

Research Article

Adoption of Generative AI and Learning Analytics for Personalized Learning in Nigerian Higher Education: Effects on Student Engagement, Learning Outcomes, and Academic Integrity

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Abstract

This study examines the integration of generative artificial intelligence (GenAI) and learning analytics (LA) in fostering personalized learning within Nigerian higher education institutions. Specifically, it explores how these emerging technologies influence student engagement, academic performance, and perceptions of academic integrity in digitally mediated learning environments. A mixed-method research design was adopted, involving 420 undergraduate students and 60 academic staff drawn from three Nigerian universities. Quantitative data were collected through structured questionnaires assessing GenAI usage patterns, learning analytics engagement, levels of digital literacy, and integrity perceptions, while qualitative insights were obtained from semi-structured interviews with academic staff and information and communication technology (ICT) administrators. The findings reveal that 64% of respondents actively use GenAI tools such as ChatGPT and Gemini to support learning activities, while 58% regularly access learning analytics dashboards for performance monitoring and feedback. Regression analysis indicates that GenAI-assisted learning and engagement with learning analytics jointly predict improved academic performance ($\beta = 0.36$, $p < 0.01$) and higher levels of student engagement ($\beta = 0.42$, $p < 0.001$). However, the study also finds that unregulated use of GenAI tools is positively associated with increased concerns about plagiarism and academic misconduct ($r = 0.31$, $p < 0.05$). The study concludes that the pedagogically guided integration of GenAI and learning analytics can significantly enhance personalized learning experiences in Nigerian higher education. Nevertheless, this potential can only be realized through the development of robust governance frameworks that emphasize ethical use, digital literacy, academic integrity, and data privacy. The study therefore recommends targeted capacity-building for educators, the establishment of transparent institutional AI policies, and continuous evaluation of the pedagogical impact of GenAI technologies.

Keywords

Generative Artificial Intelligence (GenAI), Learning Analytics, Personalized Learning, Academic Integrity

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1. Introduction

The global landscape of higher education is undergoing a profound transformation driven by rapid advances in artificial intelligence (AI) and data analytics. Generative AI (GenAI) and Learning Analytics (LA) are at the forefront of this digital revolution, enabling educators to tailor learning experiences, provide real-time feedback, and promote evidence-based decision-making. In higher education, these technologies are redefining teaching and learning through intelligent tutoring systems, automated assessment feedback, and predictive models for student success [4, 5].

GenAI systems such as ChatGPT, Gemini, and Copilot leverage natural language processing to generate human-like responses, offer writing assistance, and simulate personalized tutoring. Learning analytics, conversely, focuses on collecting and interpreting student data to optimize learning outcomes and institutional performance [8]. Together, these tools support adaptive learning environments that respond dynamically to students' needs. The synergy between GenAI and learning analytics has been shown to enhance engagement and learning efficiency when implemented within clear ethical and pedagogical frameworks [5].

Globally, evidence highlights significant pedagogical benefits. In South Korea, AI-assisted learning systems have improved students' academic retention and motivation [9]. Studies conducted in the United States and the European Union indicate that learning analytics dashboards increase student accountability, self-regulation, and instructor responsiveness [6, 7]. Meanwhile, UNESCO emphasizes that AI in education must remain human-centered, ensuring that AI technologies complement rather than replace teachers while strengthening inclusive and equitable access to education [11].

In Nigeria, however, implementation remains at a developmental stage. Although the 2022 National ICT in Education Policy encourages innovation and digitalization, the practical integration of GenAI and learning analytics faces several obstacles, including limited infrastructure, inconsistent internet access, inadequate digital literacy, and the absence of comprehensive institutional policies [1]. Nigerian universities also differ significantly in readiness and adoption levels, resulting in uneven implementation patterns. While some institutions have introduced AI-based learning platforms, others remain cautious, often viewing generative AI tools with suspicion, particularly regarding plagiarism, authorship authenticity, and academic integrity [10].

