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Exploring AI Integration in Higher Education: University Lecturers' Perspectives on Engagement, Critical Thinking, and Interdisciplinary Collaboration

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Abstract
The integration of artificial intelligence (AI) technologies in higher education is increasingly reshaping teaching and learning methodologies across diverse academic disciplines. This research explores university lecturers' perspectives on the integration of AI technologies in higher education, with a focus on fostering engagement, critical thinking, and interdisciplinary collaboration among students. A questionnaire was designed for data collection. A test re-test method was used to enhance its reliability. The sample consisted of selected academic staff members of Lagos State University of Education. A non-probability sampling technique was utilized in this study. Descriptive statistics were utilized to analyze the survey data. The results show that university lecturers have varying practices and degrees of AI integration; issues like a lack of training and difficulty incorporating AI into the current curriculum are mentioned. Despite these challenges, there is a positive perception of AI's potential to enhance student engagement, critical thinking skills, and interdisciplinary collaboration, among others. This research contributes to the ongoing discourse on AI integration in higher education and underscores the importance of evidence-based practices and policy decisions in harnessing the transformative potential of AI technologies.

Keywords: Artificial intelligence; Higher education, Critical thinking; interdisciplinary collaboration

Introduction

The potential of artificial intelligence (AI) is expanding in many facets of daily life, raising people's standards of living all over the world. Given this, it is obvious that the field of education will eventually be impacted (Mavropoulou et al., 2023). AI is gradually changing the higher education scene by revolutionizing teaching and learning approaches in a variety of academic fields (Malik et al., 2023). Academics are becoming more and more interested in utilizing AI-driven tools and methods to enhance learning opportunities as a result of their introduction (Fazil et al., 2024). Particularly noteworthy is the growing recognition of AI's capacity to foster student engagement (Fazil et al., 2024), cultivate critical thinking skills (Muthmainnah et al., 2022), and promote interdisciplinary collaboration within higher education settings (Oladele et al., 2022). Understanding university lecturers' perspectives on the integration of AI technologies in higher education is of paramount importance, as they play a pivotal role in curriculum development, instructional design, and pedagogical innovation (Ayodele et al., 2023). Thus, this research endeavours to explore the views, experiences, and insights of university lecturers regarding the integration of AI technologies in higher education, with a specific focus on fostering engagement, critical thinking, and interdisciplinary collaboration among students.

The current practices of AI integration in higher education encompass various dimensions, including the incorporation of AI algorithms and tools into course materials, instructional methods, and assessment strategies by university lecturers (Muhie &Woldie, 2020). Lecturers are increasingly exploring AI-driven technologies such as virtual assistants, automated grading systems, and personalized learning platforms to enhance the efficiency and effectiveness of their teaching practices (Williams, 2023). Furthermore, recent research has delved into specific applications of AI in educational settings, such as acting as tutor-assessors and virtual

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learning assistants, as discussed by Yildirim-Erbasli and Bulut (2023) as well as Pogorskiy and Beckmann (2023) respectively. These studies highlight the evolving role of AI in enhancing teaching and learning experiences, showcasing its potential to revolutionize educational practices beyond traditional methods.

The integration of AI technologies in higher education brings forth both perceived benefits and challenges, as viewed by university lecturers. AI-powered tools, such as intelligent tutoring systems and adaptive learning platforms, have demonstrated the potential to enhance personalized learning experiences (Hooda et al., 2022). These systems leverage AI algorithms to analyze student data, provide tailored feedback, and recommend individualized learning pathways, thereby enabling lecturers to address the diverse needs of students more effectively. Additionally, AI enables lecturers to conduct research more efficiently by automating data analysis processes (Memarian & Doleck, 2024).

Machine learning algorithms can analyze large datasets, identify trends, and generate insights, empowering lecturers to make more informed decisions and accelerate the research process (Gligorea et al., 2023). Moreover, the perceived benefits and challenges of AI integration in higher education underscore the multifaceted nature of this endeavour. While AI-powered tools offer opportunities for improving teaching methods and student performance, university lecturers also face hurdles such as insufficient training, resistance to full integration, and ethical considerations (Al-Awawdeh et al., 2023; Solis et al., 2023). These challenges highlight the need for a comprehensive approach to AI integration that addresses both the potential benefits and drawbacks, ensuring that the implementation of AI technologies in higher education is both effective and ethically sound. AI-driven tools and techniques offer promising avenues for promoting active learning, interactive pedagogies, and meaningful student-teacher interactions (Hooda et al., 2022).

