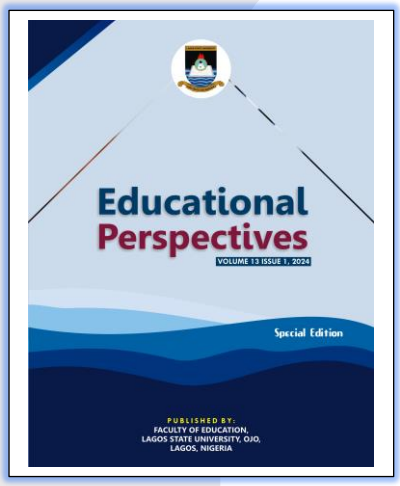

Assessing Pre-Service Teacher's Awareness and Knowledge of Using Artificial Intelligence to Conduct Research

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KEYWORDS:

Pre-service teacher, Awareness, Knowledge, Artificial intelligence (AI), Research.

WORD COUNT:
263

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ABSTRACT

This study aimed to assess pre-service teachers' awareness and knowledge of using AI in research. A descriptive survey design was employed, involving 541 pre-service teachers from Lagos State University, (LASU) and Tai Solarin University of Education (TASUED). Two research questions and one hypothesis guided the study, and a questionnaire was used to gather quantitative data. Pre-service teachers' awareness and knowledge of using AI to conduct research questionnaire (PTAKUAICRQ) was utilized to gather the quantitative data for the study. The reliability of the items in the questionnaire were related to each other were examined using Cronbach's alpha formula, reliable coefficients of 0.88 obtained. The quantitative data was analyzed using mean and simple percentage to answer the research questions while the hypothesis was tested using independent sample t-test. The findings revealed that majority of pre-service teachers are aware of the use of artificial intelligence (AI) in conducting research. With a weighted average mean= 3.20 which is above the 2.5 benchmark for this study, the findings revealed that a large number of the selected sample exhibited high awareness of using artificial intelligence to conduct research. The study also found a statistically significant impact of pre-service teachers' experience with AI on their awareness of using it in research (t (393) = -4.589; p = 0.00). It was concluded that the study provided evidence of the poor level of awareness and knowledge among pre-service teachers, particularly in an era of rapid technological advancement. The recommendation was made that pre-service teacher training programs should integrate AI concepts to enhance pre-service teachers' understanding and awareness of AI and its application.

HOW TO CITE

Abiola O.K, Adeyefa A.K, Famuyide A.J, Edmund O.I, Adekunle A.O, Ogolo K.G & Akindoju O. G. (2024). Assessing Pre-Service Teacher's Awareness and Knowledge of Using Artificial Intelligence to Conduct Research. *Educational Perspectives*, *13*(1), 97-106.

Introduction

The integration of artificial intelligence (AI) in education has garnered significant attention in recent times owing to its potential influence on both teaching and learning. As a result, pre-service teachers are receiving more and more attention in their preparation to help them leverage artificial intelligence into their teaching. Strong information and communication technologies (ICT) and artificial intelligence (AI) systems are crucial for any country to have because of technological advancements and the quick adoption of wise methods to global development (Sanusi et al., 2022). There is widespread support for employing AI solutions to address global concerns due to the benefits of AI systems, including their efficiency in performing activities and their capacity to manage more complicated and complex responsibilities without interruption (Bang et al., 2020).

Since AI is essential to finding solutions to both current and future global issues, it is imperative that people of all ages, including children, are suitably educated for the AI-driven future (Johnson & Lee, 2022). Artificial Intelligence must thus be incorporated into the educational process as a whole. (Johnson & Lee, 2022). (Touretzky & Seehorn, July 2019). The development of novel technologies and the great processing power of intelligent machines are inextricably linked to higher education. In humankind's ongoing search for a better and more efficient teaching medium, creative technologies have continued to progress over time. The advancements in artificial intelligence present both new possibilities and difficulties for higher education's teaching and learning processes (Mehrnaz & Sedigheh, 2018).

According to Siemens and Gašević (2019), the incorporation of artificial intelligence (AI) into education has become a disruptive force that is changing the landscapes of research, teaching, and learning. The potential of artificial intelligence (AI) to improve teaching methods, customize student experiences, and support research projects is being investigated by educators more and more as technology develops (Zheng et al., 2020). Pre-service teachers are an important group in teacher education who can use AI methods and technologies to solve difficult problems in the classroom (Korthagen et al., 2017). The awareness of AI among pre-service teachers and their practical knowledge and skills in using AI for research purposes, however, still differ significantly, even with the increasing emphasis on incorporating AI into teacher education programs (Hsu et al., 2021). Pre-service teachers may be aware of the potential advantages of artificial intelligence (AI) in the classroom, such as the ability to analyse massive datasets, automate administrative tasks, and personalize instruction, but many do not have the fundamental knowledge and skills required to use AI in education effectively in their line of work (Bingimlas, 2019).

