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INTEGRATING GENERATIVE ARTIFICIAL INTELLIGENCE IN TEACHER EDUCATION: ENHANCING DIGITAL LITERACY, VIEWING AND REPRESENTING SKILLS

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Abstract

This study investigates the role of Artificial Intelligence (AI) in bridging digital literacy and viewing-representing skill gaps among English language pre-service teachers in public universities in Ekiti State, Nigeria. Anchored on the Technological Pedagogical Content Knowledge (TPACK) framework, the study explores how next-generation language educators integrate AI-driven tools to enhance technology, pedagogy, and content knowledge in language teaching and learning. Data were collected from 200 English language student teachers selected through random sampling from two government-owned universities in Ekiti and Ondo states. A self-structured, AI-integrated Google Form was used as the research instrument, validated through face and content validity procedures ($\alpha = 0.62$). Data analysis employed measurements of central tendencies, weighted mean, and standard deviation. Findings revealed moderate proficiency in basic digital literacy skills, with noticeable gaps in viewing and representing AI-related icons, particularly ChatGPT (mean scores: 1.9 and 1.8, respectively). The results underscore the potential of AI-driven pedagogical interventions to enhance digital literacy competencies, offering adaptive learning strategies aligned with learners needs. This study advocates for systematically integrating AI technologies in The Core Curriculum and Minimum Academic Standards (CCMAS) universities curriculum for Language Education programmes.

Keywords: Generative AI, Teacher Education, Digital Literacy, Viewing Skills, Representing Skills

Introduction

The rapid evolution of artificial intelligence (AI) has significantly transformed education, particularly in language instruction. AI-driven tools offer adaptive learning experiences that cater to individual needs, bridging gaps in digital literacy and pedagogical competence (Hwang et al., 2020). Pre-service English language teachers must navigate an increasingly digitalized teaching environment within the Nigerian educational landscape. However, proficiency in digital literacy, including viewing and representing AI-related icons, remains inconsistent among these future educators (Adeyemo, 2021). The Technological Pedagogical Content Knowledge (TPACK)

framework provides a lens to analyze how next-generation language educators integrate AI-driven tools to enhance technology, pedagogy, and content knowledge in language teaching and learning (Zawacki-Richter et al., 2019). In the last two decades, teacher education curricula, as contained in the erstwhile Benchmark Minimum Academic Standards (BMAS), have guidelines that help Nigerian universities design curricula. The BMAS establishes minimum requirements for graduation and provides flexibility for universities to innovate (NUC, BMAS, 2007). However, with the expected generational impact on teacher education involving a need to introduce digital pedagogies and literacy in Language education programs run in Nigerian universities, the NUC deemed it expedient to integrate digital ingredients into the curriculum, hence the emergence of The Core Curriculum Minimum Academic Standards (CCMAS). The next generation of language teachers falls into the category of undergraduate students wishing to obtain their first degrees in the different areas of education in the Nigerian University System ((CCMAS Book Series: Education - NUC CCMAS, 2023).

Despite the growing integration of technology in education, many pre-service English language teachers in Nigeria exhibit deficiencies in digital literacy, particularly in viewing and representing AI-related tools such as Google Meet icons. These gaps hinder effective technology adoption in language teaching, limiting the potential for AI-driven pedagogical innovations. While existing research emphasizes digital literacy development, there is a dearth of studies investigating the specific role of generative AI in improving pre-service teachers' engagement with viewing and representing skills (Schmid et al., 2023). This study addresses this gap by examining how AI-driven interventions enhance digital competencies and pedagogical practices in teacher education.

Therefore, the study aims to answer key research questions: What is the current level of digital literacy of pre-service English language teachers in public universities in Ekiti State? To what extent do pre-service teachers exhibit competency in viewing and representing AI-related icons in educational technology tools? How can generative AI-driven pedagogical interventions improve digital literacy skills among pre-service English language teachers? What are the implications of integrating AI technologies in the Benchmark Minimum Academic Standards (BMAS) for language education curricula?

The study pursues the following objectives: (1) To assess digital literacy levels of pre-service English language teachers in public universities in Ekiti State. (2) To examine the extent to which pre-service teachers are competent in viewing and representing AI-related icons in educational tools. (3) To explore the impact of generative AI-driven interventions in enhancing digital literacy competencies among pre-service teachers. (4) To recommend systematic AI integration strategies within the CCMAS curriculum to improve technology-driven language teaching practices.

