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Exploring AI capacity building programs in Nigerian higher education institutions: A study of curriculum design, faculty competence, and student engagement

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Abstract

Artificial Intelligence (AI) is transforming education globally, necessitating the integration of AI capacity-building programs in higher education institutions. This study explored the state of AI capacity building programs in Nigerian higher education institutions, focusing on curriculum design, faculty competence, and student engagement. A descriptive survey research design was adopted, and data were collected using a structured four-point Likert scale questionnaire. The population of the study comprised 79,668 staff from federal and state universities in Nigeria. the sample size for the study consisted of 7,967 staff from selected universities in Nigeria. A structured questionnaire duly validated with reliability index of 0.80 was used for data collection. Data analysis was conducted using mean and standard deviation, with a criterion mean of 2.50 for decision-making. Findings revealed that AI curriculum integration is moderate, with limited interdisciplinary adoption and infrequent periodic reviews. Faculty members demonstrated low AI competence due to inadequate training and expertise, while student engagement in AI learning was moderate, characterized by active participation in AI projects but restricted access to AI research opportunities. The major challenges hindering AI education included insufficient funding, inadequate faculty expertise, and a lack of AI infrastructure. The study recommended increased funding, faculty training, interdisciplinary AI curriculum development, enhanced student research opportunities, industry partnerships, and regular curriculum reviews. These measures will help improve AI education in Nigerian universities and enhance the country's competitiveness in the global AI landscape.

Keywords: Artificial Intelligence, Higher Education, Curriculum Design, Faculty Competence, Student Engagement, AI Capacity Building.

Introduction

Artificial Intelligence (AI) is transforming education globally, influencing teaching, research, and administrative processes. AI-powered technologies such as intelligent tutoring systems, predictive analytics, and automated grading have revolutionized traditional learning methods, making education more efficient and personalized (Luckin et al., 2018; Iroriteraye-Adjekpovu, 2021, 2012; Oyovwi & Iroriteraye-Adjekpovu, 2022). Many universities world wide have recognized the potential of AI and are integrating it into their curricula to equip students with relevant skills. AI literacy is increasingly being viewed as essential for graduates across various disciplines, not just computer science and engineering.

Higher education institutions (HEIs) play a fundamental role in AI capacity building by training future professionals, fostering innovation, and conducting AI-related research. In developed countries, universities have designed comprehensive AI curricula that include machine learning, deep learning, natural language processing, robotics, and AI ethics (Zawacki-Richter et al., 2019). Moreover, faculty development programs have been established to ensure that educators possess the necessary competencies to teach AI effectively. These initiatives are complemented by student engagement strategies, including AI research projects, hackathons, and industry-academia partnerships, all of which contribute to a well-rounded AI education system.

Despite the global push for AI integration in higher education, Nigerian universities face significant challenges in adopting and implementing AI capacity-building programs. While some universities have introduced AI courses, these efforts remain fragmented and inconsistent across institutions (Adegbite, 2021). A key challenge is the lack of a standardized AI curriculum, which has resulted in varying levels of AI exposure among students. Many Nigerian universities embed AI topics within computer science programs rather than offering dedicated AI courses, thereby limiting students' in-depth understanding of the subject (Okonkwo & Eze, 2022). Furthermore, there is often a disconnect between university curricula and industry needs, leading to a mismatch between graduates' skills and labor market demands.

Faculty competence is another major determinant of AI education effectiveness. AI requires specialized knowledge that many university lecturers in Nigeria lack due to limited training opportunities (Olaleye, 2023). Studies have shown that most Nigerian faculty members rely on self-learning and online courses to acquire AI knowledge, which may not always provide the depth of expertise required for effective teaching (Adegbite, 2021). Moreover, access to AI research funding, professional development programs, and collaboration with international AI experts remains limited. Without adequate faculty training, universities struggle to deliver AI courses effectively and provide students with the necessary practical experience (Okonkwo & Eze, 2022).

Student engagement is also a crucial factor in AI education, as active participation in AI-related activities enhances learning outcomes (Kühl et al., 2021). Globally, universities

encourage students to participate in AI competitions, industry projects, and collaborative research initiatives to apply theoretical knowledge in practical settings. However, in Nigeria, student engagement in AI remains relatively low due to inadequate access to AI laboratories, limited mentorship programs, and a lack of institutional support (Uche et al., 2022). Many students interested in AI struggle to find the resources and opportunities needed to develop practical AI skills, ultimately affecting their preparedness for AI-related careers.

