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RESEARCHARTICLE

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Leveraging Artificial Intelligence in Enhancing the Pedagogy of Agricultural Education in Tertiary Institutions in Lagos State, Nigeria

Oluwole, S. Ajala[1], Olufemi A. Adekunle[1], Babatope S. Ayejuyo [2], Olusola M. Kelani[1], Olaiya E. Aina[1], Kike K. Ogedengbe[1], James, and O.S. Banjo[3]

[1]College of Vocational and Entrepreneurship Education, Department of Agricultural Science Education, Lagos State University of Education, Otto/Ijanikin (Epe Campus), Lagos State.

[2]School of Vocational Education, Department of Agricultural Education, Federal College of Education (Technical), Akoka, Lagos State.

[3]College of Agriculture and Hospitality Management, Department of Agricultural Science Education, Tai Solarin University of Education, Ijagun, Ogun State.

Correspondence:
ajalaos@lasued.edu.ng

Abstract

This study examined the integration of Artificial Intelligence (AI) tools in teaching Agricultural Education in Lagos State tertiary institutions, Nigeria. Three objectives and research questions guided the study. A descriptive survey design was used. Using the intact group sample technique, sixty (60) lecturers in agricultural education from three postsecondary institutions in Lagos State were chosen. A standardized 30-item survey called "LAIEPAEQ" (Leveraging Artificial Intelligence in Enhancing Pedagogy of Agricultural Education Questionnaire) was used to collect data. It was piloted for reliability and validated by experts (Cronbach's Alpha = 0.87). The mean was used to analyze the data. A grand mean of 3.73 for awareness was found in the survey, showing that agricultural education instructors had a modest level of acquaintance with AI tools (such as chatbots, simulations, and precision agriculture systems). The results also show that the adoption of AI for pedagogical frameworks was low ($\bar{X}$ = 2.94), particularly for specialized tools like data analytics and simulations. On the other hand, the grand mean of challenges to the adoption of AI was high (4.04), with respondents generally agreeing that low infrastructure, insufficient training, and complexity were obstacles. This demonstrates how structural barriers separate AI's potential from its application. The authors recommended that to achieve the objectives of agricultural education, tertiary institutions' management should invest in reliable internet and hardware through collaborations with the public and private sectors, train lecturers in required AI skills, and locally develop relevant AI tools for instructional delivery in the classroom.

KEYWORDS
Artificial Intelligence, Agricultural Education, Pedagogy, Tertiary Institution, and Lagos State

1 | INTRODUCTION

Education has been completely transformed by the quick development of artificial intelligence (AI), which has provided new tools to improve the teaching and learning process. AI in agricultural education offers chances to tackle issues like resource scarcity, the effects of climate change, and the requirement for the transmission of knowledge about precision farming (Shaikh et al., 2022). Predictive analytics, virtual simulations, and intelligent tutoring systems are examples of AI techniques that have revolutionized educational methods worldwide (Salas-Pilco et al., 2022). AI applications like data analytics and simulations for precision agriculture are changing agricultural training globally (FAO, 2022).

But in poor nations like Nigeria, the use of AI in higher education is still relatively new, especially in specialized disciplines like agricultural education. Though its use in agricultural pedagogy is still understudied in sub-Saharan Africa, artificial intelligence (AI) has the potential to revolutionize

education. The goal of agricultural education in Nigerian institutions is to give students both academic and practical knowledge of soil management, crop production, and agribusiness. But conventional teaching methods frequently find it difficult to meet the changing needs of contemporary agriculture, like data-driven decision-making and precision farming.

AI provides answers in the form of data analytics for curriculum improvement, automated assessment systems, and chat bots for individualized learning (Adarkwah et al., 2023). Since 2022, the use of AI in education has increased dramatically worldwide, with programs like Chat GPT showing promise in educational environments (Nicolescu & Tudorache, 2022). Applications of AI in agriculture, including soil analysis and crop monitoring, are becoming more popular in Africa (Obasi, 2024). Although Lagos State is a major educational hub in Nigeria, with several universities offering Agricultural Education programs aimed at training professionals to tackle food security and sustainable agriculture challenges, the integration of AI may be hampered by the state's inadequate infrastructure and low technological literacy among educators.

There is a dearth of empirical data regarding the potential obstacles that Nigerian university instructors may experience in incorporating AI into their work, both now and in the future, despite the technology's transformative potential and broad use in education worldwide (Asogwa, 2024). By examining how AI is used in agricultural education instruction in Lagos State universities and concentrating on the viewpoints of lecturers as important participants in the learning process, this study aims to close this gap.

