

ASSESSMENT OF THE USE OF ARTIFICIAL INTELLIGENCE IN SCIENCE EDUCATION RESEARCH IN NIGERIAN UNIVERSITIES: INSIGHTS, CHALLENGES, AND OUTCOMES

USMAN BINTA FATIMA

Science Education Department, Kwara State College of Education, Ilorin

<https://orcid.org/0009-0005-1822-0399>

Corresponding Author: bf_usman@kwcoeilorin.edu.ng

ABSTRACT The integration of Artificial Intelligence (AI) into science education is revolutionizing teaching, learning, and research practices globally. However, despite its potential, the adoption of AI in Nigerian universities remains nascent, with challenges impeding its widespread application. This research explores the role of AI in science education students across Nigerian universities, examining its insights, challenges, and outcomes. Using a qualitative research approach, this study investigates AI's impact on curriculum development, teaching methodologies, and research outcomes in selected Nigerian universities. The study also explores barriers such as infrastructural limitations, lack of skilled personnel, and institutional resistance to adopting AI technologies. Findings indicate that while AI tools are sparingly used, they offer significant potential for personalized learning and research innovation. However, inadequate resources, faculty training, and curriculum adaptation pose substantial challenges. The research concludes with recommendations on enhancing AI integration, including policy changes, strategic investments in infrastructure, and capacity-building programs for educators. This study provides insights into AI's future role in advancing science education in Nigerian universities.

KEYWORDS: Artificial Intelligence, Science Education, Research, Nigerian Universities, Challenges, Outcomes

I. INTRODUCTION

Artificial Intelligence (AI) is increasingly recognized as a transformative element in education, providing innovative tools and methodologies that can significantly enhance learning experiences. In Nigeria, the integration of AI technologies within universities is gaining traction, prompting a critical examination of their effects on students' academic performance. Recent research underscores the potential advantages of AI in educational environments, particularly in fostering student motivation and engagement. For example, a systematic review by García-Martínez et al. (2023) revealed that AI can improve students' attitudes towards learning, aiding in the comprehension of complex subjects while offering personalized educational experiences. Artificial Intelligence (AI) has transformed various industries, including education, by providing significant advantages in science education. These benefits include tailored learning experiences, automated grading processes, adaptive learning technologies, and improved research capabilities. However, universities in Nigeria encounter major obstacles in adopting AI due to issues related to infrastructure, technology, and workforce skills. This paper examines how AI is being utilized in science education subject at Nigerian universities. It looks into the current level of AI integration, the challenges faced, and the outcomes of these efforts. Understanding these factors is essential for developing effective strategies to maximize AI's potential in improving education quality and research within Nigerian institutions. A study by Bilal et al. (2024) highlighted that Artificial Intelligence (AI) is becoming a game-changer in education, providing new methods to improve teaching and learning. Technologies like machine learning, natural language processing, and intelligent tutoring systems can greatly enhance the educational

experience by offering personalized learning, automating administrative tasks, and giving immediate feedback to students. In science education specifically, AI helps students grasp complex ideas through interactive platforms and simulations. It also aids teachers by automating grading, tracking student progress, and customizing instructional materials to fit individual student needs (Olatunde-Aiyedun, 2024).

The implementation of Artificial Intelligence (AI) in education, especially in Nigerian universities, has been relatively slow. Although AI offers many promising benefits, several factors hinder its widespread use in higher education institutions across Nigeria. Key among these is inadequate infrastructure, which includes unreliable internet access, outdated hardware, and limited availability of advanced AI tools (Adeniran et al., 2024). Additionally, there is a significant absence of AI-focused curricula and training programs for faculty, which are essential for equipping educators to effectively integrate AI tools into their teaching and research practices (Shin et al., 2024). While AI has demonstrated considerable potential to enhance research capabilities and curriculum development in other regions, its benefits remain largely untapped in Nigeria due to ongoing budget constraints and gaps in technological infrastructure. According to Yakubu et al. (2024) indicated that Nigerian universities has traditionally faced challenges such as insufficient funding, limited access to state-of-the-art research tools, and a reliance on conventional teaching methods. As a result, the integration of AI in research practices has been minimal, and there is a lack of substantial evidence on its impact on academic outcomes. Despite these challenges, some Nigerian universities have begun exploring AI-based teaching tools and research applications, albeit at a limited scale. Faculty members have expressed interest in using AI for research data analysis and enhancing classroom experiences, but the lack of training and support for AI implementation remains a persistent issue (Shin et al., 2024).

