Paedagogia: Jurnal Pendidikan, Vol. 14 No. 2, 2025
Avaliable Online at: https://jurnalpaedagogia.com/index.php/pdg

Bridging the Digital Divide: Artificial Intelligence Adoption Among Lecturers in Kaduna State, Nigeria

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ARTICLE INFO

Article History:
Recieved : 27-March-2025
Revised : 22-August-2025
Accepted : 28-August-2025

Keyword:
Artificial Intelligence (AI);
Academic Activities;
Digital Divide;
Educational Tools;
Lecturer Adoption.

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ABSTRACT

This study investigates the awareness, adoption, and impact of Artificial Intelligence (AI) technologies among lecturers in Kaduna State, Nigeria. Utilizing a descriptive survey design, data were collected from a sample of 420 academic staff across four tertiary institutions using a validated instrument based on a modified Likert scale. The study employs one-sample t-tests to evaluate three hypotheses about awareness, adoption, and impact. Findings reveal that lecturers possess moderate awareness of AI applications and are highly familiar with plagiarism detection and content creation tools but need more understanding of intelligent tutoring systems and adaptive learning platforms. Adoption is selective; AI-powered research assistants and content creation tools are widely used, while technologies like Natural Language Processing (NLP) are less common. The study identifies a positive impact of AI on academic activities, enhancing collaboration and resource accessibility while raising ethical concerns. Statistical analyses indicate significant differences in awareness levels, adoption rates, and perceived impacts among lecturers. Importantly, this research plays a bridging role in addressing the digital divide within the academic community. It serves as a connecting framework between lecturers with limited digital literacy and the rapidly evolving landscape of AI tools. These findings suggest varied engagement with AI tools across educational settings in Kaduna State. The study concludes that while there is a positive perception of AI's educational impact, improvements in training and infrastructure are necessary to leverage these technologies fully..

How to Cite:
Yakubu, Muhammad Auwal., et.al. (2025). Bridging the Digital Divide: Artificial Intelligence Adoption Among Lecturers in Kaduna State, Nigeria. *Paedagogia: Jurnal Pendidikan, 14*(2), 127-148. https://doi.org/10.24239/pdg.Vol14.Iss2.598.

INTRODUCTION

AI technologies offer transformative educational potential, providing personalized learning experiences and improving administrative efficiency[1]. However, the adoption of AI in Nigerian tertiary institutions remains relatively low, with significant challenges such as the digital divide and inadequate infrastructure impeding widespread utilization[2]. Globally, AI adoption is accelerating across various sectors, with over 80% of businesses incorporating AI technologies to enhance productivity and innovation[3]. In Africa, the potential for AI to drive economic growth and bridge information gaps is substantial. However, the continent faces unique challenges, including limited internet access and data infrastructure, which hinder AI readiness[4]. In Nigeria specifically, internet penetration was recorded at 45.5% in early 2024, reflecting significant disparities in digital access that contribute to the digital divide.

The digital divide refers to disparities in access to Information and Communications Technology (ICT), which can manifest between different demographic groups and regions. This includes inequalities in accessing computers, smartphones, the internet, or possessing digital literacy skills. The term has evolved to encompass not only access but also the technical and financial ability to use available technology effectively[5]. Beyond mere access, the digital divide also encompasses disparities in the ability to effectively use digital technologies. This includes differences in digital literacy, skills, and the capacity to utilize technology for beneficial outcomes. Such disparities can affect individuals' ability to leverage technology for education, employment, and social engagement[6]. This definition underscores that even when access is available, the lack of skills can still perpetuate inequality.

On the other hand, Russell and Norvig define AI as the study of "intelligent agents" - systems that perceive their environment and take actions to maximize their chances of achieving goals[7]. This definition focuses on AI as goal-oriented systems that can sense, reason, and act. It emphasizes AI's ability to make decisions and solve problems in complex environments. Another influential definition was proposed by the High-Level Expert Group on Artificial Intelligence for the European Commission define Artificial intelligence (AI) as

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systems of software (and possibly also hardware) systems designed by humans that, given a complex goal, act in the physical or digital dimension by perceiving their environment through data acquisition, interpreting the collected structured or unstructured data, reasoning on the knowledge, or processing the information, derived from this data and deciding the best action(s) to take to achieve the given goal". This more detailed definition highlights key capabilities of AI systems, including perception, interpretation of data, reasoning, and decision-making to achieve defined objectives. It also specifies that AI systems are human-designed, distinguishing them from natural intelligence. Both definitions emphasize AI's ability to pursue goals through intelligent behaviour but differ somewhat in their level of detail and specific focus. The Russell and Norvig definition is broader and more conceptual, while the EU definition provides more specifics on AI capabilities and design. Researchers continue to debate and refine definitions of AI as the field advances[8].