1.1. Statement of Problem

In Lagos State, the use of artificial intelligence (AI) in pedagogy, especially in agricultural education, is still underappreciated and poorly understood. According to preliminary findings, artificial intelligence (AI) has the ability to completely transform education by mimicking farming situations, maximizing resource utilization, and customizing instruction. However, its current use in higher education seems to be restricted. These universities' lecturers might not be aware of AI tools like predictive analytics, virtual learning platforms, or AI-driven simulations, or they may encounter obstacles to accessing them, such as insufficient infrastructure or training. Lagos State institutions run the risk of lagging in training students for a technology-driven agriculture economy, given the seeming stagnation in contrast to worldwide trends where AI improves educational achievements.

The pedagogical landscape may undergo a substantial transformation if AI were more successfully incorporated into Agricultural Education in Lagos State University. By using AI technologies more effectively, instructors may be able to provide dynamic, data-driven training that anticipates learning gaps before they become more pronounced and adapts content to each student's needs. AI-powered platforms, for example, might enhance farm management practices or model the effects of climate change on crops, giving students real-world experience in tackling contemporary issues like sustainable farming and food hunger. In addition to increasing student involvement and understanding, this change would match academic results with the needs of a quickly changing agriculture sector. The potential advantages such as enhanced critical thinking, creativity, and preparedness for real-world problem-solving may go unmet in the absence of more adoption, leaving pupils unprepared for the demands of modern agriculture.

By empirically examining the degree of AI integration in agricultural education in Lagos State universities and evaluating its effects on instruction and learning, the current study aims to close this gap. This study intends to provide light on the obstacles to adoption and pinpoint areas for improvement by gathering information on lecturers' awareness, access to AI technologies, and usage trends. Additionally, it will assess how AI, when used properly, affects students' readiness for contemporary agricultural concerns, offering evidence-based insights to inform practice and policy. The goal of this study is to go beyond anecdotal observations by providing a basis for methods to effectively incorporate AI into pedagogy, which will ultimately enhance regional food security and educational outcomes.

1.2. Purpose of the Study

The primary purpose of this study is to explore and enhance the integration of artificial intelligence (AI) into the pedagogy of Agricultural Education in universities in Lagos State, Nigeria.

The study specifically sought to:

i. Assess the level of awareness of AI tools among Agricultural Education lecturers
in tertiary institutions in Lagos State.
ii. Examine the extent of AI adoption in teaching and learning Agricultural Education
in tertiary institutions in Lagos State.
iii. Identify the challenges of integrating AI tools into the pedagogical framework of agricultural education studies in tertiary institutions in Lagos State.

1.3. Research Questions

i. What is the level of awareness of AI tools among Agricultural Education lecturers?
In tertiary institutions in Lagos State?
ii. What is the extent of AI adoption in teaching and learning Agricultural Education?
In tertiary institutions in Lagos State?
iii. What are the challenges of integrating AI tools into the pedagogical framework of agricultural education studies in tertiary institutions in Lagos State?

1.4. Literature Review

The use of AI in education has really taken off since 2022, with various studies showcasing its game-changing potential. For instance, Salas-Pilco et al. (2022) discovered that AI applications, including predictive modeling and intelligent tutoring systems, significantly boost learning outcomes in higher education, especially in technical disciplines. In the realm of agriculture, Shaikh et al. (2022) pointed out that AI tools, such as machine learning algorithms, enhance crop management education by simulating real-life scenarios. Additionally, AI-driven resources like virtual labs are making practical training much more effective (Gardez et al., 2024).

According to Zawaki-Richter et al. (2023), artificial intelligence is making significant progress in improving the effectiveness of educational operations and customizing learning experiences. However, their studies focused on general education rather than agricultural education. Adarkwah et al. (2023) highlighted how AI may support personalized learning on a global level. Unfortunately, due to infrastructural and training issues, many African regions have not been able to benefit from this fully (Obasi, 2024). The adoption of AI is dependent on perceived utility and usability, according to theoretical frameworks such as the Technology Acceptance Model (TAM) (Davis, 2022).

This study expands on these ideas to investigate AI's function in agricultural education inside Lagos State tertiary institutions in order to fill the vacuum in localized research. In support of this, Mhlanga (2023) highlights that technology adoption in African educational contexts is driven by perceived utility, even though usability issues frequently constrain implementation in environments with few resources. Similar to this, Olatunde-Aiyedun (2024) contends that in order to incorporate AI into Nigerian university curricula, tools must be customized to meet local requirements, increasing their applicability and acceptance among teachers. These viewpoints frame the study of AI's use in this specialized subject.