By leveraging AI algorithms, lecturers can create dynamic learning environments that adapt to students' individual needs and preferences, thereby enhancing engagement and motivation. Moreover, AI technologies facilitate real-time feedback and personalized recommendations, enabling lecturers to provide timely support and guidance to students, which further promotes active participation and collaboration in the learning process. In addition to fostering student engagement, AI technologies hold significant potential for cultivating critical thinking skills among students (Memarian & Doleck, 2024). AI-driven tools can challenge students to think critically by presenting them with complex problems, analyzing data, and generating evidence-based insights (Hooda et al. 2022). By integrating AI technologies into their teaching practices, lecturers can create opportunities for students to engage in meaningful inquiry, problem-solving, and reflective discourse, thereby fostering a culture of critical inquiry and intellectual curiosity in higher education.

The integration of AI technologies in higher education underscores the multifaceted nature of this endeavour, presenting both opportunities and challenges. While AI-powered tools offer promising avenues for improving teaching methods, student performance, fostering active learning environments, and meaningful student-teacher interactions (Al-Awawdeh et al., 2023; Hooda et al., 2022; Solis et al., 2023), university lecturers encounter hurdles such as insufficient training, resistance to full integration, and ethical considerations (Al-Awawdeh et al., 2023; Solis et al. 2023). These challenges highlight the importance of a comprehensive approach to AI integration that addresses both the potential benefits and drawbacks, ensuring that the implementation of AI technologies in higher education is both effective and ethically sound. Additionally, AI technologies not only enhance student engagement but also hold significant potential for cultivating critical thinking skills among students (Memarian & Doleck, 2024). By leveraging AI algorithms, lecturers can create opportunities for students to engage in meaningful inquiry, problem-solving, and reflective discourse, thereby fostering a culture of critical inquiry and intellectual curiosity in higher education.

Moreover, AI technologies facilitate real-time feedback and personalized recommendations, enabling lecturers to provide timely support and guidance to students, which further promotes active participation and collaboration in the learning process (Memarian & Doleck, 2024). AI-driven tools can challenge students to think critically by presenting them with complex problems, analyzing data, and generating evidence-based insights (Hooda et al., 2022). By integrating AI technologies into their teaching practices, lecturers can create opportunities for students to engage in meaningful inquiry, problem-solving, and reflective discourse, thereby fostering a culture of critical inquiry and intellectual curiosity in higher education.

AI-driven approaches have the capacity to break down disciplinary silos, promote cross-disciplinary dialogue, and foster collaborative problem-solving among students and faculty (Bahroun et al., 2023). By leveraging AI algorithms, lecturers can create innovative learning experiences that transcend traditional disciplinary

boundaries and encourage students to explore diverse perspectives and methodologies (Chan & Colloton, 2024). This interdisciplinary collaboration is particularly significant in addressing complex challenges related to sustainable development and other societal issues, as it allows for the synthesis of knowledge and expertise from multiple disciplines to develop innovative solutions.

Despite the promising potential of AI-driven approaches to foster interdisciplinary collaboration and address societal challenges, the extent of AI integration in higher education remains variable across institutions and disciplines (Hutson et al., 2022)., Moreover, while there is a growing body of research on the benefits and challenges of AI integration (Akinwalere & Ivanov, 2022), more empirical studies are needed to provide insights into the nuanced nature of AI integration from the perspective of university lecturers. These studies are crucial for informing evidence-based practices and policy decisions regarding the implementation of AI technologies in higher education settings. Therefore, this study aims to explore the integration of AI technologies in higher education from the perspective of university lecturers, with a focus on fostering engagement, critical thinking, and interdisciplinary collaboration among students and lecturers for better integration into sustainable global development of science, technology, engineering mathematics education for impactful innovative thinking and learning.