The findings from this study will contribute to the ongoing discourse on digital literacy and AI integration in teacher education, offering empirical insights to support policy recommendations for curriculum development and sustainability in the university paradigm. By advocating for the inclusion of AI-driven pedagogical inputs in Language education programs, this study aligns with global educational trends emphasizing the need for future-ready language teachers equipped with the necessary digital competencies (Selwyn, 2019). The recommendations drawn from this research will support institutional efforts

to embed AI-driven methodologies within language teacher education programs, ensuring that language educators are well-prepared for the demands of contemporary classrooms.

Review of Literature

Recent studies have highlighted the increasing role of artificial intelligence (AI) in education, particularly in enhancing digital literacy among pre-service teachers. AI-powered pedagogical tools have been shown to improve personalized learning outcomes, encourage student involvement, and reinforce responsice learning pathways (Zhai et al., 2021). However, research indicates that many educators lack the technical knowledge to effectively integrate AI tools into their teaching methodologies (Sailer et al., 2021).

According to Wang et al. (2022), the Technological Pedagogical Content Knowledge (TPACK) framework provides an essential model for understanding the intersection of technology, pedagogy, and content knowledge in teacher education. The framework has been widely adopted to assess how educators incorporate AI-driven tools into their teaching processes. Despite its relevance, challenges remain in training pre-service teachers to effectively apply AI within their pedagogical approaches (Chen et al., 2023).

In Nigeria, digital literacy among pre-service teachers remains an ongoing challenge. Adequate training in AI-related digital competencies is essential to bridging this gap (Adebayo & Olanrewaju, 2020). Studies have emphasized the need for curriculum modifications to include AI-based pedagogical interventions that align with modern educational demands (Okafor et al., 2022). Addressing these challenges requires systematically integrating AI-driven learning models within teacher education programs (Mukherjee et al., 2023).

Furthermore, research underscores the significance of viewing and representing skills in AI literacy. Studies have found that pre-service teachers with AI-powered visualization tools demonstrate improved comprehension and cognitive flexibility (Gupta et al., 2024). Moreover, structured AI literacy programs should be embedded in teacher training curricula to enhance these competencies.

The Core Curriculum and Minimum Academic Standards (CCMAS) in Nigerian universities serve as a framework designed to standardize and enhance the quality of education across various disciplines, including teacher education. The CCMAS aims to incorporate contemporary pedagogical practices that align with the demands of the 21st century, particularly in fostering digital literacy and AI integration in teacher training (Ogunleye & Adebayo, 2021).

For pre-service language teachers, the CCMAS curriculum equips them with modern teaching methodologies that integrate AI-driven tools. Studies suggest that the curriculum has been revised to accommodate emerging educational technologies, ensuring that future educators are well-versed in digital literacy and pedagogical AI applications (Nwosu et al., 2023). However, gaps remain in implementing AI-related training within teacher education programs, leading to inconsistencies in digital proficiency among pre-service teachers (Eze & Okonkwo, 2022).

Additionally, the CCMAS emphasizes competency-based education, which is particularly relevant for language teachers adapting to AI-enhanced teaching environments. Research indicates that while the framework provides a foundation for technology

integration, institutional support, and faculty development programs are necessary for its effective execution (Adekunle & Salisu, 2024). As advocated in recent studies, the systematic inclusion of AI literacy would further empower pre-service teachers to navigate the evolving educational landscape effectively (Olatunji et al., 2025).

The literature thus supports the assertion that AI-driven interventions can address the gaps in digital literacy and pedagogical effectiveness among pre-service teachers.

Methodology

This study employed a blended-method approach, integrating qualitative and quantitative research designs to provide a comprehensive understanding of how generative AI enhances digital literacy among pre-service English language teachers in public universities in Ekiti and Osun States, Nigeria. The research was anchored on the Technological Pedagogical Content Knowledge (TPACK) framework to examine the intersection of technology, pedagogy, and content knowledge in language instruction.

A descriptive survey design was used to quantify digital literacy proficiency, while qualitative interviews provided realistic revelations of participants' experiences. 200 English language teacher teachers were randomly selected from two government-owned universities in Ekiti and Osun states.

Data were collected using a self-structured, AI-integrated Google Form, which underwent rigorous face and content validity assessments. The research instrument measured digital literacy proficiency, viewing and representing AI-related icons, and AI integration in teaching practices. Reliability was established with a Cronbach's alpha value of 0.62. Quantitative data were analyzed using weighted mean, percentages, frequency counts, and standard deviation to determine digital proficiency levels and gaps. The Nnivo14 software was employed to identify patterns and thematically analyze participants' responses within the Focus Group Discussion (FGD). In addition, qualitative data was analyzed based on participants' perceptions of AI-driven pedagogical outputs. Finally, the triangulation method was employed to harness this study's quantitative and qualitative findings.