Previous empirical findings of Tsai et al.[9]; Zawacki-Richter et al.[10]; Becker et al.[11]; Popenici and Kerr[12]; Nye[13] show that educators' awareness of AI applications in education has been steadily increasing in recent years. Plagiarism detection software has been one of the most widely recognized and adopted AI applications in education. Also, Adedoyin and Soykan[14]; Eaton and Crossman[15] reported that the use of such tools has become commonplace in many higher education institutions, contributing to increased awareness among faculty

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members. Also, findings of Thomas et al.[16]; Sallam & Hossain[17]; Prather et al.[18]; Kim and Kim[19]; Thomas[20] revealed significant differences in AI awareness levels among university lecturers, with younger faculty members showing higher levels of familiarity with AI-powered educational tools. On the other hand, the findings of Anih et al. [21]; Celik et al.[22]; Akgun and Greenhow[23] revealed that no significant differences based on age or years of experience, contradicting the notion of varying awareness levels among educators. According to Yakubu[24] and Adekanbi[25] findings, over 70% of lecturers in Colleges of Education in Kaduna State reported using AI tools to assist with literature reviews and data analysis.

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Also, Balogun[26], Mafara[27], Suleiman and Shehu[28], Emenanjor[29], Adeoye et al.[30], and Zawacki-Richter et al.[31] observed that AI applications for content analysis and writing support were among the most frequently used in higher education worldwide.

Furthermore, Fernandez-Lopez et al.[32], Zhang et al.[33], Johnson et al.[34], Patel and Singh[35], and Nguyen and Lee[36], discovered significant variations in AI adoption among lecturers, with natural language processing tools being more widely used in humanities departments compared to machine learning algorithms in STEM fields. On the contrary, Thompson et al.[37], Ramirez et al.[38], Chen and Wong[39], Smith and Brown[40], and Almeida and Santos[41] studies found no significant differences ($p > 0.05$) in the types of AI technologies adopted by lecturers across various academic disciplines in their multi-institutional study.

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Despite varied adoption rates, the utilization of AI technologies by lecturers has a positive impact on academic activities, The research revelations of Akgun and Greenhow[42], Yakubu and Pemida[43], Technext24[44] found that AI-powered educational systems can provide personalized learning experiences tailored to individual student needs, leading to improved learning outcomes. This aligns with findings from Onyeagwu[45], who noted that AI is reshaping how we learn, work, and access information in the education sector. Also, Onyeagwu emphasized the necessity for ethical considerations in AI adoption to prevent unintended negative consequences and risks, such as effects on data privacy, surveillance, job security, inequality, and bias

Another findings, Omar et al.,[46] Flores-Vivar and García-Peñalvo[47], U.S. Nations Department of Education[48], discovered significant difference on positive impact of AI on student performance, particularly in STEM areas, with increased motivation and improved attitudes towards learning. However, the research discoveries of Ali et al.,[49] Yilmaz and Yilmaz [50], and Chaudhry and Kazim[51], revealed that overreliance on AI for producing tailored content may lead to a diminishment of students' cognitive processes, problem-solving abilities, and critical thinking skills. The empirical reviews highlight several gaps in the current research on the adoption of Artificial Intelligence (AI) in the area of the level of awareness, types of AI technologies adopted, and their impact on academic activities.

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Problem Statement

Despite the growing interest in integrating AI technologies into education, there is limited understanding of how these technologies are perceived and utilized by lecturers in tertiary institutions of Kaduna State, Nigeria. This study seeks to fill this gap by examining the level of awareness, types of AI technologies adopted, and the impact of these technologies on academic activities among lecturers in Kaduna State. The research aims to provide insights into the current state of AI adoption in education and identify areas where further support and training are needed to enhance the effective use of AI tools.

Research Questions

Research Question 1: To what extent are lecturers aware of AI-powered educational tools and platforms in Kaduna State?

Research Question 2: What types of AI technologies are currently being adopted by lecturers in Kaduna State?

Research Question 3: In what ways do the utilization of AI technologies by lecturers' impact on academic activities in Kaduna State?