Objectives of the study

1. To assess the current practices and levels of integration of AI technologies in course materials, instructional methods, and assessment strategies among university lecturers.
2. To evaluate the perceived benefits and challenges associated with the integration of AI technologies in higher education settings from the perspective of university lecturers.
3. To assess how university lecturers, perceive the role of AI technologies in fostering student engagement in their courses.
4. In what ways do university lecturers believe AI technologies can enhance critical thinking skills among students?
5. To ascertain the extent to which university lecturers view AI technologies as facilitators of interdisciplinary collaboration in their teaching practices.

Research Questions

1. What are the current practices and levels of integration of AI technologies in course materials, instructional methods, and assessment strategies among university lecturers?
2. What are the perceived benefits and challenges associated with the integration of AI technologies in higher education settings from the perspective of university lecturers?
3. How do university lecturers perceive the role of AI technologies in fostering student engagement in their courses?
4. In what ways do university lecturers believe AI technologies can enhance critical thinking skills among students?
5. To what extent do university lecturers view AI technologies as facilitators of interdisciplinary collaboration in their teaching practices?

Methodology

This study employed a survey research design to explore the integration of AI technologies in higher education from the perspective of university lecturers. A non-probability sampling technique was utilized in this study. Non-probability sampling was chosen due to practical considerations of accessibility and convenience. The population of interest comprised all academic staff members across the seven colleges of Lagos State University of Education. Data were collected using a Google Form survey questionnaire. The use of online surveys facilitated efficient data collection. A total of one hundred and seven (107) responses were received, representing academic staff members from all seven colleges of the university. The reliability coefficient of the survey instrument was calculated to be 0.88 using Cronbach's alpha, indicating high internal consistency and reliability of the measures used in the questionnaire. Descriptive statistics were employed to analyze the survey data. Descriptive statistics allow for the summarization and interpretation of key findings, including measures of central tendency, variability, and frequency distributions. This method of analysis facilitated a comprehensive exploration of university lecturers' perspectives on the integration of AI technologies in higher education.

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Results

Research question one: What are the current practices and levels of integration of AI technologies in course materials, instructional methods, and assessment strategies among university lecturers?

Table 1: University lecturers' current practices and levels of integration of AI

S/N	Statement	Responses	Mean	Percent
1	How often do you use AI-integrated course materials in your lectures?	Always	6	5.7
		Often	16	15.1
		Sometimes	45	42.5
		Rarely	23	21.7
		Never	16	15.1
2	In what ways do you currently incorporate AI into your teaching assessments?	Class presentation	22	20.8
		Group projects	6	5.7
		Lecture notes	2	1.9
		Multiple choice ex	23	21.7
		Never	23	21.7
		Other	12	11.3
		Written assignment	18	17.0
3	Which instructional methods do you believe are most effective for teaching AI concepts?	Demonstrations and lectures	29	27.4
		Flipped classroom approach	5	4.7
		Hands-on activities and demonstrations	47	44.3
		Open-ended projects	16	15.1
		Other	9	8.5
4	In your experience, how successful have you been in integrating AI technologies into your teaching?	Great success	32	30.2
		Limited success	21	19.8
		Moderate success	27	25.5
		Unable to determine	26	24.5
5	What are your reasons for using AI technologies in your teaching?	To enhance teaching effectiveness	43	40.6
		To have a competitive edge in the industry	4	3.8
		To increase student interest and motivation	32	30.2
		To prepare students for future job market	13	12.3
		Other	14	13.2
6	What factors do you consider when selecting AI tools for your lectures?	Cost	2	1.9
		User-friendliness	8	7.5
		Accessibility	23	21.7
		Relevance to the subject matter	46	43.4
		Other	2	1.9
		Never used AI for lectures	25	23.6
7	What are the potential ethical considerations when using AI technologies in education?	Privacy and security concerns	39	36.8
		Lack of transparency in AI decision-making	8	7.5
		Unfair allocation of resources	16	15.1
		Data ownership and protection	29	27.4
		Other	14	13.2

Table 1 reveal varied practices and levels of integration of AI technologies among university lecturers. While a significant portion of lecturers reported using AI integrated course materials sometimes (42.5%), only a small percentage reported always using them (5.7%). Regarding teaching assessments, the most commonly incorporated methods were multiple-choice exercises (21.7%) and written assignments (17.0%). Lecturers mostly believed that hands-on activities and demonstrations (44.3%) were the most effective instructional methods for teaching AI concepts. A considerable proportion reported moderate success (25.5%) in integrating AI technologies into their teaching.