In recent years, the application of AI in education has been met with both enthusiasm and skepticism. While AI systems promise to provide personalized learning experiences, streamline administrative processes, and enhance teaching methodologies, their actual impact on academic achievement among students in Nigerian Universities is not well-documented. This study aims to investigate the role of Artificial Intelligence (AI) in science education courses in Nigerian universities, focusing on the insights, challenges, and outcomes related to AI adoption. The research intends to explore how AI can be utilized to fill existing gaps in higher education in Nigeria and enhance teaching methods and research outputs. By examining the current status of AI integration in these universities, this paper will contribute to a better understanding of the opportunities and limitations of AI within the context of higher education in Nigeria. Although AI has shown transformative potential in global education, Nigerian universities have been slow in adopting these technologies. In science education departments, AI could support innovative research methodologies, improve learning outcomes, and enhance administrative processes. However, the lack of proper infrastructure, insufficient training for faculty, and inadequate AI-centric curricula hinder the full utilization of these technologies. As a result, there is a need to investigate the extent of AI's application in Nigerian universities and the barriers hindering its broader adoption.

The purpose of this study is to explore the application of Artificial Intelligence (AI) in science education department at Nigerian universities. Specifically, the study aims to

- a) investigate the current level of AI integration in science education subject in Nigerian universities
- b) identify the challenges faced in adopting AI, and assess its impact on teaching, learning, and research outcomes.
- c) examine how AI technologies influence research outcomes in science education departments in Nigeria Universities?

II. RELATED WORKS

The integration of Artificial Intelligence (AI) into education has been extensively researched and is recognized for its ability to tailor learning experiences, boost student engagement, and enhance teaching methods. According to Bilal et al., (2021) AI-driven educational technologies, such as intelligent tutoring systems (ITS) and learning analytics, provide personalized educational experiences that adapt to the unique

needs of each student. These systems have proven effective in improving student outcomes by offering immediate feedback and customizable learning paths. The increasing use of AI in online learning platforms, particularly in science education, has been associated with greater learning efficiency and accessibility (Mupaikwa, 2025). Moreover, AI tools are being utilized to automate administrative tasks, allowing educators to dedicate more time to meaningful interactions with students instead of getting bogged down by administrative responsibilities (Shin et al., 2024).

However, the growing adoption of AI in education also presents challenges for educators. Halili (2019) pointed out the necessity for technological advancements in the context of Education 4.0, while Gao et al. (2021) discussed essential technologies in AI and data-driven e-learning. Successful AI implementation in educational settings hinges on overcoming barriers related to digital literacy, ethical issues, and the need for adequate training for educators to effectively employ AI tools in the classroom (Nwadinobi et al., 2024). These challenges may impede the effective use of AI technologies, thereby influencing both teaching methodologies and student learning outcomes. According to Olatunde-Aiyedun (2024) highlight the potential of AI in enhancing research output in science education departments, particularly in areas such as data analysis, algorithm development, and model optimization. Additionally, AI applications like machine learning platforms are being used to train students in real-world applications of AI, thus bridging the gap between theoretical knowledge and practical skills (Yakubu, et al., 2024). However, the integration of AI into the curriculum often faces challenges, including a lack of qualified instructors and a shortage of resources for AI-focused coursework and projects (Yadav,(2025).

Despite the vast potential of AI in transforming education, Nigerian universities have faced significant obstacles in adopting these technologies. Yakubu et al., (2024) identify infrastructural issues, such as poor internet connectivity, outdated hardware, and limited access to AI tools, as the primary barriers to AI integration. Moreover, the lack of faculty training in AI and the absence of AI-centric curricula have impeded the effective implementation of AI in science education departments. Shin et al., 2024) further emphasize the importance of faculty development, noting that effective AI adoption requires educators to not only integrate AI tools into their teaching but also to be well-versed in AI concepts themselves. In addition to technological barriers, institutional resistance to change and limited funding has slowed down AI adoption in Nigerian universities. Adeniran, et al. (2024) argue that while there is significant interest in AI among Nigerian students, the lack of support from university administrations and policymakers has hampered the development of AI-driven education initiatives. Furthermore, the adoption of AI is often limited to a few progressive institutions, while the majority of universities remain reliant on traditional teaching methods.

