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# DIGITAL PEDAGOGY AND AI-ENABLED PERSONALIZED LEARNING: TRANSFORMING TEACHING AND LEARNING IN NIGERIAN TERTIARY INSTITUTIONS

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**ABSTRACT**

This study examined digital pedagogy and artificial intelligence (AI)-enabled personalized learning as mechanisms for transforming teaching and learning in Nigerian tertiary institutions. A correlational research design was adopted, utilizing a multistage sampling procedure to select a sample of 300 postgraduate students from a population of 1,200 across selected Nigerian tertiary institutions. Data were collected using a validated researcher-developed instrument titled the Digital Pedagogy and AI-Enabled Personalized Learning Questionnaire (DPAIPQ), which yielded a reliability coefficient of 0.87 using Cronbach's alpha. Data were analyzed using mean and standard deviation to answer the research questions, while Pearson Product-Moment Correlation (PPMC) was used to test the null hypotheses at the 0.05 level of significance. The findings revealed that digital pedagogy practices are utilized to a high extent among lecturers (Grand Mean = 3.09), and AI-enabled personalized learning is employed to a high extent to support instruction (Grand Mean = 2.97). Furthermore, the inferential analyses demonstrated statistically significant positive relationships between digital pedagogy and teaching and learning ($r$=0.641,$p$<0.05), AI-enabled personalized learning and teaching and learning ($r$=0.718,$p$<0.05), and between digital pedagogy and AI-enabled personalized learning ($r$=0.684,$p$<0.05). The study concluded that the effective integration of digital tools and artificial intelligence substantially fosters flexible, individualized, and learner-centered educational experiences. Consequently, the study recommends that tertiary institutions invest in robust digital infrastructure, organize continuous professional development programs for educators and students, and establish clear ethical frameworks governing data privacy and responsible AI use.

**Keywords:** Digital Pedagogy, AI-Enabled Personalized Learning, Teaching and Learning Transformation, Postgraduate Students, Higher Education, Nigerian Tertiary Institutions

## 1. INTRODUCTION

Digital technology is becoming a crucial part of modern education, changing how educators create lessons, how students access educational materials, and how educational institutions oversee the teaching and learning process. With the rise of digital pedagogy, education has moved away from teacher-centered methods and toward more adaptable, interactive, collaborative, and learner-centered approaches. In order to enhance instructional delivery and students' learning experiences, digital pedagogy refers to the deliberate integration of digital technology, tools, platforms, and resources into teaching and learning Baba, and Hassan [1]

Learning management systems, multimedia resources, virtual classrooms, digital assessment, online collaboration, educational applications, and other technology-supported strategies are examples of digital pedagogy in higher education. These advancements are especially pertinent to Nigerian higher education institutions, where the need for creative teaching and learning strategies has been brought about by rising student enrollment, a variety of learning requirements, and the need for pertinent digital capabilities Nwosu and Igwe [2].

By offering systems that can analyze learner data, create instructional content, provide feedback, and promote adaptive learning, artificial intelligence (AI) has further increased the potential of digital pedagogy. Artificial intelligence is used in AI-enabled personalized learning to customize learning activities, material, pace, evaluation, and feedback to each student's needs, skills, interests, and learning progress Ogunode and Musa[3].

Artificial intelligence (AI)-enabled systems can analyze student interaction and performance patterns and utilize that knowledge to offer relevant learning materials or activities, in contrast to traditional digital learning environments where students might get the same content and activities. Consequently, AI has the potential to support more individualized learning experiences while assisting lecturers in identifying areas where students require additional academic support Okafor and Uche [4]

With the growing adoption of digital technologies by higher education institutions, the importance of AI-enabled personalized learning is becoming increasingly clear. Students can receive immediate support and possibilities for self-paced learning with AI technologies including intelligent tutoring systems, adaptive learning platforms, automated feedback systems, learning analytics, and generative AI applications Oke and Ogunleye [5]. These tools can help instructors with class planning, evaluation, feedback, and identifying learning challenges Okorie, [6]. But using these technologies effectively calls for more than just giving people access to digital devices and the internet. To effectively incorporate technology into curriculum content, instructional practices, evaluation, and classroom engagement, lecturers must possess the necessary digital pedagogical knowledge and skills Okoye and Afolabi [7].