Research question two: What are the perceived benefits and challenges associated with the integration of AI technologies in higher education settings from the perspective of university lecturers?

Table 2: University lecturers' perceived benefits and challenges of integrating AI

S/N	Statement	Responses	Mean	Percent
1	Which of the following are benefits you perceive from using AI technologies in education?	Increased student engagement	28	26.4
		Enhanced critical thinking skills	31	29.2
		Improved assessment accuracy	17	16.0
		Faster grading and feedback	14	13.2
		Other	14	13.2
		Never used AI	2	1.9
2	What are the main challenges you face when integrating AI technologies into your teaching methods?	Lack of training on AI	26	24.5
		Difficulty integrating with current curriculum	23	21.7
		Resistance from students	14	13.2
		Lack of electricity	2	1.9
		Lack of access to AI tools	23	21.7
		Other	18	17.0
3	Which of the following do you think are the main biases of AI technologies?	Inaccurate data	18	17.0
		Gender and racial biases	2	1.9
		Socio-economic biases	39	36.8
		Lack of diverse data sets	30	28.3
		Other	17	16.0
4	In what ways do you think AI technologies can be used to overcome traditional teaching limitations?	Enhancing personalized learning	19	17.9
		Providing real-time feedback	8	7.5
		Creating interactive learning experiences	61	57.5
		Increasing access to education	16	15.1
		Other	2	1.9
5	Which of the following do you think are the most significant barriers to AI integration in higher education?	Lack of funding	11	10.4
		Resistance from colleagues	3	2.8
		Lack of administrative support	2	1.9
		Lack of technological infrastructure	38	35.8
		Lack of training on the use of AI	47	44.3
		Other	5	4.7

University lecturers recognized various benefits of AI integration, including increased student engagement (26.4%) and enhanced critical thinking skills (29.2%). However, they faced challenges such as a lack of training (24.5%) and difficulty integrating AI with the current curriculum (21.7%). Concerns about biases in AI technologies, particularly socio-economic biases (36.8%), were noted, along with optimism about AI's potential to overcome traditional teaching limitations through interactive learning experiences (57.5%).

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Research question three: How do university lecturers perceive the role of AI technologies in fostering student engagement in their courses**?**

Table 3: University lecturers perceive role of AI in fostering student engagement

S/N	Statement	Responses	Mean	Percent
1	How important is fostering student engagement in your teaching approach?	Not important	2	1.9
		Slightly important	2	1.9
		Moderately important	13	12.3
		Very important	62	58.5
		Extremely important	27	25.5
2	How much do you believe that AI technologies can enhance the learning experience for students?	Not at all	4	3.8
		Slightly	5	4.7
		Moderately	16	15.1
		Very	54	50.9
		Extremely	27	25.5
3	How do you determine the integration of AI technologies in your teaching according to your students' needs?	By monitoring student progress	19	17.9
		Through feedback and evaluations	45	42.5
		By considering student interests and abilities	21	19.8
		Based on course outcomes and goals	12	11.3
		Other	9	8.5

The findings in table 3 indicate that university lecturers overwhelmingly perceive fostering student engagement as crucial in their teaching approach, with 58.5% considering it very important and 25.5% deeming it extremely important. Moreover, a significant majority (76.4%) believe that AI technologies can greatly enhance the learning experience for students, with 50.9% rating AI's potential as very high. Regarding the integration of AI technologies, lecturers predominantly determine their usage based on student needs, with 42.5% relying on feedback and evaluations and 19.8% considering student interests and abilities.

Research question four: In what ways do university lecturers believe AI technologies can enhance critical thinking skills among students?