Although the adoption of AI in Nigerian universities remains limited, there are indications that its use has started to yield positive results. For instance, AI-based tools have shown promise in improving research outcomes by enabling better data analysis and enhancing computational efficiency (Olatunde-Aiyedun, 2024). Additionally, some universities have started implementing AI for administrative tasks, streamlining course registration, grading, and student performance monitoring, which enhances operational efficiency (Adeniran et al., 2024). However, as Yakubu et al. (2023) point out, these initiatives are often small-scale and lack institutional support to expand their impact across the country. Despite the existing barriers, some Nigerian universities have shown initiative in integrating AI into their educational frameworks. The development of AI-centric programs, collaboration with industry partners, and participation in global AI research networks have allowed certain institutions to advance in AI integration (Bilal et al., 2024). However, as Olatunde-Aiyedun (2024) highlight AI to reach its full potential in Nigerian universities, strategic efforts must be made to overcome infrastructural and educational challenges. This includes policy support from the government, funding for technology infrastructure, and a commitment to faculty development.

III. METHODOLOGY

A qualitative research design was adopted; a stratified random sampling technique was employed to ensure representation from different universities and academic levels. A sample size of 400 respondents was used, depending on the total number of science education undergraduates and their faculty lecturer. This sample size is deemed sufficient to achieve reliable and generalizable results. A structured questionnaire was developed using Google form to collect quantitative data on students and their lecturers based on the 3 research questions, 6 universities was randomly selected based on their reputation and focus on science education. A survey was administered to 350 students and 50 faculty lecturers with questions designed to assess their experiences and perceptions of AI in the curriculum and research practices. Data was analyzed using simple percentage and descriptive statistics for the survey responses.

Research Questions

1. What is the current level of AI integration in science education courses in Nigerian universities?
2. What are the main challenges faced by Nigerian universities in adopting AI in science education department
3. How do AI technologies influence lecturers research outcomes in science education departments in Nigeria Universities?

IV. RESULTS AND DISCUSSION

A. Presentation and Analysis of Data

The data collected from Table 1 reveals that 46% of the respondents were male and female 54%, constituting 100% of the total responses. This clearly shows that there was a balance representation of students.

Table 1: Gender of students

Gender	Frequency	Percentage (%)
Male	161	46%
Female	189	54%
Total	350	100%

Source: Field survey, 2025

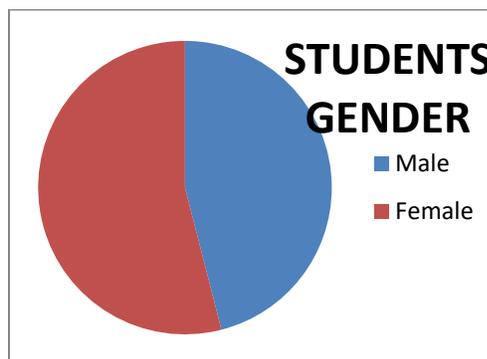


Figure 1: Chart Showing Gender Differences of Students

Table 2: Gender of Faculty Lecturers

Gender	Frequency	Percentage (%)
Male	33	65%
Female	17	35%
Total	50	100%

Source: Field survey, 2025

The data collected from Table 2 reveals that 65% of the respondents were male and female 35%, constituting 100% of the total responses. This clearly shows that there was a balance representation of faculty lecturers in the study

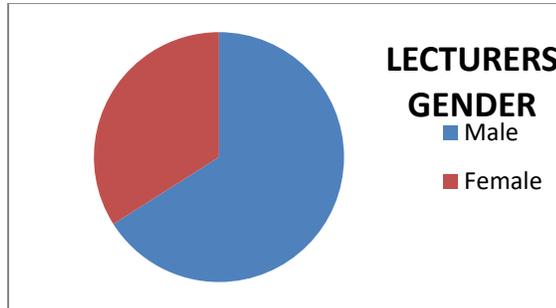


Figure 2: Lecturer’s Gender Differences

Table 3: Educational Level of students Respondents

Options	Frequency	Percentage
100 Level	90	25.8%
200 level	98	28%
300 level	86	24.5
400 level	76	21.7
Total	350	100%

Source: Field survey, 2025

The data in table 3 shows the distribution of responses respondents of different educational levels. Among the 350 responses, the majority (25.8%) were from students in 100 Level, indicating a significant representation from this group. This could imply that students in their second year were more actively engaged or accessible for the survey than students at other academic levels requirements.

