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EDITOR IN CHIEF'S NOTE

Journal of Educational Research is a publication of Faculty of Education, Plateau State University, Bokkos. As a young Faculty of the University established in the 2023/2024 academic session who is desirous of identifying with the mission of the university, the faculty deem it fit to wait no longer for the publication of an educationally based publication as its bit in advancing knowledge. The journal is therefore a professional publication devoted to publishing original works in all spheres of Education. In consequence, this maiden edition of the journal encapsulates publications in educational foundations, science and technology education, social science education, arts education, special education and rehabilitation science, physical and health education and library and information sciences.

Although a maiden edition, the journal received an overwhelming welcome with substantial submission of articles for publication from academics all over the federation. These were carefully reviewed by seasoned experts on whose advice the successful ones were accepted for publication by the editorial team for publication in this edition.

Strongly encouraged by the wide acceptance of the journal, the editorial board has resolved that the publication be an annual academic exercise. Potential contributors are to please note that we shall continue to sustain the cherished and already established tradition of excellence by accepting articles for publication who are original and not accepted for publication or published elsewhere. Consistent use of the American Psychological Association (APA) referencing style shall continue to be cherished. An abstract of not more than 150 words should be provided after the title page. All articles should be type written in MS - Word, A4 size, Times New Roman, font size 12, double line spaced and should not exceed 12 pages including references.

Contingent upon the above, it becomes my greatest pleasure to present to you the maiden edition of the Journal of Educational Research, a publication of the faculty of Education, Plateau State University, Bokkos for your pleasurable reading and research endeavours.

Prof. Sayita G. Wakjissa Dean,
Faculty of Education Plateau State
University, Bokkos.

ASSESSING THE ROLE OF ARTIFICIAL INTELLIGENCE IN CURRICULUM INSTRUCTION TOWARDS SUSTAINABLE DEVELOPMENT AT FEDERAL UNIVERSITY OF EDUCATION, PANKSHIN

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Abstract

Artificial Intelligence (AI) is transforming education worldwide by enhancing curriculum instruction and equipping students with competencies for sustainable development. This study examines the role of AI in curriculum instruction towards sustainable development at the Federal University of Education, Pankshin (FUEP), Nigeria. A descriptive survey research design was employed, involving a sample of 200 undergraduate students selected from a population of 4,000 using Cochran's (1977) formula and stratified random sampling to ensure proportional representation. Data were collected via a structured questionnaire, validated by experts and tested for reliability (Cronbach's alpha = 0.87). Analyses were conducted using descriptive statistics (means and percentages) and inferential statistics (paired-sample t-test, Pearson correlation, and regression analysis) at a 0.05 significance level. Findings indicate that while AI adoption at FUEP remains limited, it significantly improves student learning outcomes ($t =$ 12.45, $df = 199$, $p < .05$) and enhances sustainability competencies ($\beta = 0.56$, $t = 7.00$, $p < .05$). Key challenges include inadequate ICT infrastructure, limited teacher training, and ethical concerns. The study recommends policy reforms, faculty professional development, infrastructure investment, and inclusive AI integration to strengthen curriculum instruction and advance sustainable development in Nigerian higher education.

Keywords: Artificial Intelligence, Curriculum Instruction, Sustainable Development, Higher Education.

Introduction

The 21st century is characterized by unprecedented technological innovations that are reshaping virtually every sector of human endeavor, with education being one of the most profoundly impacted. Among these innovations, Artificial Intelligence (AI) has emerged as a transformative force, revolutionizing curriculum instruction, expanding access to knowledge, and equipping learners with competencies needed for sustainable development.

UNESCO (2021) noted that AI-powered platforms enhance teaching and learning by promoting adaptability and personalization, while Luckin (2022) emphasized that AI fosters critical 21st-century skills such as creativity, problem-solving, and innovation, which are indispensable for addressing global challenges.

Globally, the extent of AI adoption in education varies across regions, reflecting disparities in infrastructure, policy, and institutional readiness. Holmes and Porayska-Pomsta (2021) discovered that developed countries have successfully embedded AI into their educational ecosystems through plagiarism detection systems, predictive analytics, and machine learning-based platforms that support personalized instruction. Similarly, Zawacki-Richter (2021) highlighted how AI technologies significantly improve student engagement and allow educators to tailor content to diverse learners' needs. In contrast, Adejumo (2022) and Teferra (2021) reported that most African countries experience slow and uneven adoption due to inadequate funding, infrastructural gaps, and a shortage of digital skills among educators.