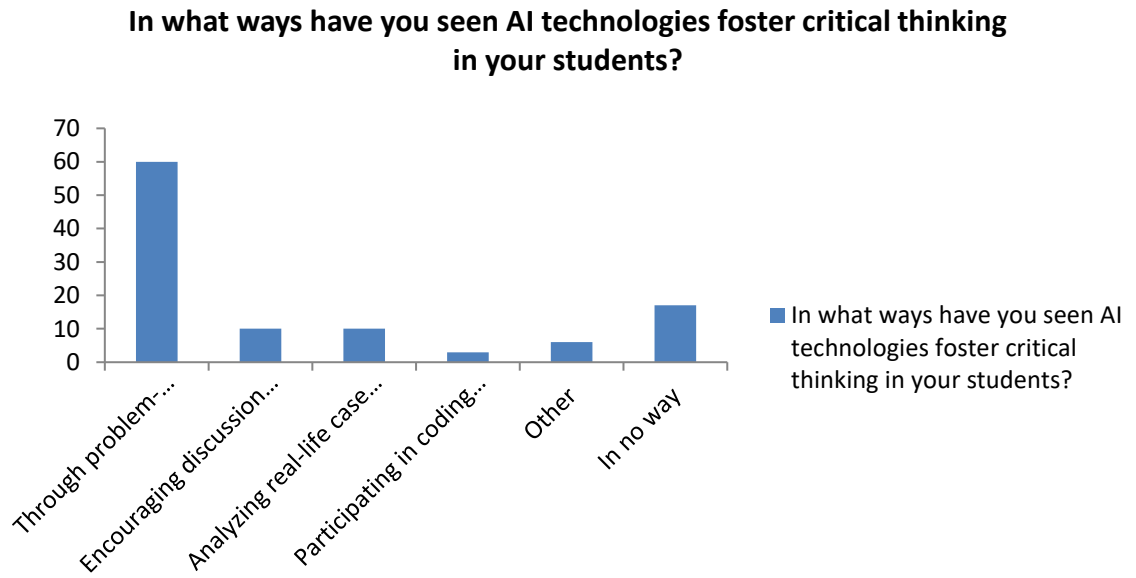

Figure 1: University lecturers' believe in how AI can enhance critical thinking skills among students

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The responses suggest that AI technologies play a substantial role in fostering critical thinking skills among students. Notably, 56.6% of lecturers observed AI fostering critical thinking through problem-solving activities, highlighting its effectiveness in promoting analytical skills. However, a notable percentage (16.0%) did not perceive AI technologies as contributing to critical thinking skills in any way.

Research question five: To what extent do university lecturers view AI technologies as facilitators of interdisciplinary collaboration in their teaching practices?

Table 4: The extent of university lecturers view AI technologies as facilitators of interdisciplinary collaboration in their teaching practices

S/N	Statement	Responses	Mean	Percent
1	To what extent do you think interdisciplinary collaboration can be enhanced through the integration of AI technologies?	Extremely effective	15	14.2
		Limited	5	4.7
		Moderately effective	24	22.6
		Somewhat effective	12	11.3
		Very effective	50	47.2
2	How often do you collaborate with colleagues from other disciplines to incorporate AI technologies into your courses?	Always	5	4.7
		Never	27	25.5
		Often	6	5.7
		Rarely	31	29.2
		Sometimes	37	34.9
3	How do you think AI technologies can help in promoting diversity and inclusivity in higher education?	Promotes inclusion of diverse perspectives	23	21.7
		Eliminates bias in grading	8	7.5
		Provides equal learning opportunities for all students	44	41.5
		Encourages participation from all students	24	22.6
		Other	7	6.6

Regarding interdisciplinary collaboration, university lecturers generally view AI technologies as effective facilitators. A significant portion (47.2%) rated AI's potential as very effective in enhancing interdisciplinary collaboration. However, collaboration with colleagues from other disciplines to incorporate AI technologies into courses was reported to be infrequent, with only 5% collaborating always and 29.2% rarely. Lecturers identified AI technologies' ability to provide equal learning opportunities for all students (41.5%) and encourage participation from all students (22.6%) as essential in promoting diversity and inclusivity in higher education.