Tertiary institutions in Nigeria have adopted digital technologies more and more, especially in reaction to the growth of blended and online learning. Effective implementation, however, may be hampered by issues like poor digital infrastructure, erratic power and internet connectivity, low digital proficiency among some instructors and students, budgetary limitations, and worries about data privacy and the moral application of AI Olatunji, and Musa, [8].

Concerns regarding academic integrity, an excessive reliance on information produced by AI, unequal access to new technology, and the necessity of ensuring that AI enhances rather than eliminates meaningful teacher-student contact are also present Omodara and Adegbija [9]. Thus, an important topic of research in Nigerian higher education is the nexus of digital pedagogy and AI-enabled individualized learning. The degree to which these technologies are changing teaching and learning can be demonstrated by understanding how instructors and students use digital pedagogical techniques and see AI-supported personalization (Onyema et al.,[10]

The establishment of suitable digital strategies, professional development programs, ethical norms, and technology infrastructure may be aided by such evidence for higher education institutions, legislators, and educators. In order to comprehend the opportunities and difficulties related to the developing digital transformation of higher education, it is crucial to look at digital pedagogy and AI-enabled personalized learning as mechanisms for changing teaching and learning in Nigerian tertiary institutions.

## 2.STATEMENT OF THE PROBLEM

Opportunities to change teaching and learning in Nigerian higher education institutions have been made possible by the growing usage of digital technology and artificial intelligence (AI). While AI-enabled personalized learning can offer adaptive content, tailored feedback, and learning support, digital pedagogy facilitates the use of learning management systems, multimedia, virtual classrooms, online assessment, and collaborative tools. Nevertheless, successful pedagogical integration is not always guaranty by the availability of these tools. Inadequate digital infrastructure, inconsistent internet access, a lack of digital competences, inadequate training, and worries about data protection, academic integrity, and ethical AI use are still problems in many postsecondary schools. As a result, it is yet unclear how well digital pedagogy and AI-enabled tailored learning are incorporated into instruction. Additionally, there is no empirical data regarding the ways in which these technologies work together to support learner-centered and individualized education in Nigerian postsecondary institutions. In order to change teaching and learning in Nigerian higher education institutions, this study looks at digital pedagogy and AI-enabled individualized learning.

## 3.AIM OF THE STUDY

The aim of the study is to examine digital pedagogy and AI-enabled personalized learning as mechanisms for transforming teaching and learning in Nigerian tertiary institutions. The study specifically seeks to:

1. determine the extent of digital pedagogy practices among lecturers in Nigerian tertiary institutions.
2. examine the extent to which AI-enabled personalized learning is used to support teaching and learning in Nigerian tertiary institutions.
3. determine the relationship between digital pedagogy and AI-enabled personalized learning in transforming teaching and learning in Nigerian tertiary institutions.

## 4.RESEARCH QUESTIONS

1. What is the extent of digital pedagogy practices among lecturers in Nigerian tertiary institutions?
2. To what extent is AI-enabled personalized learning used to support teaching and learning in Nigerian tertiary institutions?
3. What is the relationship between digital pedagogy and AI-enabled personalized learning in transforming teaching and learning in Nigerian tertiary institutions?

**Hypotheses**

The following null hypotheses were tested at the 0.05 level of significance:

**$H_o1$:** There is no significant relationship between digital pedagogy and teaching and learning in Nigerian tertiary institutions.

**$H_o2$:** There is no significant relationship between AI-enabled personalized learning and teaching and learning in Nigerian tertiary institutions.

**$H_o3$:** There is no significant relationship between digital pedagogy and AI-enabled personalized learning in Nigerian tertiary institutions.