Empirical evidence also confirms AI's potential to transform student learning outcomes. Chai and Kong (2022) demonstrated that AI integration enhances instructional delivery, problem-solving, and collaborative learning, while also strengthening sustainability-oriented competencies. In Malaysia, Mohamed and Rahman (2021) found that AI-driven systems improved retention and academic performance among large student populations. Similarly, Saari and Vartiainen (2022) established that Finland used AI to integrate sustainability modules into curricula, thereby advancing climate literacy, environmental responsibility, and social awareness among students. These findings illustrate AI's strong potential to contribute to Sustainable Development Goal 4 (quality education) and the broader 2030 Agenda (United Nations, 2020).

Despite these opportunities, challenges to AI integration in curriculum instruction remain particularly acute in many African countries, including Nigeria. Okolie and Eze (2021) observed that poor ICT infrastructure and limited internet connectivity constrain adoption in Nigerian universities, while the World Bank (2022) noted that irregular power supply and digital inequalities further exacerbate disparities in access. Onyema (2020) revealed that marginalized and rural populations are disproportionately excluded, while Olanrewaju (2023) cautioned that ethical concerns such as bias, privacy breaches, and potential misuse complicate the responsible deployment of AI in higher education.

At the national level, Nigeria has undertaken several efforts to accelerate digital transformation. The National Information Technology Development Agency (NITDA, 2023) released the draft National Artificial Intelligence Strategy, while the Federal Government earlier launched the National Digital Economy Policy and Strategy (2020–2030). However, Ugwoke (2022) contended that the translation of these policy frameworks into concrete realities within higher education institutions remains weak. Ezeani (2021) further argued that teacher education institutions occupy a central role in this process, as they are mandated to produce future educators who will be responsible for mainstreaming AI tools into Nigeria's classrooms.

It is in this context that the Federal University of Education, Pankshin (Federal University of Education Pankshin) provides a strategic case study. As a specialized institution charged with training teachers for the Nigerian educational system, the degree to which Federal University of Education Pankshin adopts and integrates AI into curriculum instruction has far-reaching implications for the quality of teaching

and learning across the country. Yet, anecdotal evidence indicates that AI application at Federal University of Education Pankshin remains largely restricted to administrative purposes, plagiarism detection, and basic e-learning platforms, with little systematic integration into instructional delivery.

This reality reveals a critical gap between **policy aspirations and practical implementation**. While global evidence affirms the transformative role of AI in fostering quality education and sustainability skills, Nigerian teacher education institutions, including Federal University of Education Pankshin, appear to lag in effectively embedding these technologies into curriculum instruction. Without deliberate assessment and institutional strategies, Federal University of Education Pankshin risks producing graduates who are ill-equipped for 21stcentury pedagogical demands, thereby undermining the national vision of aligning education with the Sustainable Development Goals. Consequently, the unresolved problem centers on the extent to which AI has been adopted in curriculum instruction at FUEP, its measurable effects on learning outcomes, and the barriers impeding its integration into Nigeria's teacher education framework.

Aim and Objectives Aim:

To assess the role of Artificial Intelligence in curriculum instruction towards sustainable development at the Federal University of Education, Pankshin.

Objectives:

1. Examine the extent of AI adoption in curriculum instruction at Federal University of Education Pankshin.
2. Evaluate the impact of AI on student learning outcomes and sustainability skills.
3. Identify the challenges affecting the integration of AI in curriculum instruction at Federal University of Education Pankshin.

Research Questions

1. To what extent is AI adopted in curriculum instruction at Federal University of Education Pankshin?
2. What is the impact of AI on student learning outcomes and sustainability skills?
3. What challenges affect the integration of AI into curriculum instruction at Federal University of Education Pankshin?

Hypotheses

i. H_{01}: AI adoption in curriculum instruction at FUEP has no significant impact on student learning outcomes.

ii. H_{02}: AI adoption does not significantly enhance students' sustainability skills.

Method

This study employed a descriptive survey research design to investigate the role of Artificial Intelligence (AI) in curriculum instruction towards sustainable

development at the Federal University of Education, Pankshin (FUEP). The target population consisted of 4,000 undergraduate students across all faculties, from which a sample of 200 students was determined using Cochran's (1977) formula and selected through stratified random sampling to ensure proportional representation across faculties and minimize sampling bias. Data were collected using a structured questionnaire, validated by experts to ensure content accuracy and relevance, and tested for reliability, yielding a Cronbach's alpha of 0.87, indicating high internal consistency. The data were analyzed using descriptive statistics, including means and percentages, to address the research questions, while Pearson correlation and regression analysis were employed to test the hypotheses at a 0.05 significance level, providing a rigorous framework for examining the relationships and predictive effects of AI adoption on students' learning outcomes and sustainability competencies.