Government policies and regulatory frameworks influence AI education in Nigeria. The National Universities Commission (NUC) and other regulatory bodies have acknowledged the importance of AI and have included digital literacy in their policy agenda (Olaleye, 2023). For instance, the National Digital Economy Policy and Strategy (NDEPS) advocates for AI adoption in education as part of Nigeria's digital transformation strategy. However, the implementation of these policies has been slow, and many universities still lack clear guidelines on AI curriculum development and faculty training (Adegbite, 2021). Additionally, industry-academia collaborations, which are essential for practical AI training, remain weak in Nigeria, limiting students' exposure to real-world AI applications.

Despite the growing body of research on AI education globally, there is limited empirical evidence on how Nigerian universities are implementing AI capacity-building programs. Previous studies have explored AI education from various perspectives, such as curriculum integration, faculty competence, and student engagement, but few have examined the interplay of these factors within Nigerian higher education institutions (Okonkwo & Eze, 2022; Uche et al., 2022). There is a need for a comprehensive study that assesses AI curriculum design, evaluates faculty readiness to teach AI, and examines the level of student participation in AI-related activities. Understanding these dimensions will provide valuable insights for policymakers, university administrators, and educators seeking to improve AI education in Nigeria.

Given the increasing relevance of AI in education and the workforce, it is crucial to investigate how Nigerian universities are preparing students and faculty for AI-driven futures. Existing research highlights challenges related to curriculum gaps, faculty training deficits, and low student engagement in AI learning (Adegbite, 2021; Uche et al., 2022). However, there remains a lack of empirical studies that holistically examine AI capacity building in Nigerian higher education institutions. This study seeks to fill that gap by providing a detailed analysis of AI curriculum design, faculty competence, and student engagement. The findings will inform strategies for improving AI education in Nigeria, ensuring that universities produce graduates equipped with the skills needed to thrive in an AI-driven world.

Artificial Intelligence (AI) is rapidly transforming education and industry, making AI literacy essential for students and faculty in higher education. While universities globally are integrating AI into their curricula, Nigerian universities face significant challenges in developing AI capacity-building programs. These challenges include inadequate curriculum

design, limited faculty expertise, and low student engagement, which hinder Nigeria's competitiveness in the global AI landscape.

Many Nigerian universities lack a structured AI curriculum, with AI content often embedded within broader computer science courses. This fragmented approach limits students' exposure to key AI concepts and practical applications. Additionally, faculty members often lack formal AI training, relying on self-learning due to limited access to professional development programs. Without adequately trained lecturers, AI education remains suboptimal.

Student engagement in AI is also low due to insufficient research opportunities, inadequate institutional support, and weak industry-academia collaborations. Unlike their counterparts in more technologically advanced countries, Nigerian students have fewer opportunities to participate in AI projects, competitions, and internships, reducing their preparedness for AI-driven careers.

Given these challenges, this study examines the extent of AI integration in Nigerian universities, evaluates faculty competence in AI instruction, and assesses student engagement in AI learning activities. Findings from this study will provide insights for improving AI education and fostering AI capacity-building programs in Nigerian higher education institutions.

Purpose of the Study

The purpose of this study is to examine the state of AI capacity-building programs in Nigerian higher education institutions by investigating curriculum design, faculty competence, and student engagement. Specifically, the study aims to:

1. Examine how AI is integrated into the curriculum of Nigerian higher education institutions.
2. Assess the level of AI competence among faculty members in Nigerian universities.
3. Evaluate the extent of student engagement in AI-related learning activities in Nigerian universities.
4. Identify challenges and opportunities in AI capacity-building programs within Nigerian higher education institutions.
5. Provide recommendations for enhancing AI education in Nigerian universities.

Research Questions

The study is guided by the following research questions:

1. How is AI integrated into the curriculum of Nigerian higher education institutions?
2. What is the level of AI competence among faculty members in Nigerian universities?
3. To what extent are students engaged in AI-related learning activities in Nigerian universities?
4. What are the challenges and opportunities in AI capacity-building programs within Nigerian higher education institutions?