Additionally, pre-service teachers are essential to the advancement of educational innovation and research because they are the future educators (Sang et al., 2019). Their capacity to use AI to research in an efficient manner advances both their personal academic endeavours and the body of knowledge within the academic community. According to Lee et al. (2021), pre-service teachers can perform more rigorous and insightful research and change educational practices and policies based on evidence by utilizing AI tools for data analysis, literature review, and experimental design. Thus, it is critical to comprehend pre-service teachers' awareness of and familiarity with AI in research in order to guide curriculum design, pedagogical strategies, and policy efforts that aim to equip future educators to deal with the challenges of the digital era (Khanlari et al., 2018). This study aims to close the knowledge gap between theory and practice by investigating pre-service teachers' perspectives, experiences, and educational needs regarding AI integration. This will enable pre-service teachers to fully utilize AI to conduct research that advances both educational theory and practice.

AI has the potential to revolutionize the way we conduct research, analyse data, and make informed decisions. However, the adoption of AI in education is still in its infancy, and there is a growing need to understand the awareness and knowledge of pre-service teachers regarding the use of AI in research. A study by Wang et al. (2015) found that teachers' attitudes towards AI were influenced by their prior experiences and knowledge of technology. The study suggested that teachers who were more familiar with technology were more likely to have positive attitudes towards AI. However, another study by Zhang et al. (2016) found that many teachers lacked the necessary knowledge and skills to effectively integrate AI into their teaching practices. The use of AI in research has also been gaining attention in recent years. A study by Rittel et al. (2017) found that AI could be used to improve the accuracy and efficiency of research data analysis. Another study by Papadopoulos et al. (2018) found that AI could be used to identify patterns and relationships in large datasets, which could lead to new insights and discoveries.

Despite the potential benefits of using AI in research, there are concerns about the lack of awareness and understanding of AI among educators. A study by Wang et al. (2020) found that many teachers lacked the necessary knowledge and skills to effectively integrate AI into their teaching practices, which could lead to a lack of adoption and utilization of AI in education. In terms of pre-service teachers, there is a growing need to understand their awareness and knowledge of using AI in research. A study by Chen et al. (2019) found that pre-service teachers had limited knowledge and understanding of AI, which could impact their ability to effectively integrate AI into their teaching practices. Another study by Li et al. (2020) found that pre-service teachers had varying levels of awareness and understanding of AI, which could impact their ability to effectively utilize AI in their future teaching practices.

In Africa, where many schools lack access to qualified teachers and adequate resources, AI can be particularly effective in bridging the educational divide. For example, AI-powered chatbots can provide students with instant support and guidance, helping them to overcome difficulties in their learning journey (Liang et al., 2020). Moreover, AI can help improve student engagement and motivation by providing personalized feedback and recognition (Kumar et al., 2020). Furthermore, AI has the potential to enhance teacher training and development in Africa. AI-powered educational platforms can provide teachers with personalized professional development opportunities, helping them to stay up-to-date with best practices in teaching and learning (Abdulrahman et al., 2022). This can be particularly beneficial in Africa, where teacher training is often limited due to resource constraints. Despite these potential benefits, there are also concerns about the integration of AI in African education. For example, there are concerns about the potential job displacement of teachers and the need for policymakers to develop strategies to address this issue (Kofi et al., 2020). Additionally, there are concerns about the need for ethical considerations in the development of AI-powered educational systems, including issues related to data privacy and bias (Nkengasong et al., 2020).

Artificial Intelligence (AI) in education

This is the use of advanced technology, namely computational models and machine learning algorithms, to improve educational outcomes, improve the learning process, and tailor instruction to each student's particular needs (Schueller et al., 2017). Artificial Intelligence (AI) can take many different forms in Nigerian secondary education. Some examples of these are virtual simulations, adaptive learning platforms, and intelligent tutoring systems. These technologies aim to analyze students' learning patterns, provide personalized feedback, and create engaging learning environments. Artificial Intelligence (AI) in education refers to the application of various

methods, such as computer vision, natural language processing, and data analytics, to create a flexible and dynamic learning environment. By leveraging computing power to adapt to each student's unique strengths and limits, it outperforms traditional teaching methods and fosters a more personalized and effective learning environment. The role of teachers in the face of developing AI technology, which has the potential to replace their labor with intelligent software-equipped machines, is a topic that has been extensively explored and researched. Right now, the emphasis is on creating AI to help teachers with a variety of teaching and learning processes, from automating repetitive jobs to selecting the best content to present (Lee & Lee, 2021).

