

UTILIZING AI TOOLS TO PROMOTE ACTIVE LEARNING: AN INVESTIGATION INTO THE ADOPTION BY PRE-SERVICE TEACHERS

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Abstract

The integration of AI tools in education offers innovative ways to enhance teaching and learning experiences. This study explored pre-service teachers' adoption of AI tools for active learning. The study examined the perceived usefulness and ease of use of AI tools. The study utilized descriptive research of the survey type. A total 425 pre-service teachers responded to instrument from the University of Lagos. Stratified random sampling was used to select based on gender and departments. Data was collected using Google form and the collected were analysed using descriptive statistics. The study revealed that AI enhanced student engagement, improved formative assessments, and increased personalized learning experiences. However, concerns emerged around data privacy, ethical implications, and AI potentially perpetuating biases. The study concluded that pre-service teachers' AI tool adoption is for fostering active learning environments and improve learning outcome. The study recommended that pre-service teacher's adoption of AI should be moderated and monitored for proper usage.

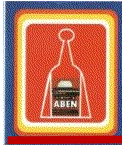
Keywords: AI tools, Active learning, Pre-service teachers, Student engagement and Higher-order thinking skills

Introduction

The integration of artificial intelligence (AI) tools in education has emerged as a transformative approach to enhance teaching and learning experiences, offering new avenues for knowledge transmission (Zawacki-Richter et al., 2019; Adamu & Achuen, 2022). These innovative tools possess the potential to revolutionize the way active learning strategies are facilitated, fostering increased student engagement and development of higher-order thinking skills (Popenici & Kerr, 2017; Ogunlade & Biobaku, 2021). While the principles of active learning pedagogy are well-established, the advent of AI technology presents an opportunity to amplify its impact in unprecedented ways, particularly in the realm of teacher training programs (Luckin et al., 2016; Oye et al., 2012).

Active learning is a student-centered approach that actively engages students in the learning process through activities, discussions, and hands-on experiences, rather than passive reception of information (Prince, 2004; Freeman et al., 2014). In the study "Leveraging AI Tools to Foster Active Learning: A Study of Pre-Service Teachers' Adoption and Outcomes," active learning strategies are central to the research focus.

Knowledge transmission in educational settings has relied heavily on conventional methods, such as lectures, textbooks, and static instructional materials. However, these approaches often struggle to fully engage learners and facilitate the deep understanding and application of concepts (Tight, 2020). AI tools offer a powerful solution by providing personalized, adaptive, and interactive learning experiences tailored to individual student needs and learning styles, enhancing the transmission of knowledge through dynamic and immersive means (Timms, 2016). Traditionally, knowledge transmission in educational settings has relied heavily on conventional methods, such as lectures, textbooks, and static instructional materials. However,



these approaches often struggle to fully engage learners and facilitate the deep understanding and application of concepts in the Nigerian context (Tight, 2020; Okebukola, 2008). AI tools offer a powerful solution by providing personalized, adaptive, and interactive learning experiences tailored to individual student needs and learning styles, enhancing the transmission of knowledge through dynamic and immersive means (Timms, 2016; Jegede & Hameed, 2020).

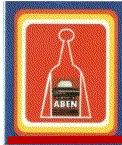
Moreover, the integration of AI in teacher education programs holds immense promise for preparing future educators to effectively harness these cutting-edge tools and create dynamic, student-centered learning environments in Nigeria. By equipping pre-service teachers with the knowledge and skills to leverage AI for active learning, they can better engage students, enhance formative assessments, and foster personalized learning journeys, ultimately optimizing the transmission of knowledge and skills (Scherer et al., 2019; Adubu & Yusuf, 2021). However, as with any disruptive technology, the adoption and implementation of AI tools in education are not without challenges in the Nigerian context. Concerns surrounding data privacy, ethical implications, and the potential perpetuation of biases through AI algorithms must be carefully addressed (Zawacki-Richter et al., 2019; Popenici & Kerr, 2017; Omoregbe & Azeta, 2019). Additionally, factors such as perceived ease of use, usefulness, and technological self-efficacy may influence pre-service teachers' willingness to embrace and integrate AI tools into their teaching practices, impacting the effective transmission of knowledge (Venkatesh et al., 2003; Bandura, 1997; Adeosun & Olaopa, 2021).

