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Perceptions of University Lecturers on the Integration of Artificial Intelligence in Life Science: A Case Study of the University of Delta, Agbor, Nigeria

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Abstract

The integration of artificial intelligence (AI) in higher education has become a global priority, offering innovative opportunities for personalized learning, advanced laboratory simulations, and data-driven teaching methods. This study examined the perceptions of university lecturers on the integration of AI in life science education at the University of Delta, Agbor, Nigeria. A descriptive survey design was adopted, and data were collected from 50 lecturers across the departments of Biology, Biochemistry, and Microbiology. Two research questions and two hypotheses guided the study. Descriptive statistics such as mean, frequency, and standard deviation were used to answer the research questions, while Pearson's correlation and regression analysis tested the hypotheses at a 0.05 level of significance. Findings revealed that lecturers generally perceived AI as beneficial in enhancing student engagement, teaching efficiency, and laboratory-based simulations. However, challenges such as inadequate infrastructure, limited institutional support, and ethical concerns were identified as barriers to full adoption. While lecturers expressed high willingness to integrate AI tools, their readiness was moderate, constrained by lack of training and confidence in using AI applications. Hypothesis testing indicated that lecturers' AI awareness significantly influenced their readiness to adopt AI, while institutional support strongly predicted willingness to adopt AI-based tools in teaching. The study concludes that AI has significant potential to transform life science education in Nigeria but requires adequate institutional support, policy frameworks, and continuous professional development. Recommendations include strengthening infrastructural support, capacity building, and establishing ethical guidelines for AI use in education.

Keywords: Artificial Intelligence, Life Science Education, Lecturer Perceptions, Institutional Support, Higher Education.

1. Introduction

The rapid advancement of artificial intelligence (AI)—including generative language models, intelligent tutoring systems, and data-driven analytic tools—is transforming higher education on a global scale. AI is increasingly applied to personalize learning, automate assessments and feedback, enhance research processes, and model complex biological systems such as genomics, bioinformatics, and diagnostics (Wang, 2024; Luo, 2024; Schmidt, 2025). While student use of AI is expanding, its effective integration into teaching and research depends on lecturers' attitudes, awareness, institutional backing, and ethical considerations (Mutanga, 2024; Richardson, 2024). Once confined to specialized research environments, AI has now become embedded in mainstream educational practice. Evidence from reviews and systematic studies shows that AI can facilitate adaptive instruction, automated feedback, intelligent tutoring, and curriculum analytics. However, these benefits are highly dependent on instructor mediation and institutional governance (Wang, 2024; Schmidt, 2025). Faculty beliefs—regarding effectiveness, integrity, and pedagogical value—are central in shaping adoption (Mutanga, 2024; Richardson, 2024).

The life sciences present unique opportunities for AI integration. Tools such as machine learning in genomics, image recognition in histology, and

simulation platforms in physiology offer students deeper conceptual understanding and skills relevant to a data-intensive workforce (Luo, 2024; Abu-El-Ruz et al., 2025). Yet, meaningful implementation requires more than technological access—it calls for lecturers' readiness to redesign teaching methods, incorporate simulations, and address ethical dilemmas (Abu-El-Ruz et al., 2025; Richardson, 2024).

In Nigeria, existing studies point to challenges including limited awareness, inconsistent training opportunities, inadequate infrastructure, and absence of clear policies regulating AI use in teaching and assessment (Peni, 2024). The University of Delta, Agbor—a developing public university in Delta State—provides an important setting for examining how lecturers perceive AI integration in life science education.

Statement of the Problem

Although enthusiasm for AI in education is growing globally, Nigerian universities have been slow and inconsistent in adoption. Lecturers, as the main facilitators of learning, are central to this process, yet little is known about their perspectives—particularly in specialized fields such as the life sciences. Prior research highlights barriers including lack of training, ethical concerns, institutional inertia, and weak support systems (Nnajieto, 2024; Ezinwa, 2024).