5.   What strategies can be adopted to enhance AI education in Nigerian universities?

Review of Related Literature

The study is hinged on the Technological Pedagogical Content Knowledge (TPACK) framework.The TPACK framework was propounded by Mishra and Koehler in 2006. The theory states that effective teaching with technology requires an integration of technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK) to enhance learning outcomes. According to this framework, teachers must not only understand the subject matter (content knowledge) and how to teach it effectively (pedagogical knowledge) but also how to integrate appropriate technologies to facilitate learning (technological knowledge). The successful combination of these three components enables educators to design and implement instructional strategies that leverage technology to enhance teaching and learning.

Relevance of the Theory to the Current Study

The TPACK framework is highly relevant to this study as it provides a theoretical foundation for examining faculty competence in delivering AI education in Nigerian universities. AI teaching requires specialized knowledge that combines AI concepts (content knowledge), effective instructional strategies (pedagogical knowledge), and the use of AI tools and digital technologies (technological knowledge). The extent to which faculty members possess and integrate these three knowledge domains determines the effectiveness of AI curriculum delivery and student engagement. By applying the TPACK framework, this study evaluates the preparedness of faculty members to teach AI courses, the quality of AI curriculum design, and the role of technology in AI education. Understanding these aspects will provide insights into the strengths and gaps in AI capacity-building programs in Nigerian higher education institutions.

Several empirical studies have explored AI capacity-building programs in higher education, focusing on curriculum design, faculty competence, and student engagement. Adegbite (2021) conducted a study titled "Artificial Intelligence Education in African Universities: Challenges and Opportunities." The study adopted a descriptive survey design and was guided by three research questions and two hypotheses. The population comprised faculty members and students from AI-related courses across ten African universities, with a sample of 300 participants selected through stratified random sampling. A structured questionnaire was used for data collection, and the instrument was validated by AI education experts, yielding a reliability coefficient of 0.84. Data were analyzed using descriptive statistics and t-tests. Findings revealed that AI education in African universities is fragmented, with outdated curricula and limited faculty training. The study concluded that AI adoption requires standardized curricula, faculty development, and industry collaboration.

Similarly, Okonkwo and Eze (2022) assessed faculty competence in teaching AI courses in Nigerian universities in their study titled "Assessing Faculty Competence in Teaching AI Courses in Nigerian Universities." The study employed a mixed-method

research design, guided by three research questions and three hypotheses. The population consisted of AI lecturers in public and private universities in Nigeria, with 150 lecturers selected using purposive sampling. A questionnaire and semi-structured interviews were used for data collection. The instrument, validated by AI specialists, had a reliability coefficient of 0.89. Data were analyzed using ANOVA and thematic analysis. Findings indicated that most AI lecturers lacked formal AI training and relied on self-learning due to limited access to professional development programs. The study concluded that structured training and certification programs are necessary to improve faculty competence in AI education.

In a global study, Li, Chen, and Zhang (2021) examined student engagement in AI learning in their research titled "Student Engagement in AI Learning: A Global Perspective." The study adopted a longitudinal survey design with four research questions and two hypotheses. The population included university students enrolled in AI-related programs across five countries, and a sample of 500 students was selected using stratified random sampling. A questionnaire and focus group discussions served as research instruments, with expert validation ensuring content accuracy and a reliability coefficient of 0.91. Data were collected at multiple time points and analyzed using regression analysis. The study found that active learning approaches, such as AI projects and competitions, significantly improved student engagement. The researchers concluded that hands-on learning experiences should be integrated into AI education to enhance student participation and skill development.

Uche, Chinedu, and Adeyemi (2022) explored the role of industry-academia collaboration in AI education in their study titled "Industry-Academia Collaboration in AI Education: A Case Study of Selected Nigerian Universities." The research employed a case study design, guided by three research questions and two hypotheses. The population included AI faculty members and industry professionals collaborating with universities. A sample of 20 faculty members and 15 industry experts was selected through purposive sampling. Data were collected using an interview guide and document analysis, with validity ensured by AI policy experts and reliability strengthened through triangulation. Thematic analysis was used for data interpretation. Findings indicated that weak collaboration between universities and AI industries, due to inadequate funding and infrastructure, hindered AI education. The study concluded that stronger industry-academia partnerships are needed to enhance AI education and research in Nigeria.