2 MATERIAL AND METHOD

The study, which focused on tertiary institutions providing agricultural education, was carried out in Lagos State, Nigeria. These include Lagos State University of Education, Oto-Awori, Lagos State, and the Federal College of Education (Technical), Akoka, chosen for their well-established programs in this area. According to institutional data as of March 2025, the population consisted of all 60 lecturers of Agricultural Education at the three tertiary institutions. The design of the survey was descriptive. Five-item statements per research question were scored on a 5-point Likert scale in a structured questionnaire tagged "LAIEPAEQ" (Leveraging Artificial Intelligence in Enhancing Pedagogy of Agricultural Education Questionnaire), which had 15 items. Experts validated the instrument and piloted it for reliability (Cronbach's Alpha = 0.87). Data were analyzed using mean ($\bar{X}$), with a threshold of 3.0 signifying awareness, adoption, or agreement.

3 RESULTS

Research Question 1: What is the level of awareness of AI tools among Agricultural Education lecturers in tertiary institutions in Lagos State?

Table 1 above indicates the grand mean of 3.73, which is above the cut-off point of 3.00, hence showing that the majority of the respondents are moderately aware of AI tools in teaching and learning of Agricultural education in tertiary institutions in Lagos State.

Research Question 2: What is the extent of AI adoption in teaching and learning Agricultural Education in tertiary institutions in Lagos State?

Table 2 shows that the majority of the respondents have a grand mean of 2.94, which is below the cut-off point of 3.00, hence showing that there is a low extent of AI adoption in teaching and learning Agricultural Education in tertiary institutions in Lagos State

Research Question 3: What are the challenges of integrating AI tools into the pedagogical framework of agricultural education studies in tertiary institutions in Lagos State?

Table 1: Mean responses of the respondents on the level of awareness of AI tools among Agricultural Education lecturers in tertiary institutions in Lagos State.

S/N	Item Statements	$\bar{X}$	Decision
1.	I am aware of the usage of AI tools in agricultural education instruction, such as virtual simulations (for example, crop modeling or animal management).	3.00	Moderately Aware
2.	I am familiar with AI-powered data analytics technologies (such as those used to analyze yield or soil data) and how they might enhance my Agricultural Education presentations.	3.33	Moderately Aware
3.	I understand how AI-powered precision agriculture solutions, such automated weed management systems or drone-based monitoring, can improve my ability to teach Agricultural Education ideas.	4.00	Aware
4.	I've learned about AI teaching tools that can enhance the delivery of agricultural education, such as adaptive learning systems and AI lesson generators.	4.33	Aware
5.	I am aware of how AI chat bots and virtual assistants, such as Chat GPT and Microsoft Copilot, can help teach agricultural education subjects.	4.00	Aware
	Grand Mean	3.73	Moderately Aware

N=120
Source: Field Survey 2025
Key: 5-Strongly Aware, 4- Aware, 3- Moderately Aware, 2-Slightly Aware, 1-Not Aware

Table 3 reveals that the grand mean is 4.04, which indicates that the majority of the respondents agreed to all the identified challenges of integrating AI tools into the pedagogical framework of agricultural education studies in tertiary institutions in Lagos State.

4 DISCUSSION

Table 1 indicates an average of 4.33, suggesting that the majority of respondents are highly aware of AI chatbots or virtual assistants (4.33) and AI teaching platforms (e.g., adaptive learning systems or AI-generated lesson plans) (4.00). They are moderately aware of AI-powered precision agriculture tools (3.33), AI-based virtual simulations (3.00), and AI-driven data analytics tools (3.00). These results are consistent with Abdulai (2022), who observes that awareness of digital tools in sub-Saharan African education is higher for broadly applicable technologies than for sector-specific ones like agriculture, reflecting uneven dissemination. Olatunde-Aiyedun (2024) emphasizes that lecturers at Nigerian universities are becoming more aware of AI chatbots because of their accessibility, but awareness of tools that require domain-specific knowledge, like precision agriculture systems, lags, supporting the moderate scores noted.

Table 2 shows that the majority of respondents report a very high level of adoption for AI chat bots or virtual assistants (4.33), indicating widespread use in teaching and learning. The adoption of AI teaching platforms (3.00) is moderately high, suggesting some integration into pedagogical practices. However, the adoption of AI-powered precision agriculture tools (2.48) is low, while AI-based virtual simulations (1.67) and AI-driven data analytics tools (1.67) exhibit very low uptake. According to Obasi (2024), who contends that a lack of specialized applications and budget constraints impede the adoption of AI in Nigerian education, these findings are consistent with global trends of sluggish adoption in poor environments. In line with the low funding for precision agriculture and analytics tools, Mhlanga (2023) notes that a lack of training and infrastructure hinders the adoption of specialized AI technologies in African agricultural education. This is further supported by Boateng et al. (2024), who note that although AI chat bots like Kwame are becoming more popular in West African education because of their user-friendliness, more sophisticated technologies like simulations are still underutilized because of contextual and technical limitations.