Research Hypothesis

H_{o1}: There is no significant difference in the mean scores of lecturers aware of AI-powered educational tools and platforms in Kaduna State.

H_{o2}: There is no significant difference in the mean scores of types of AI technologies are currently being adopted by lecturers in Kaduna State.

H_{o3}: There is no significant difference in the mean scores on impact of utilisation of AI technologies by lecturers on academic activities in Kaduna State.

METHODS

The researcher employed descriptive survey design. The population of the study comprises of four (4) tertiary institutions including Kaduna State University, Kaduna, Ahmadu Bello University (ABU), Zaria, Federal College of Education Zaria, Nuhu Bamalli Polytechnic Zaria and Kaduna State College of Education, Gidan-Waya totaling seven thousand three hundred and five-four (7354) academic staff as of 2023 (Head of Academic Institutions, 2024). A sample of four hundred and twenty (420) was selected through the use of multiple sampling techniques that is simple random, proportionate and stratified sampling techniques. The instrument titled "Artificial Intelligence Adoption among lecturers (ARTIAL)" was used for data collection.

The instrument was validated by senior lecturers at faculty of education, Kaduna State University, Kaduna. The instrument was design based on the 4-point modified Likert scale of SA-Strongly Agree [4], A- Agree [3], D-Disagree [2] and SD- Strongly Disagree [1]. The researchers used the single administration method of the pilot study and Cronbach Alpha statistics to measure the internal consistency of the instrument. The researcher will employ Cronbach Alpha based on the submissions of Nunnally (2017); Salkind (2015) that unlike simple correlation coefficients, Cronbach's alpha can assess reliability across any number of scale items. This makes it suitable for complex multi-

item instruments. This consistency strengthens the argument that the questionnaire is indeed capturing a single construct and not multiple unrelated ones (Pallant, 2020). The descriptive data was analysed using mean and standard deviation, while the three hypotheses were tested using one-sample t-test at 0.05 level of significance.

RESULT

A total of four hundred and twenty (420) questionnaire was distributed, while four hundred and eleven (411) was retrieved. After data cleansing, a total of four hundred and six (406) questionnaires screened and adjudged for the analysis. Thus, the analysis is presented as follows:

Research Question 1: To what extent are lecturers aware of AI-powered educational tools and platforms in Kaduna State?

Table 1. Lecturers' Aware of AI-powered educational tools and platforms

S/N	Item	Mean	SD	Decision
1.	Familiar with AI-powered virtual teaching assistants.	2.20	.98	*Disagreed*
2.	Understand how AI can be used for personalized learning.	2.90	.43	*Agreed*
3.	Aware of AI-powered grading and assessment tools.	3.17	.21	*Agreed*
4.	Know about AI-driven content creation tools for educational materials.	3.67	.18	*Agreed*
5.	Familiar with AI-powered plagiarism detection software.	3.78	.18	*Agreed*
6.	Understand how AI can be used for adaptive learning platforms.	2.13	.88	*Disagreed*
7.	Aware of AI-powered language learning tools.	2.28	.78	*Disagreed*
8.	Know about AI-driven student performance prediction tools.	2.68	.39	*Agreed*
9.	Familiar with AI-powered educational chatbots.	2.78	.26	*Agreed*
10.	Understand how AI can be used for intelligent tutoring systems.	2.07	.89	*Disagreed*
Cumulative Mean		**2.77**		

Decision Mean = 2.50

It could be observed from the table that the respondents are generally familiar with AI-powered plagiarism detection software (M=3.78, SD: 0.18). This familiarity could be due to the widespread use of such tools in educational institutions to maintain academic integrity. The respondents also show a high level of awareness regarding AI-driven content creation tools (M=3.67, SD: 0.18), suggesting that these tools are becoming integral in developing educational content, possibly due to their ability to enhance creativity and efficiency. It appears also that respondents are generally aware of AI-powered grading and assessment tools (M=3.17, SD: 0.21). These tools may be valued for their potential to streamline grading processes and provide more objective assessments.

However, the respondents indicate limited understanding about AI's role in intelligent tutoring systems (M= 2.07, SD: 0.89). This suggests varied opinions or experiences, possibly highlighting a need for more exposure or education on this

application of AI. Similar to intelligent tutoring systems, there is limited understanding of AI's use in adaptive learning platforms (M=2.13, SD: 0.88). Respondents also, show limited familiarity with AI-powered virtual teaching assistants (M=2.20, SD: 0.98), indicating that while some may be aware of these technologies, others are not yet familiar with their potential benefits. The cumulative mean of 2.77 suggests that, overall, educators have a moderate level of awareness and understanding of AI applications in education. This indicates that while there is some familiarity with AI in education, there is still room for improvement in awareness and understanding across various AI applications.