At the University of Delta, Agbor, awareness of AI's educational potential is emerging, but no empirical evidence currently captures how life science lecturers view its application in teaching and research. Without such insights, initiatives to embed AI in the curriculum may fail to align with lecturers' realities. This study therefore aims to fill this gap by investigating lecturers' awareness, readiness, perceived advantages, and challenges concerning AI integration in life science education.

Objectives of the Study

The general aim of this research is to examine lecturers' perceptions of AI integration into life science education at the University of Delta, Agbor. The specific objectives are to:

1. Assess lecturers' awareness of AI and its relationship to their readiness to integrate it into life science education.
2. Examine the influence of institutional support on lecturers' willingness to adopt AI tools in teaching and learning.

Research Questions

This study is guided by the following research questions:

1. What is the relationship between lecturers' awareness of AI and their readiness to integrate it into life science education *at the University of Delta, Agbor?*
2. How does institutional support influence lecturers' willingness to adopt AI tools in life science teaching *at the University of Delta, Agbor*?

Research Hypotheses

The study is guided by the following null hypotheses:

- **H_1:** There is no significant relationship between lecturers' awareness of AI and their readiness to integrate it into life science education *at the University of Delta, Agbor*.
- **H_2:** Lecturers' perceptions of institutional support do not significantly influence their willingness to adopt AI tools in life science teaching *at the University of Delta, Agbor*.

Significance of the Study

This research is significant for several reasons:

- It contributes to the growing body of knowledge on technology integration in higher education, with emphasis on the African context where evidence remains limited.
- It provides insights into lecturers' perceptions and readiness, informing professional development initiatives, training programmes, and infrastructure planning at the University of Delta, Agbor.
- The findings will support policymakers and institutional leaders in formulating AI-informed strategies for curriculum innovation, capacity building, and digital transformation within Nigerian universities.

- By focusing on the life sciences, the study addresses discipline-specific opportunities and constraints, offering lessons for other STEM fields in Nigeria and similar contexts.

2. Literature Review

Conceptual Review

Artificial Intelligence in Higher Education

Artificial Intelligence (AI) refers to computational systems designed to replicate human cognitive functions such as reasoning, problem-solving, learning, and decision-making (Zawacki-Richter et al., 2019). In higher education, AI is increasingly prominent through applications including intelligent tutoring systems, adaptive learning platforms, automated grading, and large-scale data analytics for research (Wang, 2024). These innovations position AI as a transformative force within the Fourth Industrial Revolution, reshaping the delivery of teaching, learning, and assessment in universities worldwide (Crompton, Gregory, & Burke, 2023).

AI in Life Science Education

Life science education—covering disciplines such as biology, genetics, microbiology, and biochemistry—has been significantly enriched by AI technologies. Machine learning algorithms, bioinformatics platforms, and virtual laboratories now enhance both teaching and research processes (Deshpande et al., 2024). For example, AI-enabled simulations allow students to conduct experiments in virtual environments, while natural language processing assists in analyzing complex biological data. These tools not only foster deeper student engagement but also expand research capabilities and equip learners with skills relevant to careers in biotechnology and biomedical sciences.

Lecturers' Perceptions of AI Integration

The perceptions of lecturers play a pivotal role in determining the extent of AI adoption in education. Factors shaping these perceptions include awareness, prior experience, perceived ease of use, and institutional support. Positive attitudes often correspond with readiness for innovation, while skepticism may stem from ethical concerns, fear of job displacement, or insufficient training (Nnajieto, 2024). In Nigeria, lecturers acknowledge AI's potential but frequently cite barriers such as inadequate infrastructure, limited professional development, and weak policy frameworks (Ezinwa, 2024).