The integration of AI in teacher education programs holds immense promise for preparing future educators to effectively harness these cutting-edge tools and create dynamic, student-centered learning environments. By equipping pre-service teachers with the knowledge and skills to leverage AI for active learning, they can better engage students, enhance formative assessments, and foster personalized learning journeys, ultimately optimizing the transmission of knowledge and skills (Scherer et al., 2019). However, as with any disruptive technology, the adoption and implementation of AI tools in education are not without challenges. Concerns surrounding data privacy, ethical implications, and the potential perpetuation of biases through AI algorithms must be carefully addressed (Zawacki-Richter et al., 2019; Popenici & Kerr, 2017). Additionally, factors such as perceived ease of use, usefulness, and technological self-efficacy may influence pre-service teachers' willingness to embrace and integrate AI tools into their teaching practices, impacting the effective transmission of knowledge (Venkatesh et al., 2003; Bandura, 1997).

As AI continues to permeate the educational landscape, it is crucial to understand its role in amplifying active learning strategies and facilitating effective knowledge transmission, as well as to explore the factors that impact its adoption by pre-service teachers. By investigating these aspects, teacher education programs, policymakers, and technology developers can make informed decisions and develop strategies to cultivate more engaging and student-centered learning experiences, ultimately preparing future educators to effectively leverage the potential of AI for enhancing teaching and learning outcomes and optimizing the transmission of knowledge in the digital age (Tuomi, 2018; Zawacki-Richter et al., 2019).

Statement of the Problem

Despite the growing interest in AI tools for education, there is a lack of empirical evidence on the factors influencing pre-service teachers' adoption and perceived impact of these tools for facilitating active learning strategies. Understanding the motivations, benefits, and challenges associated with AI tool integration in lesson planning and instruction are crucial for effective implementation and cultivation of engaging and student-centered learning experiences.



The purpose of this study was to examine pre-service teachers' perception of the adoption of AI tools in facilitating active learning. Specifically, the study examined perception of pre-service teachers on the ease of use of AI tools for active learning *and* perception of pre-service teachers on the usefulness of AI tools for active learning

Research Questions

1. What is the perception of pre-service teachers on the ease of use of AI tools for active learning?
2. What is the perception of pre-service teachers on the usefulness of AI tools for active learning?

Method

The study is a descriptive study of the cross-sectional type. The descriptive survey research enables a researcher to collect information about study. This is considered appropriate for this study because it give the researcher the opportunity to ascertain the outcome of the study. This research was conducted in University of Lagos. Lagos state has 21 Local Government Areas. Each education district has minimum of three local governments. The population of the study was all pre-service teachers in the University of Lagos. Structured research designed questionnaire was used for data collection in this study. The questionnaire comprises of two sections. Section A is made up of information on personal data of the respondent e.g gender while section B obtain the opinion of the respondent on the perceived usefulness and perceived ease of use. The pointing rating scale of Strongly Agree (SA) - 4, Agree (A) -3, Strongly Disagree (SD) -2, Disagree (D) -1, will be used for the study. The instrument was given to the experts in the Department of Technology and Vocational Education for face and content validation. The corrections were effected and tested for reliability. The instrument was administered to 20 preservice teachers in at Lagos State University of Education (LASUED) who were not part of the study. The reliability test was analyzed using Cronbach Alpha to determine reliability co-efficient of the instrument and the co-efficient value was 0.87 index. The questionnaire was administered to all pre-service teachers in university of Lagos, Faculty of Education after which the completed copies of the instrument which was administered via google form were collected by the researcher for data analysis. The data collected for the study was subjected to both the descriptive statistical analyses. Percentage was used to describe the demographic characteristics of the respondents. The research questions were answered using mean.

Results

The result of the study is presented below:

Research Question 1: What is the perception of preservice teachers on the ease of use of AI tools for active learning?

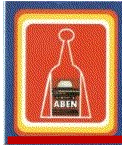
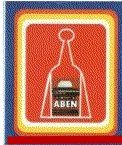


Table 3: Perception of preservice teachers on the ease of use of AI tools for active learning

	Perception of preservice teachers on the ease of use of AI tools for active learning	Mean	SD	Remark
1	Pre-service teachers find AI tools user-friendly for creating interactive learning experiences	3.31	0.92	Agree
2	Many believe AI enhances their ability to design engaging activities for students	3.26	0.89	Agree
3	Some express concerns about the learning curve associated with AI tools	2.31	0.38	Disagree
4	Pre-service teachers see AI as useful for personalizing instruction and assessment	2.69	0.67	Agree
5	Technological self-efficacy varies widely among pre-service teachers regarding AI use	2.63	0.64	Agree
6	Many feel AI tools increase their productivity in lesson planning and resource creation	2.34	0.39	Disagree
7	Some worry about overreliance on AI affecting their teaching skills development	3.04	0.79	Agree
8	Pre-service teachers appreciate AI's potential for creating diverse learning materials quickly	3.21	0.99	Agree
9	Many express a need for more training to effectively integrate AI tools	3.23	0.92	Agree
10	Some view AI as a valuable supplement to, not replacement for, traditional teaching methods	3.24	1.03	Agree

The data in Table 3 reveals a mixed perception among pre-service teachers regarding the ease of use of AI tools for active learning. The highest mean score of 3.31 (SD = 0.92) indicates that pre-service teachers generally find AI tools user-friendly for creating interactive learning experiences. This is closely followed by the belief that AI enhances their ability to design engaging activities for students (M = 3.26, SD = 0.89). Pre-service teachers also appreciate AI's potential for creating diverse learning materials quickly (M = 3.21, SD = 0.99) and view AI as a valuable supplement to traditional teaching methods (M = 3.24, SD = 1.03). However, there's a notable concern about the potential overreliance on AI affecting their teaching skills development (M = 3.04, SD = 0.79).