Table 4: Impact of AI on Teaching and Learning

Impact of AI on Teaching and Learning	Faculty lecture (%)		Students (%)		Overall (%)
	SA+A	SD+ D	SA+A	SD+ D	
Its improved my learning/teaching experiences	35(70%)	15(30%)	228(65%)	122(35%)	100%
Its personalized my learning/teaching paths	28(55%)	22(45%)	210(60%)	140(44%)	100%
Its increased my engagement	30(60%)	20(40%)	217(62%)	133(38%)	1005%
Total (%)	100%		100%		100%

Source: Field survey, 2025

The above Table 4 indicates that 30 (70%) out of 50 faculty lecturers and 228(65%) out of 350 students reported that AI has improved learning/teaching experiences, primarily through personalized feedback and adaptive learning tools, 28 (55%) of 50 faculty lecturers and 210(60%) of students noted that AI has helped to create personalized teaching/learning paths, enhancing the learning process for individual students, while

30 (60%) of faculty lectures and 217(62%) of students agreed that AI increased student engagement, suggesting AI's potential for making learning more interactive and dynamic.

Research Question 1

Table 5: Investigate the current level of AI integration for science education student in Nigerian universities.

Level of AI Integration	Frequency		Percentage	TOTAL
	SA+A	SD+D		
No AI integration in the subject offering	220(65%)	110(45%)		100%
There is a Basic AI courses/programs	100(25%)	250(75%)		100%
There is Advanced AI courses/programs	120(20%)	230(800%)		100%

Source: Field survey, 2025

The item in the table 5 shows that 65% of respondents reported that their universities do not currently integrate AI in the science education curriculum, which shows that AI adoption in Nigerian universities is still in its infancy. 25% indicated that basic AI courses are not being introduced, with institutions starting to incorporate some AI content into the curriculum. 20% reported advanced AI courses, indicating that only a small number of institutions have fully developed AI programs. The low percentage of advanced AI courses suggests that most Nigerian universities have not yet fully integrated AI into their science education. There is a need for increased curriculum development and institutional investment in AI tools and resources.

Research Question 2

Table 6: Identify the challenges faced in adopting AI, and assess its impact on teaching, learning, and research outcomes

Challenges	Students Frequency/%		Faculty lecturer Frequency/Percentage		TOTAL
	SA + A	SD+D	SA+A	SD+D	
Lack of infrastructure	200(57%)	150(43%)	35(70%)	15(30%)	100%
Insufficient faculty training	220(63%)	130(37%)	28(55%)	22(45)	100%
Resistance to change	224(64%)	126(36%)	30(60%)	20(40%)	100%

Source: Field survey, 2025

Table 6 above indicates that (200)57% out of 350 students and 35 (70%) out of 50 faculty lecturer respectively identified lack of infrastructure as the major barrier to adopting AI. This includes issues such as poor internet connectivity, outdated hardware, and limited access to AI tools, 220(63%) of students and 28 (55%) faculty lecturers respectively pointed to insufficient faculty training, highlighting the need for professional development programs. While (224)64% and 30 (60%) respectively mentioned resistance to

change, with faculty or administrative reluctance to adopt AI-driven methods due to traditional teaching preferences.

Research Question 3

Table 7: Examine how AI technologies influence lecturer’s research outcomes in science education departments in Nigerian universities.

Impact of AI on Research Outcomes	Faculty lecturers (%)	Research Productivity Improvement	Overall (%)
Improved data analysis and modeling	23(45%)	Significant productivity boost 27(55%)	100%
Enhanced research accuracy	30(60%)	Notable improvement 20(40%)	100%
Increased research efficiency	25(50%)	Increase in productivity 25 (50%)	100%
Total (%)	100%	100%	100%