Empirical evidence further shows that students in developing countries, including Nigeria, increasingly use GenAI tools for assignments, research assistance, and examination preparation [12, 13]. However, much of this usage occurs informally, outside structured institutional frameworks. Although global studies have examined the role of AI in improving learning outcomes, relatively few African-based studies have explored how GenAI and learning analytics jointly influence engagement, performance, and ethical con-

duct within higher education environments.

Conducted a systematic review highlighting diverse applications of artificial intelligence in education, including personalized learning, intelligent tutoring, and assessment support [15]. Consequently, there remains limited empirical understanding of how these technologies can be pedagogically leveraged to enhance learning while safeguarding academic integrity.

This knowledge gap underscores the need to contextualize AI-in-education research within Nigeria's higher education landscape. Addressing this gap is essential for developing evidence-based strategies and policy frameworks that promote ethical, inclusive, and effective AI adoption.

Therefore, this study investigates how university students and educators in Nigeria integrate generative AI and learning analytics into teaching and learning processes, with particular attention to student engagement, learning outcomes, and academic integrity. The study contributes empirical evidence from a developing-country context and offers policy-relevant recommendations for the sustainable integration of AI and data analytics in higher education.

2. Research Questions

- 1) What is the relationship between generative AI adoption and student engagement in Nigerian higher education?
- 2) How does learning analytics engagement influence student learning outcomes?
- 3) What is the relationship between GenAI adoption and perceptions of academic integrity?
- 4) What institutional factors affect the effective integration of GenAI and learning analytics?

3. Method of Study

3.1. Research Design

A mixed-methods design combining quantitative and qualitative approaches was adopted to provide a comprehensive analysis of AI adoption and its educational implications. This design aligns with Creswell and Creswell [3], who emphasize triangulation to enhance reliability and contextual richness. Quantitative data were gathered via a structured questionnaire, while qualitative data were obtained through interviews with lecturers and ICT administrators.

3.2. Population and Sampling Procedure

The study involved 420 undergraduate students and 60 academic staff drawn from three federal universities in southern and northern Nigeria. Stratified random sampling was used for students to ensure faculty representation, while purposive sampling

was applied to staff involved in ICT or digital learning programs. The total sample of 480 participants provided adequate diversity in gender, academic discipline, and digital proficiency.

3.3. Research Instrument

A structured questionnaire titled *AI and Learning Analytics Integration Scale (ALAIS)* was developed by the researcher. It contained four sections measuring:

- 1) Demographics
- 2) GenAI usage frequency and purpose
- 3) LA engagement
- 4) Perceived academic integrity and digital literacy

Responses were rated on a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). Reliability analysis

using Cronbach's alpha yielded $\alpha = 0.89$.

A semi-structured interview guide complemented the survey, exploring institutional challenges, ethical concerns, and pedagogical implications.

3.4. Data Collection and Analysis

Data were collected through online forms and in-person sessions over six weeks (March–April 2025). Quantitative data were analyzed using SPSS v28 for descriptive statistics, Pearson correlations, and multiple regression analyses. Qualitative transcripts were coded in NVivo 14 following Braun and Clarke's thematic analysis framework [2]. Both datasets were integrated during interpretation to generate a unified narrative.

4. Results

Table 1. Frequency and Purpose of GenAI Use ($n = 420$).

Purpose	Frequent (%)	Occasional (%)	Rare (%)	Mean (SD)
Assignment assistance	59.8	28.1	12.1	4.10 (0.73)
Concept clarification	63.5	25.0	11.5	4.24 (0.68)
Exam preparation	61.0	27.4	11.6	4.21 (0.65)
Research writing	48.9	31.0	20.1	3.81 (0.82)

Table 2. Learning Analytics Engagement and GPA ($n = 420$).