Interestingly, the data shows lower mean scores for some aspects of AI use. Pre-service teachers express moderate concerns about the learning curve associated with AI tools (M = 2.31, SD = 0.38), suggesting that while they find AI user-friendly, they still perceive challenges in mastering these tools. The perception of AI's usefulness for personalizing instruction and assessment is also moderate (M = 2.69, SD = 0.67), as is the technological self-efficacy regarding AI use (M =



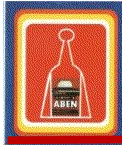
2.63, SD = 0.64). Notably, the feeling that AI tools increase productivity in lesson planning and resource creation has a relatively low mean score ($M = 2.34$, $SD = 0.39$), indicating that pre-service teachers may not fully perceive the efficiency benefits of AI in these areas yet. This aligns with the high mean score ($M = 3.23$, $SD = 0.92$) for expressing a need for more training to effectively integrate AI tools, suggesting that while pre-service teachers see the potential of AI, they feel they need more support to fully leverage these tools in their teaching practice.

Research Question 2: What is the perception of pre-service teachers on the usefulness of AI tools for active learning?

Table 4: Perception of pre-service teachers on the usefulness of AI tools for active learning

	Perception of pre-service teachers on the usefulness of AI tools for active learning	Mean	SD	Remark
1	Pre-service teachers show mixed feelings about AI tools in active learning environments	3.21	0.99	Agree
2	Many see AI as potentially enhancing student engagement and personalized learning experiences	3.23	0.92	Agree
3	Some express concerns about AI replacing traditional teaching methods and human interaction	3.24	1.03	Agree
4	Pre-service teachers often lack training in effectively integrating AI for active learning	3.28	0.97	Agree
5	Adoption rates vary based on individual comfort levels with technology and AI	3.20	0.94	Agree
6	Some view AI tools as time-savers for administrative tasks, freeing time for active learning	2.31	0.38	Disagree
7	Concerns about data privacy and ethical use of AI in education persist	2.69	0.67	Agree
8	Pre-service teachers recognize AI's potential for creating interactive and adaptive learning experiences	2.63	0.64	Agree
9	Many desire more guidance on selecting appropriate AI tools for specific learning objectives	2.34	0.39	Disagree
10	Some worry about over-reliance on AI, potentially hindering critical thinking skills development	2.98	0.78	Agree

Table 4 reveals a nuanced perspective among pre-service teachers regarding the usefulness of AI tools for active learning. The highest mean score of 3.28 ($SD = 0.97$) indicates that pre-service teachers often lack training in effectively integrating AI for active learning, suggesting a significant need for professional development in this area. Despite this, there's a generally positive outlook on AI's potential, with high mean scores for AI enhancing student engagement and personalized learning experiences ($M = 3.23$, $SD = 0.92$) and AI's potential for creating interactive and adaptive learning experiences ($M = 2.63$, $SD = 0.64$). However, this optimism is tempered by concerns about AI replacing traditional teaching methods and human interaction ($M = 3.24$, $SD = 1.03$), reflecting a tension between embracing new technology and preserving valued aspects of traditional education.



The data also highlights several areas of concern and variation in perceptions. Pre-service teachers show mixed feelings about AI tools in active learning environments ($M = 3.21$, $SD = 0.99$), and adoption rates vary based on individual comfort levels with technology and AI ($M = 3.20$, $SD = 0.94$). There are persistent concerns about data privacy and ethical use of AI in education ($M = 2.69$, $SD = 0.67$), suggesting a need for clear guidelines and policies in this area. Interestingly, the perception of AI tools as time-savers for administrative tasks has a relatively low mean score ($M = 2.31$, $SD = 0.38$), indicating that pre-service teachers may not fully recognize or experience this potential benefit. There's also a notable desire for more guidance on selecting appropriate AI tools for specific learning objectives ($M = 2.34$, $SD = 0.39$), which aligns with the earlier indication of a lack of training. Lastly, there's a moderate concern about over-reliance on AI potentially hindering critical thinking skills development ($M = 2.98$, $SD = 0.78$), highlighting the need for a balanced approach to AI integration in education.