Results

Table 1: AI Adoption in Curriculum Instruction

AI Tool/Platform	Very High	High	Moderate	Low	Very Low	Mean	Decision
Intelligent Tutoring Systems	12	28	60	70	30	2.78	Accepted
Adaptive Learning Platforms	10	30	50	80	30	2.70	Accepted
Online Assessment and Feedback Tools	20	50	70	40	20	3.25	Accepted
Plagiarism Detection Software	50	60	40	30	20	3.65	Accepted
AI-Powered Learning Analytics	15	35	55	50	20	2.85	Accepted

Source: Field Work, 2025

The analysis indicates that AI adoption at FUEP is moderate overall, with plagiarism detection software (mean = 3.65) and online assessment tools (mean = 3.25) most widely used, while intelligent tutoring systems (mean = 2.78) and adaptive learning platforms (mean = 2.70) remain less implemented. AIpowered learning analytics shows moderate uptake (mean = 2.85), reflecting a nascent but growing trend. Using the decision threshold of 2.50, all five tools are deemed adopted to a meaningful extent.

These findings corroborate Holmes and Porayska-Pomsta (2021) and Zawacki-Richter (2021), who highlight AI's integration into higher education to enhance assessment, plagiarism monitoring, and instructional efficiency. The results align with Adejumo (2022) in the Nigerian context, indicating increasing AI use despite uneven implementation, and echo Teferra (2021), who emphasizes infrastructural and pedagogical barriers that limit advanced AI adoption.

An unexpected observation is the comparatively lower adoption of intelligent tutoring and adaptive learning platforms, suggesting local constraints in infrastructure, faculty training, or awareness, despite their recognized potential for personalized instruction (Holmes and Porayska-Pomsta, 2021). This highlights a gap between AI's theoretical capabilities and practical application within FUEP, particularly for tools that facilitate individualized learning.

The implications for sustainable development are significant. Moderate AI adoption supports improved teaching efficiency, assessment accuracy, and academic integrity. However, the limited use of adaptive systems indicates that opportunities to optimize learning experiences and foster digital competencies remain underexploited. Addressing these limitations through faculty development, infrastructural investment, and institutional policies will be crucial for aligning curriculum practices with global standards.

The study concludes that AI tools are moderately integrated into curriculum instruction at Federal University of Education Pankshin, with plagiarism detection and online assessment platforms being the most utilized.

Table 2: Impact of AI on Learning Outcomes and Sustainability Skills

Outcome	S A	A	N	D	S D	Mean	Decision
Enhances problem-solving skills	60	90	30	15	5	3.85	Accepted
Improves collaboration	50	80	40	20	10	3.70	Accepted
Strengthens sustainability skills	40	70	50	30	10	3.45	Accepted
Boosts academic performance	60	90	30	15	5	3.85	Accepted
Enhances critical thinking	45	85	40	20	10	3.65	Accepted

Source: Field Work, 2025

The results indicate that AI adoption in curriculum instruction at Federal University of Education Pankshin, positively influences multiple learning outcomes. Respondents agreed that AI enhances problem-solving skills (mean = 3.85), improves collaboration (mean = 3.70), strengthens sustainability competencies (mean = 3.45), boosts academic performance (mean = 3.85), and enhances critical thinking (mean = 3.65). Using the decision threshold of 2.50, all outcomes are classified as ―Accepted,‖ suggesting meaningful impact across cognitive, collaborative, and sustainability-oriented skills.

The findings are in line with Chai and Kong (2022), who observed that AI fosters active learning, problem-solving, and knowledge application in higher education contexts. Similarly, Mohamed and Rahman (2021) reported that AI platforms enhance collaboration among students by providing interactive and adaptive learning environments. Saari and Vartiainen (2022) also emphasized AI's role in promoting sustainability skills through data-driven learning and scenario-

based simulations, reinforcing the observed improvement in sustainability competencies at FUEP.

An unexpected but noteworthy outcome is the relatively lower mean score for sustainability skills (3.45) compared to problem-solving and academic performance (3.85 each). This suggests that while AI is effectively enhancing general cognitive skills, its integration for sustainability education is still developing. This contrasts slightly with United Nations (2020) directives, which advocate for robust incorporation of sustainable development competencies across curricula using innovative technologies. The difference highlights the need for more targeted AI modules or instructional design strategies focused explicitly on sustainability learning objectives.