Discussion

The findings from this study shed light on the current practices and perceptions of university lecturers regarding the integration of AI technologies in higher education. The results indicate a varied level of integration of AI technologies among university lecturers. While a significant portion reported using AI-integrated course materials sometimes (42.5%), only a small percentage reported always using them (5.7%). These results align with previous research indicating a range of adoption rates and approaches to AI integration in higher education. Al-Awawdeh et al. (2023) reported that university lecturers show limited integration of AI technologies in course materials, instructional methods, and assessment strategies, with over 80% indicating partial or no integration in foreign language teaching. This suggests that there is room for improvement in the widespread adoption of AI technologies in teaching practices.

University lecturers recognized various benefits of AI integration, including increased student engagement and enhanced critical thinking skills. However, challenges such as lack of training and difficulty integrating AI with the current curriculum were noted. This is consistent with prior literature highlighting barriers to AI adoption in educational settings. Pisica et al. (2023) reported the positive aspects of AI implementation in higher education are related to gains in the learning–teaching process, improvements in students skills and competences, better inclusion, and greater efficiency in administrative costs. Similarly, the negative aspects revealed by the research are linked to psychosocial effects, data security, ethical aspects, and unemployment threats.

The overwhelming perception among university lecturers regarding the importance of fostering student engagement (84%) and the belief in AI's potential to greatly enhance the learning experience for students (76.4%) underscores the recognition of AI as a valuable tool in higher education. Moreover, AI technologies were found to play a substantial role in fostering critical thinking skills among students, particularly through problem-solving activities. These findings echo previous studies demonstrating the positive impact of AI technologies on student learning outcomes. According to the outcomes of the study by Muthmainnah et al. (2022), AI enhances students' critical thinking abilities and has a positive impact on the participants. This is because critical thinking skills are the foundation for 21st-century skills, and AI-based instruction helps students learn these skills.

Despite the positive perception of AI technologies as effective facilitators of interdisciplinary collaboration (47.2%), collaboration with colleagues from other disciplines to incorporate AI technologies into courses was reported to be infrequent. This highlights the need for more collaborative efforts across disciplines to fully leverage the potential of AI in higher education. Lu (2024) affirmed that AI accelerates model-building and integrates multiple disciplinary research processes. In the realm of interdisciplinary knowledge production, problem definition and research priorities no longer stem solely from a single disciplinary perspective but are increasingly shaped by societal needs.

Conclusion

The findings of this study provide valuable insights into the current landscape of AI integration in higher education from the perspective of university lecturers. While there is recognition of the potential benefits of AI technologies in enhancing teaching and learning experiences, challenges such as lack of training and difficulty integrating AI with the curriculum persist. Moreover, while AI is perceived as an effective facilitator of interdisciplinary collaboration, there is a need for increased collaboration across disciplines to fully leverage its potential. Addressing these challenges and fostering collaborative efforts are essential to realizing the transformative potential of AI in higher education, ultimately enhancing student engagement, critical thinking skills, and interdisciplinary collaboration. Future research should focus on addressing these challenges and exploring innovative approaches to AI integration in higher education for better impactful innovative thinking and learning in the global world.

Recommendations are as follows:

1. Universities should invest in comprehensive professional development programs such as hands-on workshops, seminars and ongoing support to equip lecturers with the necessary skills and knowledge to effectively integrate AI technologies into their teaching.
2. Lecturers are to implement AI tools that enhance student's engagement such as intelligent tutoring systems, personalized learning platforms, and interactive virtual classrooms that will help them find the most effective strategies for their specific courses.
3. Universities should develop AI applications focused on fostering critical thinking skills such as adaptive learning systems that provide challenging problem-solving scenarios and AI-driven debate platforms that encourage analytical thinking.
4. Managements of universities should create AI-powered platforms that facilitate interdisciplinary collaboration among students and colleges/faculty or cross departmental research.
5. Universities must establish clear ethical guidelines for the use of AI in higher education, addressing issues such as data privacy, algorithmic bias and transparency. Ensure that lecturers and students are aware of these guidelines and adhere to them.
6. There should be means of implementing systems for regular feedback and assessment of AI tools in the educational process.
7. There is need for fostering partnerships with AI experts and industry leaders to stay updated on the latest AI advancements and best practices.
8. Allocate sufficient resources, including funding and technical support, to ensure successful implementation and maintenance of AI technologies. This includes investing in necessary hardware, software and technical staff to support lecturers and students.

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