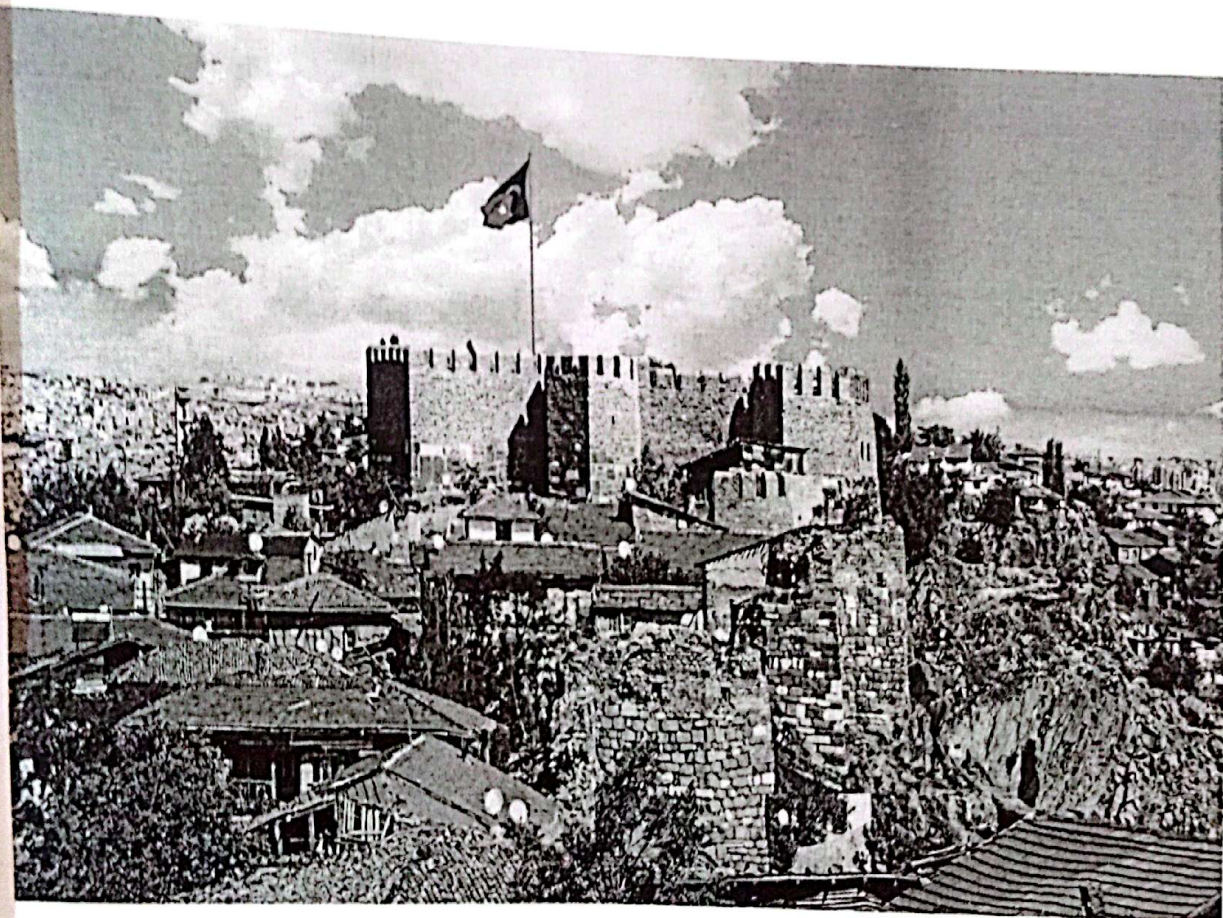


March 16-18, 2025
Ankara, Türkiye

8. INTERNATIONAL ANKARA MULTIDISCIPLINARY STUDIES CONGRESS

FULL TEXTS BOOK



EDITED BY

German Martínez Prats

William Baldemar Lopez Rodríguez

Veronica Vazquez Vidal

Maximiliano Martinez Ortiz

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March 16-18, 2025

Session 3 / Hall-6

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TITLE	AUTHOR(S)	AFFILIATION
LSTM-BASED LEARNING OF AUTOMATA MODELS FOR PRODUCTION LINE OPERATIONS	Iyas Mohammad Ibrahim AlTalafta Yaprak Yalçın Gülcihan Özdemir	Istanbul Technical University, Istanbul, Turkey
REVOLUTIONIZING AUTONOMOUS VEHICLES: THE CRITICAL ROLE OF SENSORS IN SELF-DRIVING CARS	Michael Okon Bassey, Francis Etang, Agnes Obob	Akwa Ibom State Polytechnic, Nigeria San Francisco Bay University, California, USA. University of Uyo, Nigeria
INTERNET OF THINGS (IoT) AND SMART CITIES: THE FUTURE OF URBAN LIVING	Saloni Sharma, Suhani Sharma	Deemed to be University, New Delhi, India
ENHANCED SECURITY AND RELIABILITY IN WIRELESS NETWORK ROUTING THROUGH PATTERN ANOMALY DETECTION USING MACHINE LEARNING	Dr. Jogendra Kumar	Govind Ballabh Pant Institute of Engineering & Technology
MACHINE LEARNING FOR CYBERSECURITY: DETECTING AND MITIGATING ATTACKS IN DISTRIBUTED NETWORKS	Dr. Jogendra Kumar	Govind Ballabh Pant Institute of Engineering & Technology
OPTIMIZATION OF MULTIPLE PARTICLE IMPACT ON COLD SPRAYED INCONEL POWDERS	Al-murisi Abdulaziz Hamed Abdulrahman, MD Helal Uddin, Ikbāl Ahmed, Mohammad Nur-E-Alam	Universiti Tenaga Nasional, Selangor CCN University of Science & Technology, Bangladesh
THE ROLE OF MATHEMATICS IN ARTIFICIAL INTELLIGENCE	Kishore Dr. P. Suganthi	R.M.K Engineering College, Tamil Nadu, India.
AWARENESS AND UTILISATION OF ARTIFICIAL INTELLIGENCE CHATBOTS AMONG UNIVERSITY SCIENCE AND TECHNOLOGY PRE-SERVICE TEACHERS IN NIGER STATE	Mohammed C.M., Umar I.S.B, Babagana M., Adediran S.O, Saifullahi M.	Federal University of Technology Minna, Niger State, Nigeria. ✓