## 5.METHODOLOGY

The study adopted a correlational research design to examine the relationship between digital pedagogy, AI-enabled personalized learning, and the transformation of teaching and learning among postgraduate students in Nigerian tertiary institutions. The population comprised 1,200 postgraduate students enrolled in selected tertiary institutions in Nigeria. A sample of 300 postgraduate students was selected using a multistage sampling procedure. Data were collected using a researcher-developed instrument titled Digital Pedagogy and AI-Enabled Personalized Learning Questionnaire (DPAIPQ). The questionnaire consisted of sections measuring digital pedagogy practices, AI-enabled personalized learning, and teaching and learning outcomes. Items were structured on a four-point Likert scale ranging from Strongly Agree (4) to Strongly Disagree (1). Three experts in Educational Technology and Measurement and Evaluation validated the instrument. A pilot test involving 30 postgraduate students outside the study sample produced a Cronbach's alpha reliability coefficient of 0.87, indicating satisfactory internal consistency. The questionnaire was administered electronically and physically, and 300 copies were successfully retrieved and analyzed. Data were analyzed using mean and standard deviation to answer the research questions, while Pearson Product-Moment Correlation (PPMC) was used to test the three null hypotheses at the 0.05 level of significance. A mean criterion of 2.50 was used to determine the level of agreement, with mean scores of 2.50 and above indicating a high extent and scores below 2.50 indicating a low extent.

## 6.RESULTS

**Research Question 1: What is the extent of digital pedagogy practices among lecturers in Nigerian tertiary institutions?**

**Table 1: Mean and Standard Deviation of Postgraduate Students' Ratings of Digital Pedagogy Practices**

| S/N | Digital Pedagogy Practices | N | Mean | SD | Decision |
|---|---|---|---|---|---|
| 1 | Use of learning management systems | 300 | 3.18 | 0.71 | High |
| 2 | Use of multimedia instructional resources | 300 | 3.24 | 0.68 | High |
| 3 | Use of online discussion and collaboration tools | 300 | 3.05 | 0.76 | High |
| 4 | Use of digital assessment tools | 300 | 2.96 | 0.81 | High |
| 5 | Use of virtual classrooms for instruction | 300 | 2.88 | 0.84 | High |
| 6 | Provision of digital learning resources | 300 | 3.21 | 0.70 | High |
| | Grand Mean | 300 | 3.09 | 0.75 | High |

The mean and standard deviation of postgraduate students' assessments of lecturers' use of digital pedagogy are shown in Table 1's statistical analysis. Every item (1–6) had mean scores between 2.88 and 3.24 that were higher than the benchmark cutoff criterion of 2.50. In particular, Item 2 (Use of multimedia instructional resources) had the highest mean score (M=3.24, SD=0.68), closely followed by Item 6 (Provision of digital learning resources) (M=3.21, SD=0.70).

In contrast, the lowest mean score (M=2.88, SD=0.84) was obtained for Item 5 (Use of virtual classrooms for instruction), although it is still high. Overall, the Grand Mean of 3.09 (SD=0.75) shows that instructors at Nigerian higher education institutions use digital pedagogical techniques extensively.

**Research Question 2: To what extent is AI-enabled personalized learning used to support teaching and learning in Nigerian tertiary institutions?**

**Table 2: Mean and Standard Deviation of AI-Enabled Personalized Learning**

| S/N | **AI-Enabled Personalized Learning Practices** | N | Mean | SD | Decision |
|---|---|---|---|---|---|
| 1 | AI tools provide individualized learning support | 300 | 3.02 | 0.79 | High |
| 2 | AI applications provide personalized feedback | 300 | 2.91 | 0.83 | High |
| 3 | AI tools recommend learning materials based on students' needs | 300 | 2.84 | 0.86 | High |
| 4 | AI supports students' self-paced learning | 300 | 3.08 | 0.74 | High |
| 5 | AI tools help identify students' learning difficulties | 300 | 2.79 | 0.88 | High |
| 6 | Generative AI supports academic learning activities | 300 | 3.15 | 0.72 | High |
| | Grand Mean | 300 | 2.97 | 0.80 | High |

Data on how much AI-enabled tailored learning enhances training is shown in Table 2. The mean scores for each of the six assessed items, which ranged from 2.79 to 3.15, were higher than the 2.50 cutoff. The highest rating (M=3.15, SD=0.72) was given to Item 6 (Generative AI supports academic learning activities), followed by Item 4 ("AI supports students' self-paced learning") with M=3.08, SD=0.74. The item with the lowest mean score (M=2.79, SD=0.88) was item 5 (AI tools help identify students' learning difficulties). The results show that AI-enabled personalized learning is used extensively to assist teaching and learning activities within the institutions under study, with a Grand Mean of 2.97 (SD=0.80).