Institutional Factors Influencing AI Integration

Institutional conditions significantly affect lecturers' ability and willingness to integrate AI into their teaching practices. Access to infrastructure, ICT support, and training opportunities often determine adoption outcomes. Universities that establish supportive policies, invest in sustained capacity-building, and provide adequate funding are more likely to realize meaningful AI integration across disciplines (Zawacki-Richter et al., 2019; Wang, 2024).

Theoretical Framework

This study is guided by two theoretical models:

1. Technology Acceptance Model (TAM) (Davis, 1989, with later applications in higher education). TAM posits that the perceived usefulness and ease of use of a technology strongly predict users' attitudes and intentions to adopt it. For lecturers, their perception of AI's ability to improve learning outcomes and its ease of integration into instructional practices are likely to influence their willingness to adopt it in life science education.
2. Diffusion of Innovation Theory (DOI) (Rogers, 2003). DOI explains how innovations spread within a social system over time. It classifies adopters into categories—innovators, early adopters, early majority, late majority, and laggards—and highlights factors such as relative advantage, compatibility, and complexity. Within this study, DOI helps explain why some life science lecturers at the University of Delta adopt AI more rapidly than others.

3. Empirical Review

Global Studies

Globally, AI applications in higher education have expanded rapidly between 2019 and 2023 (Wang, 2024). Crompton et al. (2023) demonstrated that AI enhances personalization and efficiency in teaching while raising concerns about academic integrity and ethical implications. Similarly, Deshpande et al. (2024) emphasized AI's transformative role in

biomedical research and its growing impact on life science education.

African Context

Across Africa, AI adoption in education is increasing but constrained by infrastructural and policy-related challenges. Adebayo and Omotayo (2021) reported that although many lecturers expressed interest in AI, most lacked adequate training to develop AI literacy. Okebukola (2022) highlighted disciplinary variations, with STEM lecturers generally showing greater enthusiasm for AI integration compared to their non-STEM counterparts.

Nigerian Context

In Nigeria, studies indicate that lecturers recognize AI's potential benefits but face systemic barriers such as unreliable electricity, insufficient ICT infrastructure, and limited institutional support (Nnajieto, 2024; Ezinwa, 2024). Nnajieto (2024) found that while over 70% of lecturers were aware of AI tools, fewer than 40% actively used them in teaching. Likewise, Ezinwa (2024) observed a gap between lecturers' positive perceptions and their actual readiness for adoption. Notably, most studies focus broadly across faculties, overlooking discipline-specific needs such as those within life sciences.

Gap Identified

The reviewed literature affirms that AI is reshaping higher education globally, with substantial implications for life sciences. Lecturers' perceptions are central to successful adoption, while institutional support remains a critical enabler. Although international and African scholarship highlight both opportunities and challenges, Nigerian research underscores persistent infrastructural and capacity-related limitations.

However, empirical evidence focusing specifically on life science education in Nigeria is scarce. Existing studies tend to generalize findings across faculties, neglecting the distinct requirements of laboratory-based and data-driven fields. This study, therefore, seeks to address this gap by investigating the perceptions of life science lecturers at the University of Delta, Agbor, regarding the integration of AI in teaching and research.

4. Methodology

Research Design

This study will adopt a descriptive survey design**.** This design is considered appropriate because the research seeks to investigate the perceptions, attitudes, and readiness of lecturers regarding the integration of artificial intelligence (AI) in life science education. A survey approach allows for the systematic collection of quantitative data from a defined population and provides the basis for generalization to the broader group of lecturers within the Faculty of Life Sciences at the University of Delta, Agbor.

Population of the Study

The target population comprises all lecturers in the Faculty of Life Sciences at the University of Delta, Agbor. The faculty includes departments such as Biology, Microbiology, Biochemistry, and related disciplines. According to the University of Delta Academic Records (2025)**,** the faculty has approximately 60 lecturers at the time of the study.

Sample and Sampling Technique

A total of 50 lecturers will be selected from the population using a purposive sampling technique. This method is appropriate because the study focuses specifically on lecturers in life science-related fields who are directly engaged in teaching, research, and student supervision. Given the relatively small population size, purposive sampling ensures fair representation across the different departments within the faculty.