IDENTIFICATION AND OVERCOMING MALICIOUS ATTACK IN WIRELESS MOBILE AD HOC NETWORKS	K.Thamizhmaran	Government College of Engineering
iAll participants must join the conference 10 minutes before the session time. Every presentation should last not longer than 10-12 minutes. Kindly keep your cameras on till the end of the session.		



8. INTERNATIONAL ANKARA MULTIDISCIPLINARY STUDIES CONGRESS

AWARENESS AND UTILIZATION OF ARTIFICIAL INTELLIGENCE CHATBOTS AMONG UNIVERSITY SCIENCE AND TECHNOLOGY PRE-SERVICE TEACHERS IN NIGER STATE

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ABSTRACT

The study examined awareness and utilization of artificial intelligence chatbots among university pre-service science and technology teachers in Niger state. The study was guided by two research questions. The research adopted the descriptive survey research. Target population of the study comprise of seven hundred and thirty-two (732) final year students from science education, educational technology and industrial technology education. Two hundred and forty-eight (248) questionnaires were distributed base on Krejcie and Morgan (1970) sample size determination. Data collected was analysed using descriptive (mean and standard deviation) and inferential statistics (Mann-whitney U test). From the findings, university pre-service science and technology teachers are not aware of Artificial intelligence chatbots and the analysis also revealed that the university science and technology teachers are not utilizing artificial intelligence chatbots. Provide students with information about the benefits, functionalities, and ethical considerations associated with AI chatbot technologies, Integrate AI chatbots into the curriculum to expose students to their capabilities and encourage their usage and ensure that students have access to clear and concise information about AI chatbots, including how they work, their limitations, and the data privacy measures in place.