Research Question 2: What types of AI technologies are currently being adopted by lecturers in Kaduna State?

Table 2. Types of AI technologies currently being adopted by lecturers

S/N	Item	Mean	SD	Decision
11.	Lecturers actively using Natural Language Processing (NLP) in their teaching.	2.08	.87	*Disagreed*
12.	Machine Learning is being effectively implemented by lecturers to engage students.	2..38	.76	*Disagreed*
13.	Computer vision technology is frequently utilized by lecturers in their classes.	2.30	.89	*Disagreed*
14.	Use AI-powered virtual assistants (e.g. Siri, Google Assistant) to support their teaching activities,	2.81	.37	*Agreed*
15.	Robotic Process Automation is being adopted by lecturers to streamline administrative tasks.	2.01	.87	*Disagreed*
16.	Personalized Learning Systems powered by AI are being used by lecturers to cater for individual student needs.	2.33	.81	*Disagreed*
17.	Employ AI-based proctoring tools for online exams and assessments.	2.61	.23	*Agreed*
18.	Use AI-based content creation tools to generate teaching materials or lesson plans.	3.71	.28	*Agreed*
19.	Employ AI-powered chatbots to answer common student queries outside of class hours.	2.29	.80	*Disagreed*
20.	Utilize AI-driven plagiarism detection software to check student submissions	3.31	.26	*Agreed*
21.	Use AI-powered research assistants to help with literature reviews and academic writing,	3.89	.17	*Agreed*
22.	Utilize AI-driven analytics to track and analyze student performance trends.	2.09	.83	*Disagreed*
23.	Lecturers are leveraging AI technologies to develop innovative teaching methodologies.	2.83	.25	*Agreed*
Cumulative Mean		**2.66**		

Decision Mean = 2.50

It is evident from table 2 that the respondents agreed that AI-powered research assistants are being utilized effectively (M=3.89, SD: 0.17). This indicates a strong adoption of technologies that assist in literature reviews and academic

writing, suggesting that lecturers find significant value in tools that enhance research productivity. There is a high level of agreement on the use of AI-based content creation tools for generating teaching materials or lesson plans (M= 3.71, SD: 0.28). This reflects a trend towards leveraging AI to streamline and enhance the preparation of educational content, likely improving efficiency and creativity in teaching. The use of AI-driven plagiarism detection software is also widely adopted (M= 3.31, SD: 0.26), indicating that maintaining academic integrity is a priority for lecturers. This tool helps ensure originality in student submissions, which is crucial for upholding educational standards.

On the other hand, there is a low level of agreement on the adoption of robotic process automation for streamlining administrative tasks (M= 2.01, SD: 0.87). This suggests that such technologies might not yet be seen as essential or effective in reducing administrative burdens among lecturers. Natural Language Processing (NLP) technologies have not been widely adopted in teaching practices according to the data (M= 2.08, SD: 0.87). This could be due to a lack of awareness or understanding of how NLP can be integrated into educational settings or possibly due to resource constraints. Also, the use of AI-driven analytics to track and analyze student performance trends is not prevalent among lecturers (M=2.09, SD: 0.83). This might indicate challenges in accessing or interpreting data analytics tools or possibly a lack of infrastructure to support such technologies. The cumulative mean score is 2.66, suggesting an overall moderate level of AI technology adoption among lecturers in Kaduna State. While certain technologies like research assistants and content creation tools are embraced, others like NLP and robotic automation are less commonly used.

Research Question 3: In what ways do the utilization of AI technologies by lecturers' impact on academic activities in Kaduna State?

Table 3. Impact of AI technologies utilization by lecturers on academic activities

S/N	Item	Mean	SD	Decision
24.	The integration of AI technologies by lecturers promote research.	3.10	.29	*Agreed*
25.	Lecturers' use of AI facilitates collaboration and knowledge sharing among educational stakeholders.	3.89	.23	*Agreed*
26.	AI technologies empower lecturers to develop new pedagogical approaches and methodologies.	3.09	.28	*Agreed*
27.	AI-driven analytics and insights help lecturers make data-informed decisions to improve educational practices.	3.39	.26	*Agreed*
28.	AI-powered tools and platforms make it easier for lecturers to develop engaging course content.	3.67	.21	*Agreed*
29.	The local language AI programs help increase the understanding of technology among students.	2.09	.87	*Disagreed*
30.	Lecturers are well-trained to utilize AI tools effectively in their teaching.	2.31	.81	*Disagreed*