**Research Question 3: What is the relationship between digital pedagogy and AI-enabled personalized learning in transforming teaching and learning in Nigerian tertiary institutions?**

**Table 3: Pearson Correlation between Digital Pedagogy & AI-Enabled Personalized Learning**

| Variables | N | Mean | SD | R | Decision |
|---|---|---|---|---|---|
| Digital Pedagogy | 300 | 3.09 | 0.75 | | |
| AI-Enabled Personalized Learning | 300 | 2.97 | 0.80 | 0.684 | Positive relationship |

Table 3 displays a Pearson correlation coefficient of r=0.684 between AI-enabled personalized learning (M=2.97,SD=0.80) and digital pedagogy (M=3.09,SD=0.75). The two constructs have a moderate-to-strong positive linear association, according to this value. The findings suggest that larger deployment and use of AI-enabled personalized learning technologies in transforming the teaching process is correlated with stronger integration of digital pedagogical practices among lecturers.

**Hypotheses**

**$H_o1$:** There is no significant relationship between digital pedagogy and teaching and learning in Nigerian tertiary institutions.

**Table 4: Pearson Correlation between Digital Pedagogy and Teaching and Learning**

| Variables | N | R | Sig. (2-tailed) | Decision |
|---|---|---|---|---|
| Digital Pedagogy | 300 | | | |
| Teaching &Learning | 300 | 0.641 | 0.000 | Reject $H_o1$ |

Table 4 displays a statistically significant correlation coefficient of $r$=0.641 between digital pedagogy and teaching and learning at $N$=300. The associated two-tailed probability value is $p$=0.000. Because $p$<0.05, the null hypothesis (H01) is rejected. This proves that there is a statistically significant positive relationship between digital pedagogy and teaching and learning. Consequently, elevated implementation of digital pedagogical practices directly contributes to improved teaching and learning outcomes.

**$H_o2$:** There is no significant relationship between AI-enabled personalized learning and teaching and learning in Nigerian tertiary institutions.

**Table 5: Pearson Correlation between AI-Enabled Personalized Learning and Teaching and Learning**

| Variables | N | R | Sig. (2-tailed) | Decision |
|---|---|---|---|---|
| AI-Enabled Personalized Learning | 300 | | | |
| Teaching & Learning | 300 | 0.718 | 0.000 | Reject $H_o2$ |

Table 5 reveals a strong correlation coefficient of $r$=0.718 between AI-enabled personalized learning and teaching and learning outcomes, with a significance level of $p$=0.000 at $N$=300. Given that $p$<0.05, the null hypothesis (H02) is rejected. The result confirms a statistically significant, strong positive relationship between AI-enabled personalized learning and the teaching and learning process. This demonstrates that expanding adaptive AI support systems yields substantial enhancements in teaching efficiency and student learning experiences.

**$H_o3$:** There is no significant relationship between digital pedagogy and AI-enabled personalized learning in Nigerian tertiary institutions.

**Table 6: Pearson Correlation between Digital Pedagogy and AI-Enabled Personalized Learning**

| Variables | N | R | Sig. (2-tailed) | Decision |
|---|---|---|---|---|
| Digital Pedagogy | 300 | | | |
| AI-Enabled Personalized Learning | 300 | 0.684 | 0.000 | Reject $H_03$ |

Table 6 shows the inferential test for the relationship between digital pedagogy and AI-enabled personalized learning. The calculated correlation coefficient is $r$=0.684 with a $p$-value of 0.000 ($p$<0.05). Since the calculated $p$-value is less than the standard significance threshold ($\alpha$=0.05), the null hypothesis (H03) is rejected. There is a statistically significant positive relationship between digital pedagogy and AI-enabled personalized learning. This indicates that digital pedagogy forms a functional foundation that fosters and enhances the adoption of AI-driven personalized learning systems.

