

# Technology-driven STEM Education: A Systematic Review of Generative Artificial Intelligence in Nigerian Tertiary Institutions

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## Abstract

Since 2022, GenAI has spread rapidly across Nigerian higher education, raising questions about student learning, academic integrity, and institutional policy. To synthesize recent empirical evidence on GenAI awareness, use, outcomes, acceptance drivers or barriers among students and staff in Nigerian tertiary institutions, and to map the emerging policy landscape. We searched Google Scholar, Scopus, ERIC, PubMed, and AJOL (Jan 2022–Aug 21, 2025). Inclusion: empirical studies of Nigerian higher education stakeholders using or evaluating GenAI (or ChatGPT), and Nigerian HEI policy documents. Data were extracted on setting, sample, design, instruments, outcomes, and theoretical frameworks; quality was appraised using the JBI checklist for analytical cross-sectional studies. Narrative synthesis was used. Reporting follows PRISMA 2020. We included 8 empirical studies and policy/guidance documents. Student awareness is generally high; typical uses are summarising, brainstorming, drafting and tutoring. Predictors of intention to use cluster around usefulness or performance expectancy, ease of use, and social influence (TAM/UTAUT); perceived risk and facilitating conditions show mixed effects. Lecturers' attitudes range from cautious to positive, but they emphasise the need for assessment of integrity and AI literacy. Institutional policies are emerging e.g., AI disclosure, forbidding use during assessments, staff training, while Nigeria lacks AI-specific statutes; use is governed by broader frameworks (e.g., NDPA 2023) as the National AI Strategy (draft 2024). Evidence suggests growing adoption and largely constructive attitudes among students, with integrity and capacity gaps at institutional level. It was recommended that clear assessment policies, disclosure norms, targeted AI literacy for staff/students, and infrastructure support be aligned with UNESCO/OECD guidance and Nigeria's AI strategy trajectory.

**Keywords:** academic integrity, GenAI, institutional policy, National AI Strategy, Nigerian higher education,

## I. Introduction

Generative AI (GenAI) technologies are scaffolding academic writing, students' engagement, and feedback mechanisms, offering promising opportunities to enhance teaching and learning. One of the key drivers behind the development of these generative AI technologies is the desire to elevate the creative process (Eapen *et al.*, 2023). Through the implementation of algorithms and machine learning models, GenAI generate new and unique content that cannot be achieved traditionally (Chen & Lee, 2023). As educational institutions globally explore the integration of AI technologies, it is crucial to understand the direction of research, particularly among students, lecturers, and researchers in Nigerian higher education settings.

GenAI can generate human-like text, images, and other media based on the available input. It has been considered to have the potential to reshape educational practices (Mello *et al.*, 2023). GenAI could be used in education in different ways e.g., providing personalized learning experiences, automating administrative tasks, and supporting collaboration and communication (Cho & Oforu-Anim, 2025). There are several benefits attached to the use of GenAI technologies. For instance, lecturers can use GenAI to their advantage because technology could help them generate student content and feedback, allowing them to focus more on high-level instruction and mentorship (Chan & Hu, 2023). Students can benefit from GenAI by accessing customized learning materials, receiving timely feedback, and engaging in interactive learning experiences (Mello *et al.*, 2023; Su & Yang,

2023). Also, educational administrators can use GenAI to streamline admissions, scheduling, and data analysis (Mello et al., 2023; Su & Yang, 2023).

However, the overreliance on the uses of GenAI technologies poses risks around accuracy, bias, and misconduct. Studies argued that AI-powered technologies may decrease emphasis on human-centric skills like critical thinking, problem-solving, and emotional intelligence (Bengio et al., 2023). Other studies advocated for careful consideration to ensure ethical and equitable integration of these technologies in the educational landscape (Fulton et al., 2022; Gillani et al., 2023).

The higher education sector in Nigeria has been impacted by the advancements in artificial intelligence (AI). Literature has emerging issues on GenAI integration in higher education. Some aspects also provided insights into how the Nigerian government integrates AI into its education sector. However, despite the growing body of studies on GenAI in Nigerian higher education, there is limited synthesis of empirical evidence regarding its usage, acceptance, outcomes, and policy implications. Therefore, this study systematically reviews existing literature to provide a comprehensive understanding of GenAI adoption among students, lecturers, and researchers, as well as the evolving policy landscape in Nigeria.