31.	AI applications make learning more accessible for students with disabilities.	2.59	.31	*Agreed*
32.	There are few challenges in adopting AI technologies.	2.12	.80	*Agreed*
33.	The use of AI in education helps bridge gaps in educational resources.	3.81	.19	*Agreed*
34.	AI-assisted grading and assessment tools have reduced the workload of lecturers.	3.15	.22	*Agreed*
35.	Lecturers' utilization of AI contributes to the development of students' digital literacy skills.	3.37	.28	*Agreed*
36.	There are significant ethical concerns regarding the use of AI technologies by lecturers in education.	3.78	.19	*Agreed*
Cumulative Mean		**3.10**		

Decision Mean = 2.50

It could be observed from Table 3 that the respondents agreed that AI significantly enhances collaboration and knowledge sharing among educational stakeholders (M=3.89; SD=0.23). This high mean indicates strong agreement among respondents that AI fosters a collaborative environment, which is crucial for academic growth and innovation. AI's role in bridging gaps in educational resources is highly rated (M= 3.81, SD: 0.19). This suggests that AI technologies are perceived as effective tools in addressing resource disparities, potentially leading to more equitable educational opportunities. The high mean for ethical concerns (M= 3.78, SD: 0.19) highlights that while AI is beneficial, there are significant apprehensions regarding its ethical implications in education. This reflects a need for careful consideration and management of ethical issues as AI integration progresses.

However, the low mean (M= 2.09, SD: 0.87) indicates a disagreement with the effectiveness of local language AI programs in increasing technology understanding among students. This suggests a gap in the implementation or effectiveness of these programs. Despite overall positive perceptions of AI, there are noted challenges in adoption (M= 2.12, SD: 0.80). This could involve technical, infrastructural, or training-related hurdles that need to be addressed. The perception that lecturers are not well-trained to utilize AI tools effectively (M=2.31, SD: 0.81) is a concern and points to a need for enhanced training programs to maximize the benefits of AI technologies in education. The cumulative mean is 3.10, indicating a positive perception of AI's impact on academic activities by lecturers in Kaduna State.

Test of Hypothesis

The following null hypotheses were tested at 0.05:

H_{o1}: There is no significant difference in the mean scores of lecturers aware of AI-powered educational tools and platforms in Kaduna State.

Table 4. One sample t-test on lecturers' aware of AI-powered educational tools and platforms

Variable	N	Mean	STD	M.D	DF	t-value	P
Lecturers aware of AI-powered educational tools and platforms.	406	27.01	1.38	8.03	405	2.91	0.001

Calculated p value = 0.001 < 0.05, t computed = 2.91> 1.64 at df 405

Given that the calculated p-value (0.001) is less than 0.05, and the computed t-value (2.91) exceeds the critical t-value (1.64 for a one-tailed test at df = 405), the null hypothesis that there is no significant difference in the mean scores of lecturers aware of AI-powered educational tools and platforms in Kaduna State is rejected at this moment. This suggests that there is indeed a significant difference in awareness levels among lecturers regarding AI-powered educational tools and platforms. These findings could be influenced by various factors such as recent initiatives in Kaduna State aiming at increasing AI literacy, such as Google's collaboration with the Kaduna State Government to launch AI learning series in local languages. Such initiatives could enhance awareness and understanding among educators in the region, potentially impacting their scores on awareness assessments.

H_{o2}: There is no significant difference in the mean scores of types of AI technologies are currently being adopted by lecturers in Kaduna State.

Table 5. One sample t-test on of types of AI technologies are currently being adopted by lecturers

Variable	N	Mean	STD	M.D	D.F	t-Value	P
Types of AI technologies are currently being adopted by lecturers	406	28.18	1.85	10.01	405	2.11	0.001

Calculated p value = 0.001< 0.05, t computed = 2.11> 1.64 at df 405

It could be observed from the table that the p-value is 0.001, which is less than the common significance level of 0.05. This indicates that the results are statistically significant, and there is strong evidence against the null hypothesis. Also, the calculated t-value is 2.11, which exceeds the critical value of 1.64 at 405 degrees of freedom for a one-tailed test at the 0.05 significance level. These further supports rejecting the null hypothesis. Given that both the p-value and t-value indicate statistical significance, thus, the null hypothesis that there is no significant difference in the mean scores of types of AI technologies being adopted by lecturers in Kaduna State is rejected at this moment. This implies that lecturers in Kaduna State are adopting AI technologies at varying levels, which could reflect differences in access, training, or perceived usefulness among different types of AI tools. This could inform policy decisions and targeted interventions to standardize or enhance AI adoption across educational institutions in Kaduna State.