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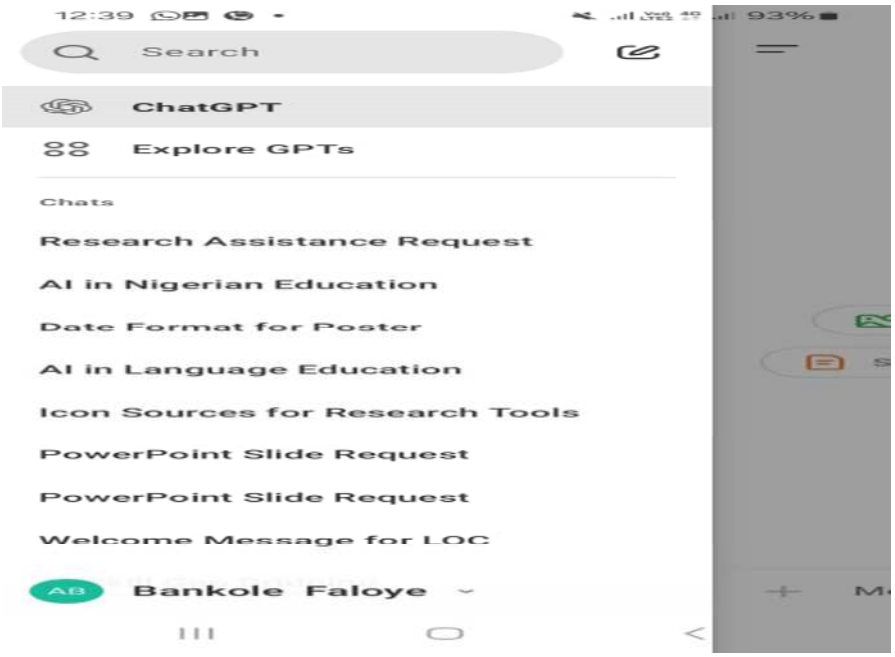
Results

S/N	ITEM	MEAN	SD
1	AI- icon with the text label	2.6	0.744
2	AI- icon with text label	2.6	0.926
3	The' sort by' AI-icon with text labels	2.6	0.740
4	The' paste' AI- icon with text label	2.5	0.977
5	The font color AI- icon with text labels	2.0	0.889
	Weighted Mean	**2.50**	

Table 1: The viewing and presenting proficiency levels of pre-service teachers in AI-related digital literacy

Table 1 presents the proficiency levels of pre-service teachers in digital literacy, particularly in viewing and representing AI-related icons.

Figure 1: Basic ChatGPT icons for navigation purposes



Digital Literacy Skills	Mean Score	Standard Deviation	Proficiency Level
Viewing AI-icons with texts	2.5	0.7	Moderate
Viewing AI- Icons without text	1.9	0.6	Low
Representing AI-related Icons	1.8	0.5	Low
Navigating ChatGPT chat environments	1.7	0.4	Very Low

Table 2: Student teachers' digital knowledge in utilizing navigational AI-related icons with text labels in instructional tasks

Table 2 presents the responses regarding student teachers' knowledge of utilizing navigational AI- icons with text labels in instructional tasks. The findings indicate that student teachers demonstrated a moderately high level of proficiency in recognizing and interpreting the icons accompanied by text labels (Figure 1), each with a mean score of 2.50. Furthermore, their overall ability to view and interpret AI icons with text labels was found to be at an average level, also reflected by a mean score of 2.50. However, the student teachers found it challenging to view and represent the AI icons without text with a mean score of 1.9 and 1,8 respectively.

Qualitative Findings

Qualitative data were retrieved from 20 Focus Groups distributed into 10 FGDs for each of the universities selected for this study. The FGD 1-10 were situated at the Osun State University, Osogbo, while FGD 11-20 involved participants at Bamidele Olumilua University of Education, Science and Technology, Ikere-Ekiti. Two research assistants selected from the universities observed the interactive sessions in each group. The discussions with participants provided knowledge of their experiences with AI integration in teacher education. Participants shared their perspectives on AI-driven pedagogical interventions' challenges and potential benefits. Below are some excerpts of participants' responses:

Theme 1: Lack of Structured AI Training

"I struggle to identify and use AI-related icons in digital teaching tools. There is no structured training on how to use these tools effectively in our courses." (Participant 3)

"Most of us rely on trial and error when using platforms like Google Meet, which affects our confidence in delivering online lessons." (Participant 7)

"Recently, some of our lecturers made us aware that AI is assisting us in composing letters and poems."