Discussion of Findings

Perception of pre-service teachers on the ease of use of AI tools for active learning

The findings reveal a complex picture of pre-service teachers' perceptions regarding the ease of use of AI tools for active learning. On one hand, there's a generally positive outlook, with pre-service teachers finding AI tools user-friendly for creating interactive learning experiences ($M = 3.31$, $SD = 0.92$) and believing that AI enhances their ability to design engaging activities ($M = 3.26$, $SD = 0.89$). This suggests that pre-service teachers see potential in AI tools and are open to their integration in education.

However, this positive perception is tempered by several concerns. There's a notable worry about overreliance on AI affecting teaching skills development ($M = 3.04$, $SD = 0.79$), indicating that pre-service teachers are cautious about becoming too dependent on these tools. Additionally, the relatively low mean scores for AI's usefulness in personalizing instruction ($M = 2.69$, $SD = 0.67$) and increasing productivity in lesson planning ($M = 2.34$, $SD = 0.39$) suggest that pre-service teachers may not fully recognize or experience these potential benefits of AI tools.

Importantly, there's a strong indication that pre-service teachers feel they need more training to effectively integrate AI tools ($M = 3.23$, $SD = 0.92$). This finding highlights a gap between the perceived potential of AI and the current ability of pre-service teachers to fully leverage these tools in their practice.

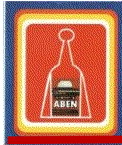
Perception of pre-service teachers on the usefulness of AI tools for active learning

The findings regarding the usefulness of AI tools for active learning reveal both enthusiasm and caution among pre-service teachers. There's recognition of AI's potential to enhance student engagement and create personalized learning experiences ($M = 3.23$, $SD = 0.92$), suggesting that pre-service teachers see value in these tools for improving educational outcomes.

However, this positive outlook is balanced by significant concerns. The highest mean score in this section ($M = 3.28$, $SD = 0.97$) indicates that pre-service teachers often lack training in effectively integrating AI for active learning. This aligns with the findings from the first research question and underscores the need for more comprehensive professional development in this area.

There are also worries about AI replacing traditional teaching methods and human interaction ($M = 3.24$, $SD = 1.03$), as well as concerns about data privacy and ethical use of AI in education ($M = 2.69$, $SD = 0.67$). These findings suggest that while pre-service teachers see the potential of AI, they are also aware of its possible drawbacks and ethical implications.

Interestingly, the perception of AI tools as time-savers for administrative tasks has a low mean score ($M = 2.31$, $SD = 0.38$), indicating that pre-service teachers may not fully recognize this potential benefit. This could be due to lack of exposure or training in using AI for such purposes.



Conclusion

Taken together, these findings paint a picture of pre-service teachers who are cautiously optimistic about the use of AI tools in education. They recognize the potential benefits in terms of creating interactive learning experiences and enhancing student engagement. However, they also have significant concerns about the impact on their own teaching skills, the ethical implications of AI use, and the potential for over-reliance on technology.

A key theme that emerges across both research questions is the need for more training and support. Pre-service teachers consistently express a desire for more guidance on how to effectively integrate AI tools into their teaching practice. This suggests that teacher education programs may need to place greater emphasis on preparing future educators to work with AI technologies.

The findings also highlight the importance of addressing ethical concerns and ensuring that the integration of AI in education is done in a way that complements, rather than replaces, human interaction and critical thinking. As AI tools become more prevalent in educational settings, it will be crucial to develop guidelines and best practices that address these concerns.

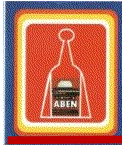
In conclusion, while pre-service teachers see potential in AI tools for active learning, there is a clear need for more comprehensive training, clearer guidelines on ethical use, and strategies to ensure that AI enhances rather than diminishes the role of educators. Future research could focus on developing and evaluating training programs for pre-service teachers in AI integration, as well as exploring ways to address the ethical and practical concerns raised in this study.

Recommendations

1. Integrate structured, hands-on training on AI tools into teacher education curricula to enhance perceived ease of use. By providing pre-service teachers with opportunities to explore and practice using AI tools in a low-risk environment, their confidence and competence with these technologies will improve. Simulations, guided tutorials, and peer-supported learning should be used to demystify complex AI tools and promote intuitive interaction.
2. Demonstrate the practical benefits of AI tools in promoting active learning by embedding them into lesson planning, instructional delivery, and student engagement activities. Encourage pre-service teachers to engage in reflective practice and action research to evaluate how AI enhances learner participation, feedback, and personalized learning. Provide case studies and real-world examples showing measurable improvements in learning outcomes due to AI integration.

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