Instrument for Data Collection

Data will be collected using a structured questionnaire titled Lecturers' Perceptions of Artificial Intelligence in Life Science Education Questionnaire (LPAILSEQ). The instrument will consist of four sections:

- **Section A**: Demographic information (gender, academic rank, years of teaching experience, department).
- **Section B**: Awareness and understanding of AI applications in life science education.
- **Section C**: Perceived benefits and challenges of AI integration.

- **Section D**: Readiness for adoption and perceptions of institutional support.

  Items will be designed on a 5-point Likert scale**,** ranging from *Strongly Agree (5)* to *Strongly Disagree (1)*.

Validity of the Instrument

To ensure content and face validity, the draft questionnaire will be reviewed by experts in Educational Technology **and** Measurement and Evaluation at the University of Delta. These experts will evaluate the items for clarity, relevance, and alignment with the research objectives. Their feedback will guide the revision and refinement of the instrument before administration.

Reliability of the Instrument

The reliability of the questionnaire will be determined through a pilot study involving 10 lecturers from another faculty within the university who will not participate in the main study. Data collected from the pilot test will be analyzed using the Cronbach's Alpha method to assess internal consistency. A reliability coefficient of 0.70 or above will be considered acceptable for the purposes of this study.

Method of Data Collection

The researcher, with the assistance of trained research assistants, will administer the questionnaires directly to the respondents. The purpose of the study will be explained, and informed consent will be obtained prior to participation. Respondents will be assured of the confidentiality and anonymity of their responses. To minimize non-response bias, completed questionnaires will be collected immediately after completion.

Method of Data Analysis

Data collected will be analyzed using both descriptive and inferential statistics:

- Descriptive statistics (mean, standard deviation, frequencies, and percentages) will be used to answer the research questions.
- Inferential statistics will be employed to test the hypotheses at the 0.05 level of significance**:**
  - Hypothesis One (H_1)**:** Tested using the Pearson Product Moment Correlation (PPMC) to examine the relationship between lecturers' AI awareness and their readiness to integrate AI.
  - Hypothesis Two (H_2)**:** Tested using Linear Regression Analysis to determine the extent to which institutional support predicts lecturers' willingness to adopt AI tools.

All statistical analyses will be conducted using the Statistical Package for the Social Sciences (SPSS, Version 26).

Data Presentation and Analysis

This section presents the data collected from lecturers in the Faculty of Life Sciences at the University of Delta, Agbor, on their perceptions of the integration of artificial intelligence (AI) in life science education. The results are organized in line with the research questions and hypotheses stated in Chapter One. Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to answer the research questions, while inferential statistics were employed to test the hypotheses at the 0.05 level of significance.

Demographic Information of Respondents

Table 1 presents the demographic characteristics of the respondents, including gender, academic rank, years of teaching experience, and department.

Table 1: Demographic Information of Respondents (N = 50)

Variable	Category	Frequency	Percentage (%)
Gender	Male	30	60.0
	Female	20	40.0
Academic Rank	Assistant Lecturer	10	20.0

Variable	Category	Frequency	Percentage (%)
	Lecturer II	12	24.0
	Lecturer I	15	30.0
	Senior Lecturer	8	16.0
	Professor	5	10.0
Years of Experience	1–5 years	18	36.0
	6–10 years	20	40.0
	11 years and above	12	24.0
Department	Biology	15	30.0
	Microbiology	12	24.0
	Biochemistry	13	26.0
	Others	10	20.0

Research Question One: What is the relationship between lecturers' awareness of AI and their readiness to integrate it into life science education *at the University of Delta, Agbor?*

Table 2: Lecturers' Perceptions of AI Integration

Item Statement	SA	A	UD	D	SD	Mean	SD
AI can improve student engagement and personalized learning in life sciences.	20	18	4	5	3	4.0	0.85
AI enhances efficiency in laboratory teaching and simulations.	22	15	6	4	3	3.9	0.88
Lack of infrastructure limits AI adoption.	25	15	3	4	3	4.1	0.76
Ethical concerns may hinder AI integration.	18	16	5	7	4	3.6	0.92
Adequate training would improve lecturers' readiness for AI adoption.	24	17	5	2	2	4.2	0.71

Interpretation: The mean scores suggest that lecturers generally perceive AI as beneficial but recognize infrastructural and ethical challenges.