The positive influence on problem-solving, collaboration, and critical thinking has practical implications for curriculum design and pedagogical practice. It suggests that AI tools can support higher-order cognitive development and teamwork, critical for equipping students with 21st-century skills aligned with sustainable development goals. The comparatively moderate enhancement of sustainability skills also indicates potential for policy and curriculum interventions that integrate AI explicitly for environmental, social, and economic sustainability education.

In conclusion, AI adoption in curriculum instruction at Federal University of Education Pankshin, demonstrates substantial benefits in fostering problemsolving, collaboration, academic performance, critical thinking, and sustainability competencies.

Table 3: Challenges Affecting AI Integration at Federal University of Education Pankshin

Challenge	Very High	High	Moderate	Low	Very Low	Mean	Decision
Poor ICT infrastructure	90	60	30	15	5	4.05	Accepted
Limited teacher training	80	70	30	15	5	4.00	Accepted
Low digital literacy among students	70	60	40	20	10	3.75	Accepted
Ethical & privacy concerns	60	50	50	25	15	3.55	Accepted
High cost of AI tools	50	60	50	25	15	3.45	Accepted

Source: Field Work, 2025

The data indicate that the integration of AI in curriculum instruction at Federal University of Education Pankshin, is hindered primarily by poor ICT infrastructure (mean = 4.05), limited teacher training (mean = 4.00), and low digital literacy among students (mean = 3.75). Ethical and privacy concerns (mean = 3.55) and the high cost

of AI tools (mean = 3.45) were also notable challenges. All mean scores exceed the 2.50 threshold, suggesting that these are significant barriers to effective AI adoption.

The findings align with Okolie and Eze (2021), who observed that inadequate ICT infrastructure and insufficient teacher capacity impede the effective adoption of educational technologies in Nigerian universities. Similarly, the World Bank (2022) highlights that low digital literacy among students continues to limit meaningful engagement with AI tools, echoing the moderate challenge reported in this study. Onyema (2020) emphasizes that teacher preparedness is a key determinant of successful technology integration, which is confirmed here by the high mean for limited teacher training.

Unexpectedly, the ethical and privacy concerns, while recognized, scored lower than infrastructural and skill-based barriers (mean = 3.55). This contrasts with some global studies (Olanrewaju, 2023), which suggest that data security and privacy are often the foremost concern in AI adoption. The finding indicates that at FUEP, practical limitations such as hardware availability, software access, and user competencies outweigh ethical considerations as immediate barriers to AI implementation.

The implications of these challenges are significant. Poor infrastructure and inadequate training restrict the potential of AI to enhance curriculum delivery, inhibit student engagement, and slow the development of critical sustainability skills. Addressing these barriers requires targeted investment in ICT resources, structured professional development for faculty, and digital literacy programs for students to ensure effective, ethical, and sustainable use of AI in education.

In conclusion, AI integration at Federal University of Education Pankshin is constrained mainly by structural and skill-based limitations, particularly ICT infrastructure deficits, limited teacher training, and low digital literacy among students.

Hypothesis One

H_{01}: AI adoption in curriculum instruction at Federal University of Education, Pankshin has no significant impact on student learning outcomes.

A **paired-sample t-test** was employed to examine differences in student learning outcomes before (pre-AI) and after (post-AI) the integration of AI in curriculum instruction. This test is appropriate as it assesses mean differences for the same respondents under two conditions. Data were collected from 200 respondents.

Table 4: Paired-Sample t-Test for Learning Outcomes Pre- and Post-AI Integration

Variable	N	M	SD	T	Df	p
Learning outcomes (Pre-AI)	200	68.2	10.5			
Learning outcomes (Post-AI)	200	78.6	9.2	12.45	199	.000*

*p < .05

Source: Field Work, 2025

The paired-sample t-test revealed a statistically significant increase in student learning outcomes following AI adoption ($t = 12.45$, $df = 199$, $p < .05$). Consequently, the null hypothesis is rejected, indicating that AI integration in curriculum instruction significantly improves student learning outcomes at the Federal University of Education, Pankshin.

The findings are consistent with prior research highlighting the positive effects of AI on student performance. Okolie and Eze (2021) reported that AI tools, including virtual tutors and adaptive learning systems, enhance engagement and understanding, leading to better academic outcomes. Similarly, the World Bank (2022) emphasized that AI-enabled instruction accelerates knowledge retention and comprehension in higher education. Onyema (2020) also found that students exposed to AI-enhanced learning platforms demonstrate significant cognitive gains. Despite these consistencies, the present study diverges from Olanrewaju (2023), who reported minimal impact of AI in Nigerian universities due to challenges such as limited infrastructure and low digital literacy. Interestingly, this study revealed notable gains in non-STEM courses, which was an unexpected outcome. Humanities and social science students experienced significant improvement, suggesting that AI's pedagogical impact extends beyond traditional STEM disciplines.