### A. Research Objectives

The aim of this study is to systematically review the current state of Generative Artificial Intelligence (GenAI) in Nigerian tertiary institutions.

The specific objectives are to:

- i. Examine the level of awareness and usage of GenAI among students and lecturers.
- ii. Identify the key factors influencing the adoption and acceptance of GenAI
- iii. Evaluate the impact of GenAI on academic practices and integrity.
- iv. Assess the existing policy and regulatory landscape guiding GenAI use in Nigerian higher education.

### B. Research Questions

This study is guided by the following research questions:

- i. What is the level of awareness and usage of GenAI among students and lecturers in Nigerian tertiary institutions?
- ii. What factors influence the adoption and acceptance of GenAI technologies?
- iii. How does GenAI affect academic practices, including teaching, learning, and assessment integrity?
- iv. What policies and frameworks currently guide the use of GenAI in Nigerian higher education?

## II. Literature Review

GenAI has quickly become the disruptive aspect of modern education, specifically in the field of higher education. It can produce human-like text, images, and multimodal products, which have transformed conventional methodologies of the teaching, learning and knowledge creation (Mello et al., 2023). In contrast to the previous implementations of artificial intelligence, GenAI functions with the help of sophisticated machine learning architectures that feature contextual comprehension, and content generation. Thus, making it an effective pedagogical instrument. This change has ignited a tremendous interest in literature to grasp its implications on academic contexts. The proliferation of GenAI technologies has been most influenced by the development of the large language models (e.g., ChatGPT) that proved to be exceptionally strong in natural language processing and generation (Su and Yang, 2023). These tools are gradually becoming a part of educational activities, allowing students to have a personalized learning experience with the ability to get feedback instantly. This has led to the fact that the lines between knowledge creation by humans, and machine-aided creation are becoming more permeable, both providing more opportunities and raising concerns by educators and policymakers. GenAI is extensively implemented in an academic writing context, generation of ideas, tutoring, and efficiency of administration in a higher education setting (Chan and Hu, 2023). These

tools are used by students to summarise more complicated materials, create essays and develop research ideas, and lecturers to develop content and provide feedback. This twofold application indicates that GenAI is quite versatile in supporting the teaching and learning processes, but its application has different implications depending on the scenario.

Theoretical knowledge of GenAI adoption mostly relies on already developed acceptance models, in particular, on the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT). Such models highlight the importance of the perceived usefulness, perceived ease of use and social influence in the determinants of the behavioral intentions of users (Ojo, 2024; Yakubu, 2025). Empirical evidence repeatedly shows that these factors are very much predictive of the probability of using GenAI tools in education. In the context of Nigerian higher education, the research has shown an increasing interest and the integration of GenAI in students and academic personnel. Studies have indicated that among students, writing-related processes, brainstorming and academic assistance are activities that students are especially excited to try using AI tools (Shittu, 2025; Apata, 2024). This tendency can be attributed to general trends in the world but also stresses the local contextual circumstances that have an impact on the adoption in the developing educational systems.

The awareness rates are high, but the quantity of information/knowledge and the appropriate use of GenAI tools can differ greatly among users. Although other students display a higher level of competency like timely engineering, other students will depend on the nature of the usage patterns that could result in a drag on the education benefits of the technologies (Izevbigie, 2025). Laws and regulations on the utilization of GenAI in education are still in development. Nigeria does not have a specific policy on AI in higher education. Rather, most of the institutions are using general laws that govern data protection as indicated by the Nigeria Data Protection Act (NDPA, 2023) and national strategies (National AI Strategy, 2024 on its draft). This is a regulatory loophole that causes doubt about acceptable use and accountability.

International bodies have also given guidelines on ethical use of AI in education through organizations like UNESCO and OECD, when using AI in education, they have ensured the guidelines are based on transparency, fairness as well as accountability. These models can be used as valuable resources to create context-based policies in Nigeria and other developing nations (Fulton et al., 2022; Gillani et al., 2023). Studies have shown that lecturers have mixed attitudes towards the adoption of GenAI as a result of empirical evidence. Whereas others acknowledge its potential to develop teaching and research, others are concerned with the effects it will have on academic standards and assessment integrity (Opesemowo, 2024). This disjuncture is where institutional support and professional development are required.