Theme 2: Difficulties in Viewing and Representing AI-related Icons:

"When using AI tools, I often get confused by the different icons and their functions. It takes too much time to figure them out, which reduces productivity in class." (Participant 10)

"The university provides access to digital resources, but we do not get sufficient training on how to represent data visually or navigate AI-based teaching tools." (Participant 5)

"Most of the AI icons confuse me since I cannot differentiate them from the standard icons on computers.

Theme 3: Potential Benefits of AI Integration

"If AI-driven training modules were integrated into our curriculum, I believe it would enhance our teaching and digital skills, making us better prepared for the future." (Participant 2)

"AI tools can personalize learning for both teachers and students. With proper training, we can leverage them to improve lesson delivery and engagement." (Participant 8)

" *ChapGPT is very useful in guiding teachers in constructing effective teaching materials in English language lessons*."

Semi-structured interviews with participants revealed recurring themes regarding AI integration challenges. Many participants reported difficulties recognizing and utilizing AI-driven educational tools, emphasizing a lack of structured AI training. Participants suggested that systematic AI integration in the language education curriculum could enhance their digital competency and teaching effectiveness to align with global educational standards.

Triangulation of Findings

Triangulating the quantitative and qualitative results reveals that while pre-service teachers possess moderate basic digital literacy, they struggle significantly with viewing and representing AI-related icons. The statistical data confirm the qualitative outputs, as participants expressed a need for more structured AI literacy programs in courses such as LED 111 (Introduction to Digital Literacy and Pedagogy). This alignment underscores integrating AI-driven training modules in teacher education to bridge the identified skill gaps. Furthermore, findings revealed moderate proficiency in basic digital literacy skills among pre-service teachers. However, significant gaps were identified in viewing and representing AI-related icons, particularly in navigating ChatGPT navigation icons, with mean scores of 1.9 and 1.8, respectively. Participants expressed challenges in interpreting and effectively utilizing AI-powered features, indicating the need for structured AI training in teacher education curricula. Furthermore, the study underscored the potential of AI-driven pedagogical interventions to enhance digital literacy competencies and provide adaptive learning pathways tailored to individual needs. The results suggest that integrating AI technologies into The Core Curriculum and Minimum Academic Standards (CCMAS) curriculum could bridge digital literacy gaps and

improve technology-driven language teaching through systematic pedagogical instruction in generative artificial intelligence.

Discussion

The findings of this study align with global research on integrating artificial intelligence (AI) in teacher education. AI-driven pedagogical tools have been widely recognized for their potential to enhance digital literacy and personalize learning (Zhai et al., 2021). However, the results of this study indicate that while pre-service teachers exhibit moderate proficiency in basic digital literacy, they struggle significantly with viewing and representing AI-related icons. This finding aligns with previous research suggesting that educators face challenges in AI literacy due to inadequate training and curriculum gaps (Schmid et al., 2023). A critical issue emerging from the findings is the inadequacy of the Core Curriculum and Minimum Academic Standards (CCMAS) in fully integrating AI literacy within teacher education in Nigeria. Studies have emphasized that CCMAS provides a foundational curriculum but lacks substantial implementation of AI-driven pedagogical strategies (Okafor et al., 2022). This assertion suggests that despite policy-level frameworks initiated by the NUC, there is a disconnect between curriculum design and practical AI application in classrooms, a recurring challenge in educational reform (Mukherjee et al., 2023).

Another key concern is the accessibility and usability of AI tools among pre-service teachers. The study revealed that many participants struggled with using AI-powered platforms such as ChatGPT, highlighting the necessity for structured AI training programs. Similar findings were reported by Sailer et al. (2021), who noted that while AI tools are increasingly embedded in education, their effectiveness depends on user competency. Sailer et al. (2021) emphasize the importance of instructional reinforcement, institutional support, and continuous professional development to ensure educators can effectively utilize AI-driven teaching methods (Chen et al., 2023).

Despite these challenges, AI-based instruction remain a promising medium for bridging digital literacy gaps. The findings suggest that AI has the potency to provide adaptive learning pathways tailored to individual needs, an approach supported by existing literature (Wang et al., 2022). However, successful implementation requires more than technological availability; it necessitates robust policy support, periodical teacher training, and infrastructural support (Selwyn, 2019). AI adoption risks being a superficial addition rather than a transformative force in teacher education without these elements.

In conclusion, this study highlights both the potential and limitations of AI in enhancing digital literacy among pre-service teachers in Nigeria. While AI-driven interventions can address digital literacy deficiencies, the CCMAS curriculum needs significant revisions to incorporate structured AI training. Additionally, universities must prioritize faculty development programs that equip educators with the necessary skills to leverage AI tools effectively. Future research should explore the long-term impact of AI training on teaching efficiency and student involvement to provide in-depth knowledge about its role in teacher education.

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