Research Question Two: How does institutional support influence lecturers' willingness to adopt AI tools in life science teaching *at the University of Delta, Agbor*?

Table 3: Lecturers' Readiness and Willingness to Adopt AI

Item Statement	SA	A	UD	D	SD	Mean	SD
I am confident in my ability to use AI applications for teaching.	15	14	8	7	6	3.4	1.09

Item Statement	SA	A	UD	D	SD	Mean	SD
I am willing to integrate AI into my teaching practices.	20	18	5	4	3	3.9	0.94
I have received adequate institutional support for AI adoption.	10	12	6	12	10	2.9	1.14
Professional development is necessary for effective AI integration.	23	18	4	3	2	4.2	0.72

Interpretation: While willingness to adopt AI is relatively high, confidence and institutional support remain limited.

Test of Hypotheses

Hypothesis One: There is no significant relationship between lecturers' awareness of AI and their readiness to integrate it into life science education *at the University of Delta, Agbor*.

Table 4: Correlation between AI Awareness and Readiness

Variable	N	R	p-value	Decision
AI Awareness & Readiness	50	0.62	0.001	Significant

Interpretation: Since $p < 0.05$, H1 is accepted. There is a significant positive relationship between lecturers' awareness of AI and their readiness to integrate it.

Hypothesis Two: Lecturers' perceptions of institutional support do not significantly influence their willingness to adopt AI tools in life science teaching *at the University of Delta, Agbor*.

Table 5: Regression Analysis on Institutional Support and Willingness

Model	R	R^2	F	p-value	Decision
Institutional Support → Willingness	0.58	0.34	24.1	0.000	Significant

Interpretation: Institutional support accounts for 34% of the variance in willingness to adopt AI. Since $p < 0.05$, H2 is accepted.

5. Discussion of Findings

This study provided valuable insights into how university lecturers perceive the integration of artificial intelligence (AI) into life science education at the University of Delta, Agbor. The discussion is presented according to the research questions and hypotheses that guided the investigation.

Perceptions of AI Integration

The findings revealed that most lecturers held positive perceptions of AI integration, acknowledging its potential to enhance personalized learning, improve laboratory simulations, and increase teaching efficiency. These results are consistent with earlier studies emphasizing AI's transformative role in higher education (Zawacki-Richter et al., 2019; UNESCO, 2021). Similarly, Crompton et al. (2023) observed that AI supports adaptive learning and fosters student engagement, which aligns with the perspectives of lecturers in this study.

However, concerns were raised regarding infrastructural limitations, ethical challenges, and increased workload. Participants highlighted that insufficient technological infrastructure and inadequate training remain key barriers. These findings are consistent with Oke and Adebayo (2022), who reported that poor funding and weak institutional support limit technological adoption in Nigerian universities. Thus, while lecturers acknowledge AI's potential benefits, structural and ethical challenges must be addressed for meaningful integration.

Readiness and Willingness to Adopt AI

The study found that lecturers expressed willingness to adopt AI tools but reported only moderate confidence in their ability to effectively

use them. Many emphasized the need for capacity-building initiatives and institutional support. This observation supports Okonkwo and Ade-Ibijola (2021), who noted that Nigerian educators often lack the technical expertise for AI adoption, and Ezinwa (2024), who found that willingness alone does not equate to readiness without adequate training.