In recent years, Artificial Intelligence (AI) has significantly influenced various aspects of education, including research practices among pre-service teachers. There are various ways in which AI can be utilized in research conducted by pre-service teachers. Some of these ways include: Data Analysis and Interpretation, Content Creation and Curation & Personalized Learning and Feedback. Despite the numerous benefits associated with the integration of AI in pre-service teachers' research, several challenges and considerations warrant attention. These include concerns related to data privacy and security, ethical considerations surrounding the use of AI algorithms in research, and the importance of providing adequate training and support to pre-service teachers to effectively leverage AI tools in their research endeavours (Wang & Liu, 2020). The literature reviewed underscores the growing significance of AI in enhancing research practices among pre-service teachers. As AI technologies continue to evolve, their role in facilitating innovative research methodologies and empowering pre-service teachers to address complex educational challenges is expected to expand further. However, addressing the associated challenges and considerations is crucial to ensuring the responsible and ethical integration of AI in pre-service teacher research.

Statement of the Problem

In recent years, the integration of artificial intelligence (AI) technologies into various aspects of education and research has become increasingly prevalent (Tresp, 2021). Despite this growing importance, there is a significant gap in understanding the awareness and knowledge of pre-service teachers regarding the utilization of AI in conducting research (Voogt & Roblin, 2019). Pre-service teachers, as future educators, are essential in imparting both knowledge and skills to the next generation of students. Therefore, it is imperative to assess their readiness and familiarity with AI-driven research methodologies to ensure they are adequately prepared to meet the evolving demands of the educational landscape (Chien et al., 2022).

Existing literature has highlighted the transformative potential of AI in education but has largely focused on in-service teachers or the application of AI tools in classroom settings (Papadakis et al., 2021). This leaves a critical gap concerning pre-service teachers who are still in the training phase but are expected to leverage AI tools effectively once they enter the profession. Recognizing this gap, this study aims to conduct a comprehensive assessment of pre-service teachers' awareness and knowledge of AI in research.

In view of the outlined realities, it is evident that a focused investigation into pre-service teachers' awareness and knowledge of using artificial intelligence to conduct research is both necessary and timely. This study addresses the existing literature gap and provide a foundation for integrating AI competencies into teacher education curricula in a meaningful and impactful way.

Theoretical Review

The Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) is a widely used theoretical framework in the field of information systems and technology adoption research. Developed by Fred Davis in the late 1980s, TAM aims to explain and predict users' acceptance and adoption of new technologies.

TAM posits that two primary factors influence users' intentions to adopt a technology: perceived usefulness and perceived ease of use. Perceived usefulness refers to the degree to which a user believes that using a particular technology will enhance their performance or productivity, while perceived ease of use refers to the degree to which a user perceives that using the technology will be free of effort. According to TAM, users' attitudes toward a technology are determined by these perceived factors, which in turn influence their intentions to use the technology.

The Technology Acceptance Model (TAM) provides a robust theoretical framework for understanding individuals' acceptance and adoption of new technologies, which is highly relevant to the study's exploration of pre-service teachers' awareness and knowledge regarding the use of artificial intelligence (AI) for research purposes. As posited by Davis (1989), TAM suggests that users' attitudes and intentions towards adopting a technology are primarily influenced by two key factors: perceived usefulness (PU) and perceived ease of use (PEOU). In the context of the study, TAM offers valuable insights into pre-service teachers' perceptions of AI's utility and usability for conducting research. As Venkatesh et al. (2012) expanded TAM to include additional constructs such as subjective norms and facilitating conditions, it becomes pertinent to consider how social influences and external factors might shape pre-service teachers' attitudes towards AI adoption in research.

Pre-service teachers' perceptions of the usefulness of AI in research can be examined through the lens of TAM. According to Davis (1989), perceived usefulness refers to the extent to which individuals believe that using a particular technology would enhance their performance or productivity. In the context of the study, pre-service teachers may perceive AI tools as valuable assets for streamlining research processes, analyzing large datasets, or uncovering insights not readily apparent through traditional methods. Such perceptions of AI's usefulness are likely to positively influence pre-service teachers' intentions to incorporate AI into their research practices. Moreover, TAM suggests that perceived ease of use plays a crucial role in shaping individuals' attitudes towards technology adoption. Perceived ease of use refers to the degree to which individuals believe that using a technology would be effortless or free from complexity (Davis, 1989). In the case of AI tools for research, pre-service teachers' perceptions of the ease of learning and mastering AI techniques, as well as the accessibility of AI tools and resources, are likely to influence their willingness to embrace AI in their research endeavours.