Social influence cannot be ignored as a factor that will determine GenAI adoption. Peer usage, institutional culture, and societal attitudes significantly affect individuals' willingness to adopt new technologies (Yakubu, 2025). Academic settings tend to follow an example of peers when it comes to using AI tools and their attitudes. Additionally, the quality of AI-generated information contributes to the important characteristics of user acceptance. Research indicates that in cases where users see AI outputs as true, useful, their trust and confidence in technology grows (Boubker, 2024). On the other hand, bad experiences can make people go with skepticism and less usage.

The other trend that is appealing is the ethical aspect of GenAI use in education. Data privacy, algorithmic bias, and transparency are just some of the key issues that should be considered to realize responsible adoption (Gillani et al., 2023). These issues are especially important in the situations when regulatory frameworks are being advanced. The convergence of GenAI with educational equity is becoming also a point of interest. Whereas AI technologies can help to democratize access to knowledge, digital inequality threatens to widen existing inequalities (Cho & Ofosu-Anim, 2025). Providing equal access is hence an important agenda among policy makers and institutions.

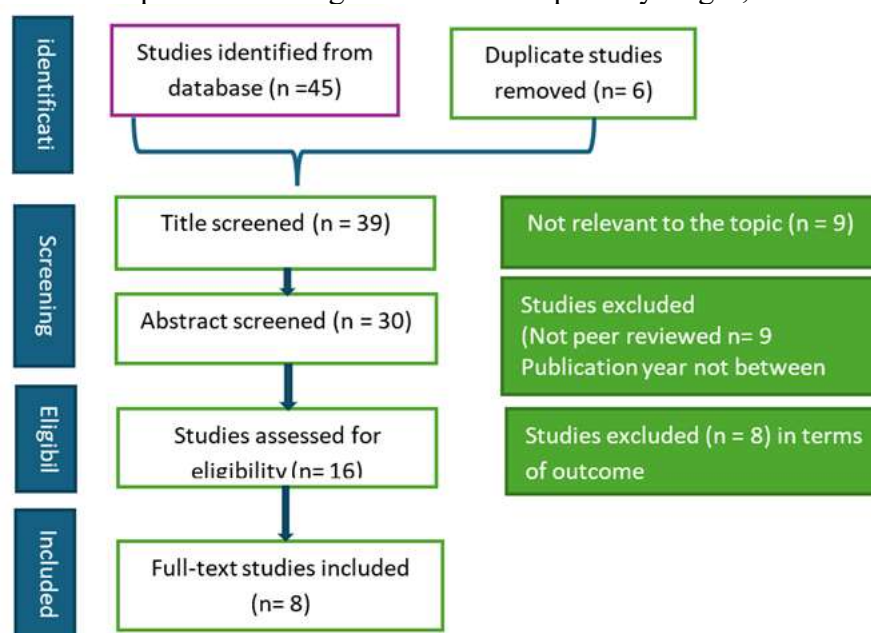
Studies also stress the need to make AI literacy part of the education program. To maximize the benefits and minimise harm, it is crucial to equip students and educators with skills to ethically and successfully utilise GenAI tools (Apata, 2024). It is not only that AI literacy involves technical prowess

but also critical consciousness of ethical and societal consequences. The evidence on GenAI in higher education shows a complicated opposition and interaction of opportunities and challenges. Although the potential of technology is high in terms of improving teaching and learning, its successful application takes into consideration ethical, pedagogical and institutional considerations. These challenges are further influenced by infrastructural short and long-term policy frameworks and changes. Therefore, this study systematically reviews existing literature on GenAI adoption among students, lecturers, and researchers, as well as the evolving policy landscape in Nigeria.

### III. Methods

This systematic review was conducted between 2022 and 2025 to investigate the current state of research on Generative Artificial Intelligence in Nigerian Tertiary Institutions. This was done following a robust protocol consistent with the established PRISMA processes. It focused on various aspects of GenAI incorporation in Nigerian Tertiary Institutions among students and lecturers. These included Use, perception, intention, outcomes, integrity issues, or governance of GenAI.