Table 3 reveals that the majority of respondents agreed on significant challenges to integrating AI into the pedagogical framework of Agricultural Education studies in Lagos State tertiary institutions. Poor technological infrastructure affecting AI integration (4.33), lack of training or technical skills among lecturers (4.00), financial constraints limiting access to AI resources (4.00), time constraints impacting adoption efforts (4.33), and perceived complexity or usability issues (4.00) were all identified as barriers. The high means show that there is broad agreement about these challenges. Consistent with the findings presented, Obasi (2024) adds that

Table 2: Mean responses of the respondents on the extent of AI adoption in teaching and learning Agricultural Education in tertiary institutions in Lagos State.

S/N	Item Statements	$\bar{X}$	Decision
1.	I actively use AI-based virtual simulations (for example, for crop modeling or animal management).	1.67	Very Low
2.	I frequently include AI-driven data analytics tools (such as those for evaluating soil, weather, or yield data) into my lectures or hands-on activities.	1.67	Very Low
3.	I use AI-powered precision agriculture tools (such as automated systems or drone-based monitoring) as part of my instructional materials to demonstrate practical applications in agricultural education.	2.48	Low
4.	I use artificial intelligence (AI) teaching platforms (such as adaptive learning systems or AI-generated lesson plans) to deliver or modify my institution's Agricultural Education program.	3.33	Moderately High
5.	I use artificial intelligence (AI) chat bots or virtual assistants (like Chat GPT or comparable programs) to help students comprehend Agricultural Education ideas or finish homework.	3.95	Moderately High
	Grand Mean	2.94	Low

N=120
Source: Field Survey 2025
Key: 5-Extremely High, 4-Very High, 3-Moderately High, 2-Low, 1-Very Low

Table 3: Mean responses of the respondents on the challenges of integrating AI tools into the pedagogical framework of agricultural education studies in tertiary institutions in Lagos State.

S/N	Item Statements	$\bar{X}$	Decision
1.	Poor technological infrastructure affecting AI integration.	4.33	Agreed
2.	Lack of training or technical skills among lecturers.	4.00	Agreed
3.	Financial constraints limiting access to AI resources.	4.00	Agreed
4.	Time constraints impacting adoption efforts.	4.33	Agreed
5.	Perceived complexity or usability issues	4.00	Agreed
	Grand Mean	4.04	Agreed

N=120
Source: Field Survey 2025
Key: 5-Strongly agreed, 4-Agreed, 3-Moderately Agreed, 2-Disagreed, 1- Strongly Disagreed

time and money restrictions make sluggish AI deployment in poor environments worse. This is corroborated by Mhlanga (2023), who points out that in Africa, a lack of technology infrastructure and a lack of skills impede the integration of AI in education, with surveys frequently indicating that these issues cost more than 4.0. Abdulai (2022) further highlights that usability and complexity concerns discourage educators from implementing AI tools, particularly in environments with few resources, such as Lagos State, where institutional support is frequently absent.

4.1. Conclusions

This study emphasizes the advantages and disadvantages of integrating AI into agricultural education in Lagos State's higher education institutions. Though their knowledge of specialist tools like precision agriculture systems, virtual simulations, and data analytics is very minimal, lecturers demonstrate a great awareness of generic AI technologies like chat bots and teaching platforms. Adoption follows this pattern, with chat bots being widely used but agriculture-specific solutions being hardly integrated. This reflects a larger tendency of sluggish adoption in environments with limited resources. Major challenges poor infrastructure, lack of training, financial hurdles, time limits, and tool complexity further hamper development, matching findings across Nigerian and African educational contexts. Despite considerable awareness, the little empirical evidence on AI's practical usage in these institutions emphasizes a gap between knowledge and implementation, caused by systemic and contextual impediments. All things considered, even though people are willing to adopt AI, these enduring obstacles prevent it from reaching its full pedagogical potential in industrial education.

4.2. Recommendations

1. Universities should make investments in modern computers, faster internet, and software access, perhaps through government funding or partnerships with tech companies. Without these foundations, even the best AI tools will remain unattainable, limiting their impact on teaching Agricultural Education.
2. Lecturers should receive training on how to use AI confidently; focusing on Agricultural Education will help lecturers bridge the awareness-to-adoption gap and transform moderate knowledge into active teaching strategies.
3. It is crucial to create AI tools that are tailored to the specific objectives of Agricultural Education in Lagos State. This will make AI more useful and encourage lecturers to incorporate it into their lessons, resolving the study's concerns about its complexity and relevance.

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