Miao, Holmes, Huang and Zhang (2021) examined AI curriculum development in higher education institutions in their study titled "Evaluating AI Curriculum Development in Higher Education Institutions." The study utilized a quantitative survey research design with five research questions and three hypotheses. The population comprised university administrators and AI curriculum developers across Asia and Europe, with a sample of 400 respondents selected through cluster sampling. Data were collected using an online questionnaire validated by curriculum experts, with a reliability coefficient of 0.87. Structural equation modeling was used for data analysis. Findings revealed that AI curriculum design was more advanced in countries with national AI education policies, leading to better

integration of AI in higher education. The study concluded that developing a standardized AI curriculum framework is essential for improving AI education quality in universities.

The reviewed studies highlight key challenges in AI capacity building, including fragmented curricula, inadequate faculty training, low student engagement, and weak industry-academia collaboration. However, these studies either focus on broader African or global contexts, lack comprehensive analysis of AI curriculum design in Nigerian universities, or do not integrate faculty competence and student engagement into a single framework. Additionally, there is limited empirical evidence on how these factors interact to influence AI education effectiveness in Nigeria. This study fills the gap by providing a holistic assessment of AI curriculum integration, faculty competence, and student engagement within Nigerian higher education institutions, offering context-specific insights and recommendations for enhancing AI capacity building.

Materials and Methods

The study adopted a descriptive survey research design to assess AI capacity-building programs in Nigerian higher education institutions. This design was appropriate as it enabled the systematic collection and analysis of data on AI curriculum integration, faculty competence, and student engagement (Johnson & Brown, 2022). The estimated population for the study was 79,668, comprising faculty members, and academic administrators in Nigerian universities offering AI-related courses. Faculty members involved in AI teaching, and administrators responsible for curriculum development formed the target population.A total sample of 7,967 staff was selected using a stratified random sampling technique to ensure representation across faculty, students, and administrators. Stratification was based on institution type and AI program availability to achieve a balanced representation (Williams, 2023). The study utilized a four-point structured questionnaire as the primary data collection instrument. The questionnaire was divided into sections covering demographic information, AI curriculum integration, faculty competence, student engagement, and challenges and opportunities in AI education.

To ensure the validity of the instrument, the questionnaire was reviewed by AI education experts and curriculum specialists, who assessed its relevance, clarity, and comprehensiveness. Face and content validity were established to confirm the appropriateness of the items in measuring the variables under investigation. As for the reliability, atrial test was conducted with 30 respondents who were not part of the main study sample. The reliability of the instrument was determined using Cronbach's alpha coefficient, which yielded a reliability index of 0.80, indicating a high level of internal consistency (Garcia et al., 2023).Data were collected through both online and physical questionnaire distribution. Respondents were informed about the purpose of the study, and consent was obtained before participation. The confidentiality of responses was assured, and respondents were encouraged to provide honest and accurate information. The data collection process spanned four weeks to ensure a high response rate and comprehensive coverage.

Quantitative data were analyzed using mean and standard deviation to answer the research questions. The mean was used to determine the extent of AI curriculum integration, the level of faculty competence, and student engagement in AI-related activities, while the standard deviation provided insights into the variability of responses across institutions. A criterion mean of 2.50 was used as the benchmark for decision-making. Responses with a mean score of 2.50 or above were considered positive, indicating sufficient AI curriculum integration, faculty competence, or student engagement, while responses with a mean score below 2.50 were considered inadequate. Open-ended responses on challenges, opportunities, and strategies for improving AI education were analyzed thematically to identify common themes and patterns.

Results and Discussion

Results: The results of the analyzed data are presented in tables according to the research questions. The data were analyzed using mean and standard deviation, with a criterion mean of 2.50 used for decision-making. A mean score of 2.50 and above indicated a positive response, while a mean score below 2.50 indicated a negative response.

Research Question 1: How is AI integrated into the curriculum of Nigerian higher education institutions?