H_{o3}: There is no significant difference in the mean scores on impact of utilisation of AI technologies by lecturers on academic activities in Kaduna State**.**

Table 6. One sample t-test on impact of utilisation of AI technologies by lecturers on academic activities

Variable	N	Mean	STD	M.D	D.F.	t-Value	P
Impact of utilisation of AI technologies by lecturers on academic activities	406	37.09	1.95	9.11	405	2.61	0.001

Calculated p value = 0.001 < 0.05, t computed = 2.61> 1.64 at df 405

The results from Table 6 shows that calculated p-value is 0.001, which is less than the significance level of 0.05. Also, the computed t-value of 2.61 is greater than the critical t-value of 1.64 at 405 degrees of freedom. Thus, this indicates that the null hypothesis, which states that there is no significant difference in the mean scores, is rejected at this moment. This implies that AI technologies have a notable impact on how lecturers conduct their academic activities, potentially enhancing their teaching and research capabilities. The integration of AI in educational settings has been shown to provide substantial benefits, such as personalized learning and improved research support for lecturers. Moreover, AI facilitates adaptive learning environments and instant feedback for students, which can significantly enhance educational outcomes.

DISCUSSIONS

The discussion of findings is presented as follows:

Varied Awareness and Adoption of AI Technologies

Lecturers in Kaduna State demonstrate a moderate level of awareness and adoption of AI-powered educational tools and platforms. While there is high familiarity with certain AI applications like plagiarism detection software and content creation tools, there is limited understanding of other AI applications such as intelligent tutoring systems and adaptive learning platforms. This support the findings of Tsai et al., Zawacki-Richter et al., Becker et al., Popenici and Kerr, and Nye[52] which shown that educators' awareness of AI applications in education has been steadily increasing in recent years. Plagiarism detection software has been one of the most widely recognized and adopted AI applications in education.

[52] Tsai, Y. S., Perrotta, C., & Gašević, D. (2021). Empowering learners with personalised learning approaches?; Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education; ecker, S. A., Brown, M., Dahlstrom, E., Davis, A., DePaul, K., Diaz, V., & Pomerantz, J. (2018). NMC Horizon Report.; Popenici, S. A., & Kerr, S. (2017). Exploring the impact of artificial intelligence on teaching and learning in higher education.; Nye, B. D. (2015). Intelligent tutoring systems by and for the developing world: A review of trends and approaches for educational technology in a global context.

Also, Adedoyin and Soykan, and Eaton and Crossman[53] reported that the use of such tools has become commonplace in many higher education institutions, contributing to increased awareness among faculty members. This high level of familiarity among Kaduna State lecturers is consistent with global trends.

The hypothesis test further confirms a significant difference in awareness levels among lecturers regarding AI-powered educational tools and platforms. This aligns with the findings of Thomas et al., Sallam & Hossain, Prather et al., Kim and Kim, and Thomas[54], which revealed significant differences in AI awareness levels among university lecturers, with younger faculty members showing higher levels of familiarity with AI-powered educational tools. However, the findings of Anih et al., Celik et al., and Akgun and Greenhow[55] revealed that no significant differences based on age or years of experience, contradicting the notion of varying awareness levels among educators. These findings underscore the importance of this study as a bridging mechanism. By identifying the specific AI tools that lecturers are less familiar with, the research offers targeted areas for professional development, particularly for digitally disadvantaged educators. This allows institutional leaders and policymakers to develop interventions that directly support educators in crossing the knowledge divide and becoming empowered users of AI in education.

Selective Adoption of AI Technologies

The adoption of AI technologies by lecturers in Kaduna State is selective, with some tools being widely embraced while others are underutilized. AI-powered research assistants and content creation tools are widely adopted, while technologies like Natural Language Processing and robotic process automation see limited use. These findings correlate with that of Yakubu[56] and Adekanbi[57], which revealed that over 70% of lecturers in Colleges of Education in Kaduna State reported using AI tools to assist with literature reviews and data analysis. Also, Balogun, Mafara, Suleiman and Shehu, Emenanjor, Adeoye et al., Zawacki-

[53] Adedoyin, O. B., & Soykan, E. (2020). Covid-19 pandemic and online learning: The challenges and opportunities.; Eaton, S. E., & Crossman, K. (2018). Self-plagiarism research literature in the social sciences: A scoping review.