**Discussion of Finding**

**Research Question 1: What is the extent of digital pedagogy practices among lecturers in Nigerian tertiary institutions?**

With a grand mean of 3.09, the study's findings showed that instructors in Nigerian higher education institutions used digital pedagogy techniques extensively. This indicates that postgraduate students thought instructors used digital platforms, multimedia resources, online collaboration tools, digital assessment, virtual classrooms, and electronic learning resources extensively. This result is in line with the findings of Agwom et al. [11], who discovered that although pre-service and in-service teachers show increasing awareness of and favorable attitudes toward digital tools, the actual level of structured digital pedagogy practices incorporated into regular classroom instruction is still quite low.

Adeoye and Bello [12] discovered that lecturers' use of digital pedagogy is mostly restricted to basic ICT usage since the shift to more sophisticated digital teaching techniques is greatly hampered by unstable power supplies, poor internet access, and subpar hardware. Although educators recognize the value of digital instruction, Adewale and Yusuf [13] discovered that a lack of specialized technical support staff, insufficient institutional finance, and poor technological facilities hinder the overall extent of practice throughout faculties of education.

**Research Question 2: To what extent is AI-enabled personalized learning used to support teaching and learning in Nigerian tertiary institutions?**

With a grand mean of 2.97, the study's findings demonstrated the extensive application of AI-enabled tailored learning. This suggests that postgraduate students believed AI applications supported academic activities, self-paced learning, individualized feedback, learning resource recommendations, and the detection of learning challenges. Igbokwe and Adeyemi [14] observed that tertiary institution curriculum lack specific modules and training covering AI literacy, adaptive tools, and learning analytics, which is why the use of AI-enabled personalized learning tools remains low.

Idris and Yakubu [15] discovered that although AI has great potential for diagnostic tests and adaptive feedback, its practical acceptance in assisting teaching and learning in Nigeria is low because of expensive technology acquisition prices and a lack of institutional framework rules. AI-enabled personalized learning can only be successfully operationalized when supported by a strong core digital infrastructure, according to Eze and Olojo [16]. The degree of AI adoption is still low and inconsistent in environments without reliable electricity and fast internet.

**Research Question 3: What is the relationship between digital pedagogy and AI-enabled personalized learning in transforming teaching and learning in Nigerian tertiary institutions?**

The study's conclusion showed that AI-enabled personalized learning and digital pedagogy were positively correlated (r = 0.684). This implies that increased usage of AI-enabled learning personalization strategies is linked to increased use of digital pedagogical methods. The results show that AI-enabled personalization does not function independently of digital pedagogy; rather, successful digital teaching strategies can offer the pedagogical and technological framework for implementing AI-supported learning.

The results are consistent with those of Eneh [17], who discovered a direct complimentary link in which AI technologies convert traditional, teacher-led instruction into adaptive, student-centered learning through the crucial foundational environment of effective digital pedagogy. Alshahrani and Alqahtani [18] discovered a positive correlation between AI integration and digital pedagogical training, showing that improving educators' digital competence (TPACK) greatly increases their capacity to use AI tools for improved student engagement and tailored learning outcomes.

## 7. CONCLUSION & RECOMMENDATIONS

**Conclusion**

According to the study's findings, teaching and learning in Nigerian higher education institutions are becoming more and more reliant on digital pedagogy and AI-enabled individualized learning. The results demonstrated that postgraduate students made extensive use of both digital pedagogy and AI-enabled tailored learning. The study also found a strong favorable correlation between teaching and learning, AI-enabled tailored learning, and digital pedagogy. These results imply that more adaptable, customized, interactive, and learner-centered educational experiences can be supported by the successful integration of digital technology and artificial intelligence. However, the benefits of these technologies depend on adequate infrastructure, digital competence, institutional support, and responsible use of AI.

**Recommendations**

1. Tertiary institutions should provide adequate digital infrastructure, reliable internet, and learning platforms to support digital pedagogy.
2. Institutions should organize regular training for lecturers and postgraduate students on digital pedagogy and effective use of AI-enabled personalized learning tools.
3. Tertiary institutions should establish clear guidelines on responsible AI use, focusing on privacy, academic integrity, ethics, and human oversight.

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