Table 1: Mean and Standard Deviation of AI Curriculum Integration in Nigerian Higher Education Institutions

S/N	Items on AI Curriculum Integration	Mean ($\bar{X}$)	Standard Deviation (SD)	Decision
1	AI-related courses are included in the curriculum of my institution.	2.75	0.89	Accepted
2	AI is a compulsory part of relevant academic programs.	2.40	0.95	Rejected
3	There is a structured AI curriculum in my institution.	2.65	0.92	Accepted
3	AI topics are integrated across multiple disciplines.	2.30	1.00	Rejected
5	There is a periodic review of AI courses in my institution.	2.45	0.88	Rejected
	Overall Mean	**2.51**	**0.93**	**Accepted**

The results in Table 1 reveal that AI integration into the curriculum of Nigerian higher education institutions is moderate, as indicated by the overall mean of 2.51. Specifically, respondents acknowledged that AI-related courses are included in their institutions' curricula ($\bar{X} = 2.75$) and that a structured AI curriculum exists ($\bar{X} = 2.65$). However, AI is not a compulsory component of most academic programs ($\bar{X} = 2.40$), nor is it widely integrated across multiple disciplines ($\bar{X} = 2.30$). The lack of periodic review of AI courses ($\bar{X} = 2.45$) suggests that curriculum updates may not be keeping pace with technological advancements. This indicates that while some efforts have been made to integrate AI into higher education, a systematic and interdisciplinary approach is still lacking. To strengthen AI education,

universities need to ensure that AI is embedded across disciplines, making it a core part of technology-driven programs and subject areas.

Research Question 2: What is the level of AI competence among faculty members in Nigerian universities?

Table 2: Mean and Standard Deviation of Faculty AI Competence

S/N	Items on Faculty AI Competence	Mean ($\overline{X}$)	Standard Deviation (SD)	Decision
1	Faculty members have basic knowledge of AI concepts.	2.80	0.85	Accepted
2	Faculty members can effectively teach AI-related courses.	2.35	0.92	Rejected
3	There are training programs for faculty on AI education.	2.40	0.89	Rejected
4	Faculty members use AI tools for teaching and research.	2.55	0.90	Accepted
5	AI-related workshops and seminars are regularly organized for faculty.	2.20	1.02	Rejected
	Overall Mean	**2.46**	**0.92**	**Rejected**

The results in Table 2 indicate that faculty competence in AI remains low, with an overall mean of 2.46, which is below the criterion mean of 2.50. While faculty members have basic knowledge of AI concepts ($\overline{X} = 2.80$) and some use AI tools for teaching and research ($\overline{X} = 2.55$), they struggle with effectively teaching AI-related courses ($\overline{X} = 2.35$) due to a lack of specialized training. The absence of structured training programs for faculty ($\overline{X} = 2.40$) and limited opportunities for participation in AI-related workshops and seminars ($\overline{X} = 2.20$) further highlight the knowledge gap. These findings suggest that faculty development programs in AI education are insufficient. Without targeted professional development and hands-on training, lecturers may be unable to effectively teach AI-related courses. Addressing this issue requires urgent investments in AI capacity-building programs for faculty members, including continuous professional development, collaborations with AI industry experts, and exposure to cutting-edge AI applications.

Research Question 3: To what extent are students engaged in AI-related learning activities in Nigerian universities?

Table 3: Mean and Standard Deviation of Student Engagement in AI Learning

S/N	Items on Student AI Engagement	Mean ($\overline{X}$)	Standard Deviation (SD)	Decision
1	Students participate in AI-related projects.	2.70	0.88	Accepted
2	Students attend AI workshops and training sessions.	2.35	0.95	Rejected
3	AI research opportunities are available to students.	2.40	0.90	Rejected
4	AI-related student clubs and competitions exist in my institution.	2.60	0.93	Accepted
5	There is access to AI-related learning resources	2.45	0.97	Rejected

for students.

Overall Mean	**2.50**	**0.93**	**Accepted**

The results in Table 3 suggest that student engagement in AI-related learning activities is moderate, with an overall mean of 2.50, which meets the criterion mean. Students actively participate in AI-related projects ($\overline{X} = 2.70$) and engage in AI-related student clubs and competitions ($\overline{X} = 2.60$), indicating interest in AI. However, attendance at AI workshops and training sessions ($\overline{X} = 2.35$) and access to AI research opportunities ($\overline{X} = 2.40$) remain low. Additionally, access to AI-related learning resources is limited ($\overline{X} = 2.45$), suggesting that students may lack exposure to practical AI tools and applications. This highlights a gap in hands-on AI learning opportunities, which could hinder students from acquiring the necessary skills to compete in the AI-driven job market. To enhance student engagement, universities must establish more AI-focused learning platforms, provide access to AI labs, encourage industry-driven AI projects, and integrate practical AI applications into academic programs.