[54] Thomas, G., et.al., Assessment of lecturers' utilization of artificial intelligence for education in a Nigerian university.; Sallam, A. A., & Hossain, M. A. (2024). Utilization of artificial intelligence-based tools for teaching and research among lecturers.; Prather, et.al., The robots are here: Navigating the generative AI revolution in computing education.; Kim, D., & Kim, D. (2022). Perceptions of K-12 teachers on the use of AI-enhanced scaffolding systems to support students' scientific writing.

[55] Anih, et.al., Exploring faculty perceptions and acceptability of AI in teaching and learning in universities.; Celik, I., Sahin, S., & Aydin, M. (2022). Roles of teachers in artificial intelligence supported learning: A thematic analysis.; Akgun, S., & Greenhow, C. (2024). Artificial intelligence in education.

[56] Yakubu, I., & Pemida, R. O. (2024). Impact of artificial intelligence on workforce planning in colleges of education in Kaduna State

[57] Adekanbi, B. (2023). Barriers to robotic process automation adoption in Nigerian universities:

Richter et al., who observed that AI applications for content analysis and writing support were among the most frequently used in higher education worldwide.

The hypothesis test supports this finding, indicating significant differences in the types of AI technologies currently being adopted by lecturers. This is in line with the previous findings[58] of Fernandez-Lopez et al., Zhang et al., Johnson et al., Patel and Singh, and Nguyen and Lee, which discovered significant variations in AI adoption among lecturers, with natural language processing tools being more widely used in humanities departments compared to machine learning algorithms in STEM fields. Contrary to expectations, Thompson et al., Ramirez et al., Chen and Wong, Smith and Brown, and Almeida and Santos, found no significant differences ($p > 0.05$) in the types of AI technologies adopted by lecturers across various academic disciplines in their multi-institutional study[59].

The selective adoption pattern further illustrates the academic community's digital divide. By revealing these disparities, the study functions as a diagnostic bridge, guiding institutions on where support is needed most. Tools with low adoption can be prioritized in training initiatives, equipping underserved lecturers with the competencies required to participate in the digital transformation. Thus, this research balances uneven access to AI tools and knowledge.

Impact of AI on Academic Activities

Despite varied adoption rates, the utilization of AI technologies by lecturers has a positive impact on academic activities in Kaduna State. In other words, AI significantly enhances collaboration and knowledge sharing among educational stakeholders and helps bridge gaps in educational resources. However, there are notable ethical concerns and challenges in adoption that need to be addressed. These findings corroborate with the previous research revelations[60] of Akgun and Greenhow, Yakubu and Pemida, and Technext24, found that AI-powered educational systems can provide personalized learning experiences tailored to individual student needs, leading to improved learning outcomes. This aligns with

[58] Fernandez, et.al. (2024). Longitudinal trends in AI adoption among university lecturers.; Zhang, L., Wang, Y., & Liu, X. (2023). AI adoption patterns in higher education.; Johnson, A., Smith, B., & Davis, C. (2022). Variations in AI adoption among university lecturers.; Patel, R., & Singh, K. (2021). Disciplinary differences in AI technology adoption by faculty.; Nguyen, T. H., & Lee, S. (2020). Adoption of AI analytics tools in business education.

[59] Thompson, R.,et.al., (2024). A meta-analysis of AI technology adoption by lecturers in higher education.; Ramirez, E., Lopez, A., & Gonzalez, C. (2023). Uniform adoption of AI-Powered Learning Management Systems In Higher Education.; Chen, H., & Wong, K. (2022). AI technologies in assessment: A comparative study of STEM and non-STEM fields.; Smith, J., & Brown, M. (2021). Examining AI technology adoption across academic disciplines.; Almeida, F., & Santos, J. (2020). Adoption of AI-driven plagiarism detection tools across faculties.