The systematic review process was organised into four primary stages, as illustrated in Fig. 1.



**Figure 1. The systematic reviews and meta-analysis (PRISMA) flowchart.**

We used sets of keywords, including use, perception, intention, outcomes, integrity issues, or governance of GenAI or ChatGPT, Nigerian HEI, and national policy documents. The timeframe and Language specified were 2022–Aug 21, 2025, and written in English language. We search through different databases e.g., Google Scholar, Scopus, ERIC, PubMed, AJOL, plus NUC and NITDA sites for policy.

In the second step, the inclusion and exclusion criteria were defined. Studies directly focused on GenAI and Nigeria Tertiary institution, policy or students or lecturers were included, while those purely on conceptual/commentary without Nigeria-specific data; K-12 only; non-GenAI AI, and lacking empirical research were excluded. The third step involved extracting information regarding the key focus, main findings, and the benefits of GenAI usage policy from the selected studies. The final step included data analysis of the existing capabilities of GenAI tools in Nigeria tertiary institutions, focus, design/framework, and main outcomes.

### IV. Results and Discussions

From multi-database searches, 8 empirical Nigerian HE studies met criteria; 3 policy/guidance documents were included for context, see Table 1.

**Table 1: Analysis of the 8 selected studies**

| Author (Year)                                 | Focus                                         | Design / Framework            | Main findings                                                                                                                               |
|-----------------------------------------------|-----------------------------------------------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Ojo (2024)                                    | Undergraduates across Nigerian HEIs           | Cross-sectional; TAM, PLS-SEM | Usefulness, ease of use, and social influence significantly predict intention; perceived risk is not significant.                           |
| Yakubu (2025)                                 | Computer Science students, Northern Nigeria   | Cross-sectional; UTAUT        | Performance expectancy, effort expectancy, social influence → intention; facilitating conditions, perceived risk, attitude not significant. |
| Apata (2024)                                  | Pre-service teachers (multiple Nigerian HEIs) | Cross-sectional; UTAUT        | Positive perceptions; drivers include access and perceived learning effectiveness; recommends training, guidelines, AI platforms.           |
| Shittu (2025)                                 | University of Ibadan students                 | Cross-sectional               | High awareness of ChatGPT; themes on benefits/concerns in student use.                                                                      |
| Opesemowo (2024)                              | Nigerian university lecturers                 | Cross-sectional               | Cautious attitudes toward ChatGPT for assessment; emphasises guidance/training.                                                             |
| Izevbigie (2025)                              | Nigerian HE sector (ethics analysis)          | Policy/ethics analysis        | Flags plagiarism, bias, infra-structure gaps; calls for responsible use frameworks.                                                         |
| Additional Nigeria-focused analyses (2024–25) | Students/educators                            | Mixed sources                 | Adoption rising; integrity and capacity gaps persist.                                                                                       |

In measuring the current state of research on Generative Artificial Intelligence among Nigerian Tertiary Institutions students, lecturers, and researchers. The primary model identified is the Technology Acceptance Model (TAM) (Ojo, 2024), which forms the basis for UTAUT and UTAUT2 (Apata, 2024; Yakubu, 2025).

Examining the selected studies, Student awareness is high (Shittu, 2025; Ojo, 2024); they use GenAI majorly on writing-related activities (Apata, 2024), and answering questions (Yakubu, 2025). brainstorming and idea generation (Ojo, 2024; Yakubu, 2025), language help (Apata, 2024; Shittu, 2025), and study support (Ojo, 2024). Other uses of GenAI among students include conducting preliminary literature searches, outlining, and creating initial drafts. It also supports literature studies and data analysis. Gen-AI aids in the composition process and performing translations (Yakubu, 2025; Shittu, 2025). It could be use during the post-writing like revisions, feedback, and evaluation (Apata, 2024; Ojo, 2024; Yakubu, 2025).

There are also related studies on the uses of Gen-AI by students that do not describe its applications. For instance, Izevbigie (2025) discovered that students who mastered prompt engineering could enhance their learning by generating more accurate and valuable responses from AI systems. Similarly, Yakubu (2025) observed that students' confidence in using Gen-AI is proportional to their experience.