Research Question 4: What are the challenges and opportunities in AI capacity-building programs within Nigerian higher education institutions?

Table 4: Mean and Standard Deviation of Challenges and Opportunities in AI Capacity Building

S/N	Items on AI Challenges and Opportunities	Mean ($\overline{X}$)	Standard Deviation (SD)	Decision
1	There is insufficient funding for AI education.	3.10	0.80	Accepted
2	There is inadequate faculty expertise in AI.	2.95	0.85	Accepted
3	Universities lack necessary AI infrastructure.	3.00	0.82	Accepted
4	There are limited partnerships with AI industry stakeholders.	2.70	0.88	Accepted
5	AI education has strong potential for future development in Nigeria.	3.20	0.79	Accepted
	Overall Mean	**2.99**	**0.83**	**Accepted**

The results in Table 4 indicate that various challenges hinder AI capacity-building in Nigerian higher education institutions, as reflected in the overall mean of 2.99, which is close to the maximum possible rating. Insufficient funding ($\overline{X} = 3.10$) was identified as a major constraint, limiting investments in AI infrastructure and training programs. Additionally, inadequate faculty expertise ($\overline{X} = 2.95$) and lack of essential AI infrastructure ($\overline{X} = 3.00$) further restrict AI education development. Limited partnerships with AI industry stakeholders ($\overline{X} = 2.70$) suggest that collaboration with the private sector and tech companies is minimal, reducing opportunities for practical learning experiences. However, the study also identified a strong potential for AI development in Nigeria ($\overline{X} = 3.20$), indicating that despite existing challenges, there is optimism about AI education's future. Addressing these challenges

requires increased funding, faculty development, infrastructure investments, and stronger industry partnerships to enhance AI capacity in universities.

Research Question 5: What strategies can be adopted to enhance AI education in Nigerian universities?

Table 5: Mean and Standard Deviation of Strategies for Enhancing AI Education

S/N	Items on Strategies for AI Education Enhancement	Mean ($\overline{X}$)	Standard Deviation (SD)	Decision
1	Increase funding for AI programs.	3.25	0.78	Accepted
2	Provide faculty training and development in AI.	3.10	0.82	Accepted
3	Establish AI research centers in universities.	3.05	0.85	Accepted
4	Develop collaborations with AI industry partners.	3.15	0.80	Accepted
5	Improve access to AI learning resources for students.	3.00	0.88	Accepted
	Overall Mean	**3.11**	**0.83**	**Accepted**

The results in Table 5 indicate that respondents strongly support several strategies for improving AI education, as reflected in the overall mean of 3.11, which is the highest across all research questions. Increasing funding for AI programs ($\overline{X}$ = 3.25) was the most emphasized strategy, followed closely by providing faculty training and development in AI ($\overline{X}$ = 3.10). Establishing AI research centers in universities ($\overline{X}$ = 3.05) and fostering collaborations with AI industry partners ($\overline{X}$ = 3.15) were also highly rated as effective strategies. Improving student access to AI learning resources ($\overline{X}$ = 3.00) was another important recommendation. These findings suggest that a multi-faceted approach is needed to strengthen AI education in Nigerian universities, combining financial investment, faculty training, institutional support, and industry collaboration. Implementing these strategies will help bridge the existing gaps in AI education and position Nigerian universities as global leaders in AI innovation and research.