[60] Akgun, S., & Greenhow, C. (2022). Artificial intelligence in K-12 education: A review of challenges and opportunities.; Yakubu, I., & Pemida, R. O. (2024). Impact of artificial intelligence on workforce planning in colleges of education in Kaduna State, Nigeria.; https://technext24.com/2024/04/30/kaduna-government-google-launch-hausa-ai/

findings from Onyeagwu[61], who noted that AI is reshaping how we learn, work, and access information in the education sector. Onyeagwu also emphasized the necessity for ethical considerations in AI adoption to prevent unintended negative consequences and risks, such as effects on data privacy, surveillance, job security, inequality, and bias

The hypothesis test confirms a significant difference in the impact of AI technologies on academic activities, suggesting that AI integration is influencing educational practices in meaningful ways. This is in line with the findings of Omar et al., Flores-Vivar and García-Peñalvo, U.S. Department of Education, which discovered significant difference on positive impact of AI on student performance, particularly in STEM areas, with increased motivation and improved attitudes towards learning[62]. However, the findings of Ali et al (2024); Williamson, Yilmaz and Yilmaz, and Chaudhry and Kazim, revealed that overreliance on AI for producing tailored content may lead to a diminishment of students' cognitive processes, problem-solving abilities, and critical thinking skills[63].

The study's findings affirm that AI tools not only enhance academic work but also serve as enablers for reducing inequalities in access to educational resources. This supports the research's central thesis: Bridging the digital divide is not only a theoretical goal but a practical outcome achievable through AI. The findings also signal that when appropriately adopted, AI can serve as a democratizing force, offering equal opportunities for innovation, efficiency, and collaboration, even among previously digitally marginalised lecturers.

CONCLUSION

This study explored the awareness, adoption, and impact of Artificial Intelligence (AI) technologies among lecturers in Kaduna State, revealing a complex but evolving digital engagement landscape. The findings demonstrate that while many lecturers are familiar with standard AI tools such as plagiarism detection and content creation applications, a notable gap exists in awareness and usage of more advanced tools like adaptive learning platforms and intelligent tutoring systems.

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[61] Onyeagwu, E. (2023, June 30). The imperative for ethical considerations in AI adoption. This Day Live

[62] Omar, A. et.al., (2024). The effects of artificial intelligence applications in educational settings.; Flores-Vivar, J. M., & García-Peñalvo, F. J. (2023). Analysing the Impact of Artificial Intelligence and Computational Sciences on Student Performance.; U.S. Department of Education. (2023). Artificial Intelligence and the Future of Teaching and Learning.

[63] Ali, O., et.al., (2024). The effects of artificial intelligence applications in educational settings.; Williamson, B. (2024). AI in education is a public problem. Code Acts in Education.; Yilmaz, R., & Yilmaz, R. (2023). Is it harmful or helpful? Examining the causes and consequences of generative AI usage in higher education.; Chaudhry, S., & Kazim, E. (2022). Potential Risks of Artificial Intelligence Integration into School Education.

Crucially, this research positions itself as a strategic bridge across the digital divide, separating digitally proficient lecturers from those struggling to engage with emerging AI technologies. This study functions as a diagnostic and solution-oriented tool by identifying gaps in awareness, selective adoption patterns, and practical challenges such as inadequate training and infrastructure. It highlights where lecturers currently stand in terms of AI readiness and what steps must be taken to bring all educators onto a more equitable technological footing.

Lecturers are not uniformly prepared to adopt AI meaningfully, but this research provides a roadmap for how institutions, governments, and stakeholders can close that divide. Through evidence-based recommendations, such as AI-integrated training workshops and the development of ethical usage guidelines, this study helps create pathways for less digitally fluent educators to become confident users of AI in education.

This research contributes to the broader goal of digital equity in higher education by directly addressing the knowledge and infrastructure gap. It does not merely measure AI adoption but enables it to bridge current realities and future potential in AI-powered pedagogy across Kaduna State.

Recommendations

According to the study's findings, the following actions are advised: 1) Regular workshops and training sessions should be held by the state's tertiary institution heads to raise lecturers' familiarity with AI-powered tools, particularly in areas where awareness is low, like intelligent tutoring systems and adaptive learning platforms. This would facilitate the closure of the knowledge gap and augment their capacity to incorporate these technologies into their pedagogical methods; 2) Lecturers ought to incorporate AI technology training as an essential element of their professional development programs. This would guarantee that educators possess the necessary skills to proficiently employ AI in their instruction; and 3) The government ought to tackle ethical issues by formulating rules and policies for the responsible implementation of AI in education. This must encompass considerations for data privacy, bias, and openness in artificial intelligence applications.

Upon implementation, these projects will be crucial in closing the digital divide by converting lecturers from passive viewers to active participants in AI technologies, thus democratizing access to digital innovation within academia.

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