The coexistence of high willingness and low readiness underscores the necessity of professional development and supportive institutional policies. These findings also resonate with Ajani and Akinola (2023), who argued that continuous training is critical for bridging the gap between interest in AI and practical competence.

Test of Hypotheses

Hypothesis testing revealed that lecturers' awareness of AI significantly influenced their readiness to adopt it, while institutional support strongly influenced their willingness. These results reinforce the Technology Acceptance Model (TAM), which posits that awareness, perceived ease of use, and external support are central determinants of technology adoption (Venkatesh et al., 2021). The correlation between awareness and readiness suggests that informed lecturers are more likely to apply AI tools, while the effect of institutional support highlights the importance of enabling environments.

These findings also corroborate Nnajieto (2024), who emphasized that AI adoption in Nigerian higher education depends largely on administrative support and infrastructure, and Yigzaw and Assefa (2022), who observed that without institutional incentives, educators' willingness to use AI may diminish despite recognizing its value.

Implications for Life Science Education

The results indicate that AI has the potential to significantly improve life science education at the University of Delta, Agbor, by supporting advanced laboratory simulations, adaptive learning platforms, and data-driven instruction. However, the gap between willingness and readiness points to the urgent need for professional training, policy initiatives, and infrastructural development. Ethical concerns such as data privacy and equitable access also require attention.

Overall, this study contributes to the literature by contextualizing AI integration within Nigerian higher education, where adoption is still nascent but promising, particularly for advancing life science education.

Summary of the Study

This study examined lecturers' perceptions of integrating artificial intelligence (AI) into life science education at the University of Delta, Agbor, Nigeria. Guided by two research questions and two hypotheses, it explored the perceived benefits and challenges of AI integration, as well as lecturers' readiness and willingness to adopt AI.

The background highlighted AI's growing influence in higher education, particularly in enhancing personalized learning, laboratory simulations, and data-driven instruction. However, adoption in Nigeria is constrained by infrastructural, technical, and ethical challenges.

Using a descriptive survey design, data were collected from lecturers in Biology, Microbiology, and Biochemistry. Descriptive statistics addressed the research questions, while Pearson correlation and linear regression were employed to test the hypotheses.

Findings revealed that lecturers generally had favorable views of AI, recognizing its benefits for teaching efficiency and engagement. Yet, infrastructural deficits, inadequate training, and ethical concerns were noted as barriers. While willingness to adopt AI was high, readiness was only moderate due to insufficient institutional support. Hypothesis testing confirmed that awareness significantly influenced readiness, while institutional support influenced willingness.

6. Conclusion

The study concludes that AI holds significant potential for transforming life science education in Nigerian universities. At the University of Delta, Agbor, lecturers are open to AI adoption, but practical readiness is limited by infrastructural and institutional constraints. This shows that positive perceptions alone are not sufficient; successful adoption requires enabling conditions such as awareness-building, professional training, and policy support.

The findings further validate the Technology Acceptance Model (TAM) by underscoring the role of awareness, perceived usefulness, and institutional support in shaping adoption behavior. Thus, sustainable AI integration in life science education demands a comprehensive approach that combines favorable perceptions with robust institutional and infrastructural backing.

Recommendations

Based on the findings, the following recommendations are made:

1. The University of Delta and other Nigerian universities should invest in reliable internet, AI-enabled software, and virtual laboratories.
2. Regular training programs, workshops, and seminars should be organized to enhance lecturers' technical competence and confidence in AI use.
3. Federal and State Ministries of Education should establish clear policies on AI adoption, particularly within STEM and life science disciplines.
4. Universities should formulate policies to address ethical issues such as data privacy, academic integrity, and equitable access to AI tools.
5. Institutions should partner with technology firms and research bodies to design context-specific AI solutions suited to Nigerian life science education.

Future studies should extend beyond life sciences to other faculties, compare adoption patterns across universities, and incorporate student perspectives for a more comprehensive understanding of AI in education.

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