Research Questions

The following research questions were asked to guide the study:

1. What is the level of pre-service teachers' awareness on the use of Artificial Intelligence (AI) in conducting research?
2. What is the level of pre-service teachers' knowledge on the use of Artificial Intelligence (AI) in conducting research?

Research Hypothesis

HO_1: There is no statistically significant effect of pre-service teacher's experience with AI on their awareness of using AI in conducting research.

Methodology

The research design used for this study was the descriptive research survey. Descriptive research is a study designed to depict the participants in an accurate way. In this study, the population of interest are final year pre-service teachers at LASU and TASUED. The total population for the study was (541) final year pre-service teachers from LASU and TASUED. Samples of final year pre-service teachers are drawn from LASU and TASUED. The Sample technique employed in this study is the random sampling technique. Respondent from both institutions were randomly selected. The main procedure used by the researcher for collection of data for this research was through

questionnaire administration. Pre-Service Teachers Awareness and Knowledge of Using Artificial Intelligence to Conduct Research Questionnaire (PTAKUAICRQ) was utilized to gather the quantitative data for the study. The instrument had three sections; section A focused on the participants' demographic data, while section B contained 11 Questions on pre-service teacher's awareness on using AI for conducting research while section C consisted of 5 questions on pre-service teacher's knowledge on using AI for conducting research. A 4-point scale was used in weighing expert responses for section B in which Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) were awarded 4, 3, 2 and 1 points respectively while a Yes/No response was used for section C. The face and content validity of the questionnaire was done by experts and a measurement and evaluation experts to provide their judgments on the items. The reliability of the items in the questionnaire were related to each other were examined using Cronbach's alpha formula, reliable coefficients of 0.88 obtained. The duly completed questionnaire was collated and analysed to answer the two research questions. The questionnaire was administered to pre-service teachers at LASU and LASUED through a link to an already prepared google form which contains the same content as the questionnaire. The quantitative data was analyzed using mean and simple percentage to answer the research questions while the hypothesis was tested using independent sample t-test.

Results and Discussions

Table 1: Demographic Information

S/N	Institution	N
1.	Lagos State University (LASU)	**87**
2.	Tai Solarin University of Education (TASUED)	**454**
	Total	**541**

Table 2: Population of Participant's Gender

S/N	Gender	N
1.	Male	**132**
2.	Female	**409**
	Total	**541**

Research Question 1

What is the level of pre-service teachers' awareness on the use of Artificial Intelligence (AI) in conducting research?

Table 3: Pre-Service Teacher's Awareness of Using Artificial Intelligence to Conduct Research

SN		SA	A	D	SD	MEAN	STD. D
1.	I am aware of what Artificial intelligence (AI) is.	253 46.8%	284 52.5%	3 0.6%	1 0.2%	3.46	0.52
2.	I believe AI can be used to assist in conducting research	273 50.5%	256 47.3%	11 2.0%	1 0.2%	3.48	0.55
3.	I am familiar with AI tools like Consensus, Semantic Scholar, Quillbot, Research Rabbit, ChatGPT, Connected Papers and other AI tools that can be used for research.	129 23.8%	324 59.9%	83 15.3%	5 0.8%	3.07	0.65

4.	I am aware of the various AI tools & technologies available for educational research.	154 28.5%	327 60.4%	57 10.5%	3 0,6%	3.17	0.62
5.	I am aware that AI provides assistance and quality free materials for research.	198 36.6%	316 58.4%	25 4.6%	2 0.4%	3.31	0.57
6.	I have received any formal training or education on using AI for research purposes.	121 22.4%	265 49.0%	139 25.7%	16 3.0%	2.91	0.77
7.	I am familiar with AI in the context of education research.	159 29.4%	342 63.2%	37 6.8%	3 0.6%	3.21	0.58
8.	I am aware that AI can help source for related papers for literature review.	167 30.9%	318 58.8%	52 9.6%	4 0.7%	3.20	0.63
9.	I am aware that AI can help in paraphrasing sentences while writing a research paper.	163 30.1%	317 58.6%	56 10.4%	5 0.9%	3.18	0.64
10.	I am aware that AI can be used for checking Plagiarism	123 22.7%	295 54.5%	116 21.4%	7 1.3%	2.99	0.70
11.	I am Aware that AI can be used to improve academic writing	180 33.3%	324 59.99%	33 6.1%	4 0.7%	3.26	0.59

Weighted Average: mean= 3.20, SD= 0.62

Note: N = 541, Strongly Agree (SA); Agree (A); Disagree (D); Strongly Disagree (SD)

The results from table 3 above reveals that majority of pre-service teachers are aware of the use of artificial intelligence (AI) in conducting research. With a weighted average mean= 3.20 which is above the 2.5 benchmark for this study, the findings revealed that a large number of the selected sample exhibited high awareness of using artificial intelligence to conduct research.