Discussion of Findings: The findings of this study reveal several critical aspects of AI capacity-building programs in Nigerian higher education institutions, particularly in terms of curriculum integration, faculty competence, student engagement, challenges, and strategies for improvement.AI curriculum integration in Nigerian universities was found to be moderate, with limited interdisciplinary adoption and infrequent curriculum reviews. This aligns with the findings of Adebayo and Okonkwo (2022), who noted that while some Nigerian universities have introduced AI-related courses, these programs are often standalone subjects rather than being embedded across multiple disciplines. Similarly, Eze and Akinola (2023) found that AI integration remains fragmented, with many institutions lacking structured AI curricula that align with global trends. The absence of a well-defined AI education framework limits students' exposure to diverse AI applications, restricting their ability to apply AI knowledge across various domains. Addressing this requires universities

to incorporate AI education across disciplines, ensuring students from different academic backgrounds gain AI literacy and competencies.

Faculty members' low AI competence was another major finding, largely due to inadequate training and expertise. This is consistent with the results of Olaleye and Olatunji (2021), who found that most faculty members in Nigerian universities lack formal AI training, making it difficult for them to effectively teach AI-related courses. Additionally, Ibrahim et al. (2023) observed that many faculty members rely on outdated teaching methods, with limited exposure to AI-driven instructional tools. The lack of AI competence among faculty members not only hinders effective teaching but also limits the mentorship and supervision of AI research projects. To address this gap, universities must invest in capacity-building programs, including AI training workshops, certifications, and industry collaborations to enhance faculty expertise in AI education.

Student engagement in AI learning was found to be moderate, with students actively participating in AI projects but having limited access to AI research opportunities. This finding aligns with the work of Chukwuma and Bello (2022), who reported that while students show enthusiasm for AI-related initiatives, many universities lack the resources and structured programs to support AI research. Similarly, Adegbite (2023) found that only a few Nigerian universities provide students with access to AI labs and mentorship opportunities for AI-driven research. Without adequate exposure to AI research, students may struggle to develop advanced problem-solving skills and real-world AI applications. Enhancing student engagement requires universities to increase AI-focused research opportunities, establish AI clubs, and provide access to AI laboratories and mentorship programs.

The study identified insufficient funding, inadequate faculty expertise, and lack of AI infrastructure as the main challenges to AI education in Nigerian universities. These findings are supported by Okeke and Nwafor (2021), who found that most universities in Nigeria allocate minimal resources to AI education, making it difficult to acquire essential AI tools and infrastructure. Additionally, Yusuf and Adebisi (2022) reported that a lack of government support and industry partnerships has resulted in slow AI development in the higher education sector. The lack of infrastructure, such as AI laboratories and computing resources, further limits students' and faculty members' ability to engage in AI research and practical applications. Addressing these challenges requires substantial investment in AI infrastructure and policy reforms that prioritize AI education at the national level.

To improve AI education in Nigerian universities, the study recommends increasing funding, training faculty, strengthening industry partnerships, and enhancing student access to AI resources. These recommendations align with the findings of Ajayi and Lawal (2023), who emphasized the need for government and private sector investment in AI education to provide universities with adequate resources. Likewise, Balogun and Ijeoma (2024) highlighted the importance of faculty training programs and industry collaborations in bridging the AI competence gap in Nigerian universities. Strengthening partnerships with AI industry stakeholders would facilitate knowledge exchange, internship opportunities, and

access to cutting-edge AI technologies. Additionally, improving students' access to AI resources, such as online courses, AI labs, and mentorship programs, will enable them to develop hands-on AI skills necessary for global competitiveness.

Conclusion

Based on the findings of the study, it was concluded that AI curriculum integration in Nigerian higher education institutions is moderate, with limited interdisciplinary adoption and infrequent periodic reviews. Faculty members have low AI competence due to inadequate training and expertise, which affects the effective delivery of AI-related courses. Student engagement in AI learning is also moderate, with active participation in AI projects but restricted access to AI research opportunities. The major challenges hindering AI education in Nigerian universities include insufficient funding, inadequate faculty expertise, and a lack of AI infrastructure. However, there is strong potential for future growth in AI education if appropriate measures are implemented to address these challenges.

References

Adebayo, T., & Okonkwo, P. (2022). The state of artificial intelligence education in Nigerian universities: Challenges and prospects. *Journal of Emerging Technologies in Education, 15*(2), 45-60.

Adegbite, R. (2023). Student engagement in artificial intelligence education: A case study of Nigerian universities. *African Journal of Educational Technology, 18*(1), 89-102.

Adegbite, T. (2021). AI education in Africa: Challenges and opportunities. *Journal of Educational Technology, 12(3)*, 45-60.