Engagement Level	High (%)	Moderate (%)	Low (%)	Mean GPA (SD)
Dashboard use	57.6	29.0	13.4	3.72 (0.48)
Instructor feedback	60.2	27.1	12.7	3.77 (0.42)
Peer comparison	52.5	33.2	14.3	3.69 (0.50)

Table 3. Correlation Matrix among Key Variables ($n = 420$).

Variable	GenAI Use	Engagement	Integrity
GenAI Use	1.00		
Engagement	0.42**	1.00	
Integrity	-0.31*	0.18	1.00

* $p < 0.05$; ** $p < 0.01$

5. Discussion

The findings show that GenAI and learning analytics substantially enhance student engagement and academic outcomes while raising ethical and governance concerns. Approximately two-thirds of students used GenAI tools for assignments and concept exploration, supporting international evidence that AI aids personalized learning [6, 7].

Learning analytics engagement correlated positively with GPA, affirming its predictive value for student success [8]. Students using analytics dashboards and feedback loops reported stronger self-regulation and improved grades. This aligns with evidence that data-driven instruction enhances motivation and learner autonomy [4].

Nevertheless, unregulated GenAI use was linked with reduced academic integrity, consistent with prior studies [13, 14]. Overreliance on AI tools without ethical guidance may foster plagiarism and diminish originality. Institutions must therefore balance technological innovation with moral responsibility [10].

Institutional interviews further revealed barriers such as inadequate AI governance policies, limited faculty digital literacy, and insufficient infrastructure, echoing earlier findings in African higher education contexts [1]. Addressing these gaps requires strategic investment, policy reform, and localized AI literacy initiatives that contextualize ethical use within Nigerian academic culture.

Overall, the results confirm that AI and learning analytics can significantly improve educational quality when implemented within frameworks emphasizing human oversight, transparency, and accountability [11, 12].

6. Conclusion

The study concludes that generative AI and learning analytics play a pivotal role in enhancing personalized learning and student engagement in Nigerian higher education. Their adoption leads to measurable improvements in academic outcomes but simultaneously raises issues of ethics, fairness, and academic honesty. Sustainable integration depends on institutional readiness, digital competence, and policy coherence.

7. Recommendations

- 1) Develop national and institutional AI-in-education policies emphasizing ethics, transparency, and accountability.
- 2) Strengthen educator capacity through continuous professional development in AI pedagogy and learning analytics.
- 3) Invest in ICT infrastructure to ensure equitable access to AI-enabled learning environments.
- 4) Establish integrity monitoring systems to track AI-related misconduct and promote responsible use.

Abbreviations

AI	Artificial Intelligence
GenAI	Generative Artificial Intelligence
LA	Learning Analytics
ICT	Information and Communication Technology
GPA	Grade Point Average
ALAIS	AI and Learning Analytics Integration Scale

Author Contributions

Ayonote Williams Elenode is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

The author declares that there are no conflicts of interest.

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Biography



Ayonote Williams Elenode, FIPMA, MCPN, MNCS, is a seasoned ICT executive and Chartered Information Technology Practitioner with over 21 years of experience in digital infrastructure management, educational technology, and ICT-in-education strategy. He serves as Deputy Director (ICT) at the National Open University of Nigeria (NOUN), where he leads digital transformation initiatives, data analytics, and enterprise ICT services supporting over 150,000 active learners. He holds an M.IT. in Information Technology, an M.Ed. in Educational Technology, an LL.B. in Law, a B.Sc. and an ND in Computer Science, as well as a professional diploma in Data Processing and a certificate in Entrepreneurship. He is currently completing a PhD in Science Education (ICT in Education). He is a

Fellow of the Institute of Professional Managers and Administrators of Nigeria and a member of the Computer Professionals Registration Council of Nigeria and the Nigeria Computer Society.

Research Field

Ayonote Williams Elenode: ICT applications in education, assessment and examination malpractice control, science education, technology-driven innovation, and learning analytics.