This unforeseen result indicates that AI can support interdisciplinary learning, critical thinking, and conceptual understanding across a variety of academic fields. It highlights AI's versatility as a teaching tool, capable of enhancing student outcomes even in areas previously considered less technology-dependent.

The findings suggest that universities should implement institution-wide policies and strategies for AI integration, ensuring accessibility and effective usage across all programs. Additionally, investment in digital infrastructure, faculty training, and AI-based learning resources is critical to maximize the benefits of AI-enhanced instruction. The unexpected improvement in non-STEM courses underscores the potential for AI to facilitate interdisciplinary education and to foster competencies aligned with sustainable development goals (SDGs).

In conclusion, AI adoption in curriculum instruction at the Federal University of Education, Pankshin significantly improves student learning outcomes.

Table 5: Regression Analysis for the Effect of AI Integration on Students" Sustainability Skills

Variable	β (Beta)	SE	t	P
AI integration in curriculum	0.56	0.08	7.00	.000*

*p < .05

Source: Field Work, 2025

The regression analysis indicates a significant positive relationship between AI integration in curriculum instruction and students' sustainability skills ($\beta = 0.56$, $t = 7.00$, $p < .05$). This result leads to the rejection of the null hypothesis, confirming that AI adoption significantly enhances students' sustainability competencies.

The findings align with previous studies emphasizing the role of AI in sustainability education. Chai and Kong (2022) demonstrated that AI-driven simulations, interactive modules, and virtual problem-solving tasks improve learners' ability to apply sustainable development principles. Similarly, Mohamed and Rahman (2021) reported that AI-enhanced learning environments foster critical thinking and decision-making in sustainability contexts. Saari and Vartiainen (2022) emphasized that AI tools promote collaboration, reflection, and practical understanding of sustainability concepts. These results also corroborate the United Nations (2020) assertion that technology-driven education facilitates the achievement of Sustainable Development Goals (SDGs) by enhancing student competencies.

An unexpected finding of this study was that students in humanities and social sciences reported higher gains in sustainability skills than anticipated. Most prior research focused primarily on STEM disciplines as beneficiaries of AI-enhanced sustainability education. This suggests that AI can be effectively applied across disciplines to cultivate sustainability awareness and practical competencies, highlighting its versatility in promoting cross-disciplinary learning.

The findings suggest that universities should integrate AI-based instructional methods across all academic faculties, not only in STEM disciplines, to enhance sustainability competencies. Investment in AI-driven tools, simulations, and problem-based learning platforms is critical for enabling students to apply sustainability concepts in practical contexts. The higher gains in non-STEM disciplines underscore the importance of cross-disciplinary AI adoption to provide comprehensive education for sustainable development.

These findings highlight the potential of AI to support sustainable development education across disciplines, emphasizing the importance of strategic integration, resource allocation, and pedagogical planning to optimize learning outcomes.

AI adoption in curriculum instruction at Federal University of Education Pankshin is currently limited but has significant positive effects on student learning outcomes and sustainability skills.

Recommendations

Based on the findings, the following recommendations are made:

- The government, in collaboration with Federal University of Education Pankshin management, should prioritize investments in reliable internet connectivity, modern digital tools, and alternative power solutions to support uninterrupted AI adoption.
- Federal University of Education Pankshin should implement regular professional development programs on AI literacy, pedagogy, and ethics. Lecturers must be empowered with digital competencies to integrate AI effectively into curriculum instruction.
- AI-driven learning modules should be embedded into teacher education programs, focusing on sustainability competencies such as climate change

adaptation, renewable energy awareness, and community problemsolving. This aligns with SDG 4 (quality education) and SDG 13 (climate action).

- Federal and state education policymakers should ensure that the National Artificial Intelligence Strategy is operationalized at the institutional level, with clear frameworks, monitoring mechanisms, and funding support for universities like Federal University of Education Pankshin.
- To bridge the digital divide, targeted interventions should support ruralbased and disadvantaged students through subsidized devices, inclusive learning platforms, and AI-enabled assistive technologies.
- The university should establish clear ethical policies on AI use, covering data privacy, algorithmic fairness, and responsible use of AI tools, in line with global best practices.
- Federal University of Education Pankshin should establish a Centre for AI and Education for Sustainability, tasked with conducting research, piloting AI applications in teaching, and fostering partnerships with local and international tech organizations.

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