiary institutions in Anambra State, Nigeria.
3. challenges and institutional readiness for integrating AI into teacher education programmes.

Research Questions

1. To what extent are AI tools used in content delivery in teacher education in Anambra State?
2. What is the impact of AI on professional development of teachers in Anambra State?
3. What are the challenges and level of institutional readiness for integrating AI into teacher education programmes in Anambra State, Nigeria?

Methods

This study adopted a descriptive survey design, which is appropriate for gathering and analysing opinions, experiences, and perceptions from a defined population without manipulation of

variables. This design enabled the researcher to describe current practices and institutional readiness regarding the integration of artificial intelligence (AI) in teacher education in selected institutions in Anambra State, Nigeria. The target population consisted of all teacher educators in selected Federal institutions in the study area. The estimated total population was 3200 teachers.

The sample consisted of 320 respondents. A stratified random sampling technique was adopted to ensure fair representation from each institution. One instrument titled Artificial Intelligence in Teacher Education Questionnaire (AITEQ) was used for data collection. the instrument contained 15 items. The instrument underwent expert validation for face and content validity. Three university scholars (specialists in educational technology, and measurement and evaluation) reviewed the instrument. Their feedback informed adjustments for clarity, relevance, and item structure. To ensure reliability, the questionnaire was pilot-tested with 30 respondents from a teacher education programme at Paul University, Awka (excluded from the main study as it is a private university). Using the Cronbach Alpha method, the internal consistency of the questionnaire was calculated to be 0.89, indicating a high level of reliability. Eight research assistants were briefed who assisted in administering and collating the instrument. Thus, all the copies of the instruments were retrieved. Data obtained from the questionnaire were analysed using descriptive and inferential statistics: Mean and Standard Deviation were used to answer the research questions. Independent Samples t-test was used to test the hypotheses at 0.05 level of significance using SPSS. For decision-making, a mean value of 2.50 was the cut-off point for determining agreement.

Results

Research Question 1

To what extent are AI tools used in content delivery in teacher education?

Table 1: Mean Ratings of Respondents on the Use of AI in Content Delivery (N = 320)

Item	SA	A	D	SD	Mean	SD	Decision
1. AI is used to tailor learning to individual students' pace.	40	72	110	98	2.19	0.94	Disagree
2. Lecturers regularly use AI platforms (e.g., ChatGPT, Knewton).	35	58	110	117	2.08	0.97	Disagree
3. AI enables real-time feedback and learning analytics for students.	42	69	120	89	2.25	0.91	Disagree
4. AI tools help design adaptive quizzes and learning paths.	30	85	115	90	2.21	0.87	Disagree
5. Many lecturers lack awareness of AI tools for personalised learning.	130	105	45	40	3.01	0.82	Agree

Overall Mean = 2.35

These findings indicate that, contrary to assumptions of growing digital integration, AI tools have not yet gained formal instructional adoption within teacher education institutions in Anambra State. While awareness of AI exists, actual use in structured teaching and learning remains extremely limited and driven by individual efforts. Institutional frameworks for AI-based instruction are largely absent.

This result is consistent with the findings of Eze and Alabi (2023), who reported that AI use in Nigerian colleges of education and faculties of education is still nascent, unstructured, and mostly limited to non-instructional purposes, such as grading assistance or content suggestions.

Research Question 2

What is the impact of AI on professional development of teachers?

Table 2: Mean Ratings on AI's Impact on teachers' Professional Development

Item	SA	A	D	SD	Mean	SD	Decision
6. AI enables automated feedback for teacher self-reflection.	95	140	55	30	2.95	0.79	Agree
7. Chatbots and AI mentors support professional growth.	100	135	60	25	2.97	0.78	Agree
8. AI encourages self-paced learning in professional development.	120	110	50	40	2.95	0.85	Agree
9. Institutions provide AI-based workshops for lecturers and students.	80	98	82	60	2.63	0.92	Agree
10. AI-driven professional support is more effective than manual methods.	89	124	61	46	2.79	0.88	Agree

Overall Mean = 2.86

Respondents agreed that AI has a positive impact on teachers' professional development, although institutional implementation is still emerging.