Source: Field survey, 2025

The above 7 table indicated that 23(45%) of faculty lecture reported that AI tools have helped improve data analysis and modeling, making it easier to work with large datasets and complex algorithms. 27(55%) accept that it has significant productivity boost, 30 (60%) of faculty lecturers reported a significant increase in research productivity due to AI tools, particularly in fields like machine learning and artificial intelligence. 20(40%) agreed with notable improvement 25(50%) of faculty lecturers noted that AI has enhanced research accuracy, especially in areas requiring extensive computational work. While 25(50%) also noted that it increases in productivity AI tools are perceived to have a positive impact on both teaching and learning, with a strong agreement on their ability to improve learning/teaching experiences and student engagement. However, challenges in infrastructure and faculty preparedness remain significant barriers to wider adoption. AI has had a notable impact on improving research outcomes in Nigerian universities, particularly in the areas of data analysis, modeling, and overall productivity. AI tools allow researchers to handle more complex problems and achieve more accurate results in less time.

V. CONCLUSION

AI holds significant promise in transforming science education in Nigerian universities. While its adoption is still in its early stages, there is substantial potential for AI to enhance both teaching and research outcomes. However, the integration of AI faces several challenges, including limited infrastructure, insufficient training, and institutional resistance. To fully harness AI’s potential, Nigerian universities need targeted policies, improved funding for technology infrastructure, and comprehensive training programs for educators. Based on the research findings the researcher made the following recommendations:

- a) Nigerian universities should invest in robust IT infrastructure, including high-speed internet and modern computing equipment, to support AI applications.
- b) Nigerian Universities should update their curricula to incorporate AI-related courses and research methodologies, ensuring students are equipped with relevant skills.

- c) Faculty Training Institutions should provide ongoing training and professional development opportunities for faculty members to increase AI literacy.
- d) Universities should seek collaborations with international institutions and industry leaders to facilitate knowledge exchange and access to AI resources.
- e) The Nigerian government, curriculum planners and educational bodies should develop policies that support the strategic integration of AI in higher education.

REFERENCES

- [1] Yakubu, M. A., Yakubu, U., Yakubu, H., & Mayun, F. A. (2024). Artificial intelligence applications in sustainable Agriculture in Nigeria: A comprehensive review. *Journal of Basics and Applied Sciences Research*, 2(4), 84-94.
- [2] Adeniran, T. A. A., Adeyemi, T., Daranijo, S. B. D., Bidemi, S., Lawal, Z. O. L., & Olawumi, Z. (2024). assessment of student-teachers'awareness and utilization of artificial intelligence (ai) at ekiti state university. *International Journal of Innovative Technology Integration in Education*, 7(2), 54-63.
- [3] Bilal, M., Algethami, A. A., & Hameed, S. (2024). Review of computational intelligence approaches for microgrid energy management. *IEEE Access*.
- [4] Mupaikwa, E. (2025). Transforming Higher Education Through Technology: The Impact of Artificial Intelligence in Education 5.0. In *Impacts of AI on Students and Teachers in Education 5.0* (pp. 553-580). IGI Global Scientific Publishing.
- [5] Olatunde-Aiyedun, T. G. (2024). Artificial intelligence (AI) in education: integration of AI into science education curriculum in Nigerian universities. *International Journal of Artificial Intelligence for Digital*, 1(1).
- [6] García-Martínez, I., Fernández-Batanero, J. M., Fernández-Cerero, J., & León, S. P. (2023). Analysing the Impact of Artificial Intelligence and Computational Sciences on Student Performance: Systematic Review and Meta-analysis. *Journal of New Approaches in Educational Research*, 12(1), 171-197.
- [7] Halili, S. H. (2019). Technological advancements in education 4.0. *The Online Journal of Distance Education and E-Learning*, 7, 63–69.
- [8] Shin, C., Seo, D. G., Jin, S., Lee, S. H., & Park, H. J. (2024). Educational Technology in the University: A Comprehensive Look at the Role of a Professor and Artificial Intelligence. *IEEE Access*.
- [9] Yadav, S. (2025). Digital pathways to excellence for bridging gaps and building competencies. *Holistic approaches to teacher development: Leadership, pedagogical practices, and cognitive insights: Leadership, pedagogical practices, and cognitive insights*, 287.
- [10] Nwadinobi, V. N., Etele, V. A., Ezebube, N. C., Monyei, F. E., & Ukpere, W. I. (2024). The Impact Of Artificial Intelligence On Undergraduates' Effectiveness In Institutions Of Higher Learning. *Educational Administration: Theory and Practice*, 30(4), 6989-6996.