Across multiple studies, perceived usefulness, performance expectancy, ease of use, and social influence consistently predict the intention to use generative AI (Shittu, 2025; Apata, 2024). The quality of GenAI's output and social influence also significantly impacts its acceptance (Boubker, 2024). As students become more familiar with GenAI, their usage patterns shift: they increasingly move from viewing it merely as a tool to recognizing it as a valuable though still supervised educational resource (Tossell et al., 2024). In contrast, perceived risk and facilitating conditions often show no significant effect (Shittu, 2025). Other research notes that perceived learning benefits and objective performance gains remain limited in higher education (Yakubu, 2025).

Meanwhile, lecturers acknowledge GenAI's potential but express concerns about content validity. They worry about plagiarism, unreliable AI detection tools, lack of transparency, and student over-reliance (Opesemowo, 2024). GenAI may produce plagiarized material, and its inherent biases

must be systematically measured (Jenko et al., 2024). Moreover, campus policies are increasingly moving toward requiring AI-use disclosure and AI-aware assessment design, rather than relying solely on detection-based approaches (Izevbigie, 2024). This study found that no AI-specific higher education policy currently exists in Nigeria. Instead, institutions are developing local policies guided by frameworks from UNESCO, the OECD, and Nigeria's National AI Strategy (NAIS). Key priorities include data protection (aligned with the NDPA), teacher training, assessment redesign, and equitable access.

Taken together, the reviewed studies should be read with some caution rather than at face value. Most rely on cross-sectional, self-report survey designs administered to convenience samples within single institutions, which limits generalisability across Nigeria's diverse higher education landscape and leaves causal claims about adoption drivers unverified. Measures of GenAI use and TAM/UTAUT constructs vary across studies, and few report validated instruments or address common-method bias, making direct comparison of effect sizes difficult. The apparent consensus on perceived usefulness and ease of use as predictors may partly reflect the shared theoretical lens applied across studies rather than fully independent confirmation, while inconsistent findings on perceived risk and facilitating conditions (Shittu, 2025) suggest the model may not travel cleanly to the Nigerian context without adaptation.

Positioned against evidence from other developing-country contexts, Nigeria's pattern of high awareness paired with uneven policy readiness is not unique. Studies from other Sub-Saharan African and South Asian higher education systems similarly report rapid, informal student uptake of GenAI tools that has outpaced institutional regulation, with universities relying on general data-protection or academic-integrity statutes rather than AI-specific policy, echoing Nigeria's reliance on the NDPA in the absence of a dedicated higher education AI policy. Where Nigeria's findings appear to diverge is in the relatively greater emphasis local studies place on infrastructural constraints, such as unreliable electricity and internet access, as a factor shaping GenAI adoption, a barrier less prominent in middle-income Asian contexts with stronger digital infrastructure. This suggests that while technology-acceptance predictors may be broadly transferable across developing regions, the relative weight of infrastructural versus attitudinal barriers is context-specific, and future comparative work explicitly benchmarking Nigerian findings against other African and Asian higher education systems would strengthen the evidence base.

## **V. Conclusion**

This study is a systematic review of GenAI adoption in Nigerian tertiary institutions. It revealed that there is a growing and mostly constructive adoption of GenAI among tertiary institutions students, lecturers and researchers in Nigeria. This is driven by their perceived usefulness and ease of use. While students and lecturers demonstrate generally positive attitudes, concerns around academic integrity, ethical use, and institutional readiness remain significant. The absence of a comprehensive national policy further highlights the need for coordinated regulatory efforts.

## **VI. Recommendations**

Based on the findings of this study, the following recommendations are proposed:

- i. Institutions should establish explicit guidelines on GenAI usage, particularly regarding academic integrity, disclosure requirements, and acceptable use during assessments.
- ii. Both students and lecturers should receive structured training on the ethical and effective use of GenAI tools to enhance learning outcomes and reduce misuse.
- iii. Investment in digital infrastructure is necessary to ensure equitable access to AI tools and reduce disparities among students.
- iv. The Nigerian government should accelerate the development of a comprehensive AI regulatory framework tailored to the education sector.

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