Research Question 2

What is the level of pre-service teachers' knowledge on the use of Artificial Intelligence (AI) in conducting research?

Table 4: Pre-Service Teacher's Knowledge of Using Artificial Intelligence to Conduct Research

	YES	NO
I feel confident in my ability to utilize AI tools for conducting educational research.	451 83.4%	90 16.6%
I know how to use Quillbot for paraphrasing	184 34.0%	357 66.0%
I know how to use Grammarly for checking for plagiarism.	240 44.4%	301 55.6%
I know how to use Connected papers and Research Rabbit for searching for related articles.	231 42.7%	310 57.3%
I know how to use Semantic Scholar and Scite AI for generating citations and references.	245 45.3%	296 54.7%

Table 4 shows that majority of the respondents feels confident in my ability to utilize AI tools for conducting educational research (83.4%). However, majority of the respondents disagreed

with the following statements "I know how to use Quillbot for paraphrasing "(66%), "I know how to use Grammarly for checking for plagiarism" (55.6), "I know how to use Connected papers and Research Rabbit for searching for related articles" (57.3%) and "I know how to use Semantic Scholar and Scite AI for generating citations and references" (54.7%). This reveals that pre-service teachers have no knowledge on how to utilize AI in the conduct of research.

Hypothesis One

There is no statistically significant effect of pre-service teacher's experience with AI on their awareness of using AI in conducting research.

Table 5: Independent Sample t-test of the impact of pre-service teacher's experience with AI on their awareness of using AI in conducting research

Group	N	T	P(Sig)Level
High	499	4.589	0.00
Low	42		

It was revealed from table 5 that there was a statistically significant effect of pre-service teacher's experience with AI on their awareness of using AI in conducting research, [t(393)= .00; p<.05]. This implies that prior experience has an effect on pre-service teacher's experience with AI on their awareness of using AI in conducting research. Therefore, the null hypothesis is not rejected.

Findings

The findings of the study are as follows:

Research question one sought to find out the level of pre-service teachers' awareness on the use of Artificial Intelligence (AI) in conducting research. The findings revealed that though pre-service teachers are aware of the usefulness of incorporating AI in research works, they are not aware of the various AI tools that can be used for research purpose. This correlates with the findings of Jovial (2022), which stated that pre-service teachers are aware of the existence of artificial intelligence in education. This finding is also in agreement with that of Gamoura (2018) whose research gave the foundations of artificial intelligence and characteristics and some of its living models to shed light on the reality of its developments and aspirations between what it actually reached and what it hopes to reach with positive feedback from the selected respondents on their knowledge of the concept.

Research question two studied the level of pre-service teachers' knowledge on the use of Artificial Intelligence (AI) in conducting research. The findings revealed that pre-service teachers have no knowledge on how to utilize AI in the conduct of research.

Hypothesis one sought to find out if there was a statistically significant impact of pre-service teacher's experience with AI on their awareness of using it in conducting research. The inferential statistics revealed that there was a significant effect of pre-service teacher's experience with AI on their awareness of using it in conducting research (t **(393)** = -4.589; p = 0.00).

Conclusion

The primary goal of this study was to assess pre-service teacher's awareness and knowledge of using artificial intelligence to conduct research. The findings of the study revealed that pre-service teachers are not well aware and equipped on the use of AI in conducting educational research. This may be attributed to the lack of formal training on the use of AI in the context of educational research. The study also revealed that there is a statistically significant impact of pre-service teacher's experience with AI on their awareness of using AI of research. The pieces of evidence from the study attested to the poor level of awareness and knowledge of pre-service teachers on AI. In an

era of rapid technological advancement, formal training should be provided for pre-service teachers all around the country so they can thrive in this technological driven society.

Recommendations

The following recommendation were made:

1. More awareness on the availability of artificial intelligence tools for conducting research should be made to preservice teachers.
2. There should be Integration of AI concepts into teacher training programs and provide opportunities for pre-service teachers to engage with AI, collaborate with experts, and conduct action research to enhance their awareness, knowledge, and confidence in using AI for research, ensuring equal access and address the digital divide among pre-service teachers.

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