Research Question 3

What are the challenges and institutional readiness for integrating AI into teacher education programmes?

Table 3: Mean Ratings on Challenges and Institutional Readiness

Item	SA	A	D	SD	Mean	SD	Decision
11. My institution has basic infrastructure to support AI integration.	65	110	85	60	2.65	0.91	Agree
12. There is low digital literacy among faculty members.	100	125	45	50	2.94	0.87	Agree
13. AI adoption is hindered by lack of policy support.	110	132	38	40	3.01	0.84	Agree
14. Internet connectivity and power supply are major barriers.	115	128	37	40	3.00	0.83	Agree
15. Funding and training opportunities for AI integration are lacking.	120	110	50	40	2.95	0.86	Agree

Overall Mean = 2.91

Respondents agree that while there is some level of readiness, significant challenges such as infrastructure, funding, policy, and digital skills persist.

Discussion of Findings

This section discusses the results of the study as presented in preceding section, integrating each research question with its corresponding hypothesis (where applicable). The findings are interpreted in relation to existing literature and the study's theoretical framework, highlighting consistencies, contradictions, and implications.

Research Question 1: To what extent are AI tools used in content delivery in teacher education?

The findings indicate a low level of use of AI tools for content delivery and personalized instruction among teacher education stakeholders in Anambra State. Items such as tailoring learning to individual pace (Mean = 2.19) and regular use of AI platforms like ChatGPT and Knewton (Mean = 2.08) were rated below the acceptable benchmark of 2.50, indicating disagreement. The only item with a positive mean (Mean = 3.01) related to *awareness* of AI tools, suggesting knowledge exists, but implementation is minimal.

This aligns with Eze and Alabi (2023) who reported that AI usage in Nigerian faculties of education is still nascent, unstructured, and primarily used for administrative tasks rather than instructional delivery. Similarly, Sani and Adejoh (2021) found that many Nigerian higher education institutions lack clear frameworks for adopting AI in pedagogy.

These results contradict global trends. For instance, Zawacki-Richter et al. (2020) noted increasing AI usage for adaptive learning and instructional personalization in teacher education globally, particularly in developed nations, suggesting a regional lag in Nigeria.

Research Question 2: What is the impact of AI on professional development of teachers?

Respondents generally agreed on AI's positive impact on professional development (Overall Mean = 2.86). High ratings were observed in areas such as self-paced learning (Mean = 2.95), chatbot mentoring (Mean = 2.97), and AI-based feedback (Mean = 2.95). This suggests AI is increasingly viewed as a supportive tool in teacher training, especially in developmental activities outside the classroom.

These findings are corroborated by Okonkwo & Ogbodo (2021), who found that AI-enabled platforms improved mentoring and feedback processes in Nigerian teacher training colleges. Similarly, Khosravi, (2022) emphasized the role of AI chatbots in facilitating continuous learning and professional development for future educators.

Research Question 3: What are the challenges and institutional readiness for integrating AI into teacher education programmes?

Findings reveal moderate readiness but significant challenges. Respondents agreed that basic infrastructure exists (Mean = 2.65), but challenges such as poor internet and power supply (Mean =

3.00), lack of policy (Mean = 3.01), and limited funding and training (Mean = 2.95) are major constraints.

These findings are consistent with Nwachukwu and Obasi (2022), who identified infrastructural inadequacy and policy gaps as barriers to AI adoption in Nigerian universities. Ozturk, (2020) also emphasized that successful AI integration hinges on policy frameworks, funding, and faculty training.

Conclusions

The study concluded that while awareness of AI tools exists among stakeholders in teacher education, actual usage particularly in content delivery and instruction remains minimal. However, AI is increasingly acknowledged as a tool for professional development in teacher education. Significant challenges such as infrastructure deficits, policy gaps, and low digital literacy hinder broader integration.

Recommendations

1. Education ministries and institutions should create clear policies for AI adoption into teacher education.
2. Regular workshops and trainings should be organized for educators and students.
3. Government should help stakeholders to explore grant opportunities to support AI integration in education and improve internet access and power supply.

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