Ajayi, O., & Lawal, M. (2023). Strategies for enhancing AI education in Africa: A focus on faculty development and industry collaboration. *International Journal of Artificial Intelligence Research, 11*(4), 120-135.

Balogun, T., & Ijeoma, C. (2024). The role of industry partnerships in advancing AI education in Nigeria. *Technology and Higher Education Review, 22*(3), 77-91.

Chen, L., & Zhao, Y. (2021). Assessing the validity of AI education research instruments. *Journal of Educational Measurement, 58(3)*, 245-261.

Chukwuma, V., & Bello, S. (2022). Analyzing student participation in AI projects: A Nigerian perspective. *African Journal of Science and Innovation, 9*(2), 55-70.

Eze, J., & Akinola, R. (2023). AI curriculum integration in Nigerian higher education: Progress and challenges. *Journal of Educational Reform in Africa, 17*(1), 33-49.

Garcia, R., Kim, S., & Patel, M. (2023). Reliability analysis in AI education research: A methodological review. *International Journal of Educational Research, 102*, 101-119.

Ibrahim, K., Yusuf, B., & Adamu, L. (2023). Faculty preparedness for AI education in Nigerian universities. *Journal of Digital Learning and Teaching, 12*(3), 101-116.

Iroriteraye-Abeke, J.I.(2022). Interactive Radio Response (IRR) Effectiveness in Small Class Size Chemistry Achievement. *Journal of Education, Society and behavioral science. 35(3), 32-38.*

Iroriteraye-Abeke, J.I.(2022). Blended Teaching Methodology for Quality Assurance in Education for Adults and Youths of Basic Education System in Nigeria. *Research in Education. 18(1), 138-142*

Johnson, T., & Brown, P. (2022). AI integration in higher education: A survey-based approach. *Journal of Digital Learning, 20(4)*, 301-315.

Kuhl, N., Goutier, M., Hirt, R., &Satzger, G. (2021). The AI Learning Framework: A Conceptual Framework for AI Education. *Computers & Education*, 160, 104025.

Li, X., Chen, Y., & Zhang, L. (2021). Student engagement in AI learning: A global perspective. *Computers & Education, 175*, 104314.

Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2018). Intelligence Unleashed: An Argument for AI in Education. *Pearson Education Report*, 1-42.

Martinez, D., & Lee, K. (2024). Statistical methods for evaluating AI curriculum effectiveness. *Educational Data Science, 15(1)*, 89-105.

Miao, F., Holmes, W., Huang, R., & Zhang, H. (2021). AI and education: Guidance for policymakers. *UNESCO Report*, 1-97.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017–1054.

Okeke, F., & Nwafor, I. (2021). Challenges of AI adoption in Nigerian universities: Funding, infrastructure, and policy gaps. *Nigerian Journal of Higher Education Research, 14*(2), 75-90.

Okonkwo, C., & Eze, J. (2022). Faculty competence and AI teaching in Nigeria. *Nigerian Journal of Higher Education, 20(1)*, 89-104.

Olaleye, B. (2023). Barriers to AI Education in Nigeria. *African Journal of Digital Learning*, 8(1), 27-45.

Olaleye, T., & Olatunji, M. (2021). Assessing faculty competence in artificial intelligence: A survey of Nigerian universities. *Journal of Educational Technology and Innovation, 19*(3), 65-81.

Oyovwi, J.I. &Iroriteraye-Abeke, J.I.(2022). Effect of Meta-Cognition on Students Academic Achievement and Retention Level in Science Curriculum Content. Psychology and Education. Research in Education. *Psychology and Education. 58(4)4932-4939*

Uche, M., Chinedu, P., & Adeyemi, O. (2022). The state of AI education in Nigerian universities. *West African Journal of Education, 14(3)*, 66-80.

Williams, J. (2023). Faculty competence and student engagement in AI courses: A case study. *Higher Education Research, 12(2)*, 112-128.

Yusuf, A., & Adebisi, O. (2022). AI infrastructure and resource allocation in Nigerian higher education: An assessment of current challenges. *West African Journal of Higher Education, 16*(4), 112-128.

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic Review of Research on AI in Education. *International Journal of Educational Technology in Higher Education*, 16(1), 39.