Keywords: Artificial Intelligence Chatbots, Awareness, Utilization, & university Science and Technology Pre-service Teacher

1.INTRODUCTION

1.1 Background to the Study

Technology has reformed the appearance and purpose of society as the world is becoming digitalized day by day. It can be stated that if one of the aims of science is to solve the problems encountered by human beings, the other is to offer a long and healthy life by raising the living standards (Moll, 2019). It has overtaken the world and all industries, wherever we go, we see technology is been used and as technologies became advanced so did many industries, slowly with time many industries adapted their work style with technology (Madushan, 2023). From healthcare, finance, food service to education technology usage gradually improved to the point where without the technology these industries could no longer operate effectively. In aspect of education traditional on-class has been the most effective way of learning for a very long time and technology has been so helpful in making teaching and learning easy due to it prompt advancement (Seufert *et al.*, 2021). Learners can acquire knowledge at distance through technology and they can get lots of information from it. Adebayo *et al.* (2021) reported that the use of emerging education technology in Nigerian universities is an idea that has become part of this digital society, which characterized science, teaching, and learning in the twenty-first century.

Information and Communication Technology (ICT) is a broad term that encompasses various technologies used to manage and communicate information. For instance, computers, smartphones, and tablets are fundamental tools in ICT infrastructure, facilitating the processing, storage, and transmission of information (Omar and Mansor, 2019). Additionally, networking technologies such as the internet, intranets, and extranets connect devices and systems, enabling communication and collaboration across vast distances. The advancements in hardware, software, and telecommunications continually drive

8. INTERNATIONAL ANKARA MULTIDISCIPLINARY STUDIES CONGRESS

innovation in ICT, leading to improved efficiency, accessibility, and functionality in various sectors such as education, healthcare, business, and government (Dwivedi *et al.*, 2023). Diverse applications or devices in the ICT setting allow young people to interact more with ICT and some of these innovations include cloud computing, digital computing, mobile learning, open content, learning analytics, three-dimension (3D) printing, wearable technology, massively open online learning (MOOCs), online learning, remote labs, Edmodo, learning management system (LMS), Google Apps for Education (GAFE), machine learning or Artificial Intelligence learning (Adebayo *et al.*, 2021).

The terms "artificial" and "intelligence," where "artificial" refers to something created by humans and "intelligence" refers to thought, combine to form artificial intelligence (AI). In other words, artificial intelligence (AI) is a man-made technology with thinking capabilities. Grewal (2014) defines artificial intelligence (AI) as a subfield of computer science that emphasises on creating machines that are able to carry out tasks that typically require human intelligence. Data-driven learning, reasoning, problem-solving, understanding natural language, and environmental observation are some of these tasks. The goal of AI research is to develop systems that can mimic or even exceed human capabilities in specific domains. Industries including healthcare, transportation, retail, and finance are among those it quickly transforms (Russell and Norvig, 2018). Another field with enormous potential for using AI technology is education (Guan, Mou, and Jiang, 2020). AI has made instructional materials readily available to students at all educational levels. Education has advanced significantly as a result of the ongoing development of smart learning, teaching, and management strategies (Lei, 2018). Among the numerous subfields of artificial intelligence include computer vision, robotics, natural language processing, machine learning and chatbots (Rayhan, 2023).

Chatbot can be describe as an application or platform that allows conversations using either text or auditory mechanisms (Dharani *et al.*, 2020). It helps in improving the overall efficiency of learners. Rule based chatbot is a type of chatbot that use a series of defined rules. These rules are based on predefined conversational path where users can get predefined questions and answers options. Bot can't answer your questions if the questions are not from the predefined question. Voice Bot is a type of chatbot that allows user to ask questions directly through speech such as Elsa speak, Alexa and Siri. The query of the user is answered by and automated response in the language of the user's choice. AI chatbot is based on AI technology. It's a computational program that trained to have human like conversation with users using a process called NLP such as ChatGPT, Google bard/Gemini, Pi AI, Perplexity AI, MATHia, Socratic, Meta AI, Gauth, Monsha AI, deepseek, You.com, Quilbot, and Microsoft Bing. With adequate awareness of these tools, academic performance of pre-service teachers' will be enhanced by providing additional study materials, recommend relevant resources and provide solution to assignments given through improved engagement and interaction.

Chatbots holds the power to fundamentally reshape the classroom experience and enhance the knowledge and skills outcomes for learners (Chen *et al.*, 2023). Artificial Intelligence (AI) is increasingly becoming a significant component of science education, transforming the way students learn and engage with scientific concepts (Rospigliosi 2023). AI technologies offer personalized learning experiences tailored to individual students' needs and preferences, enhancing the effectiveness of science education. Chatbots educational platforms can analyse students' learning patterns and provide targeted feedback, helping them grasp complex scientific concepts more effectively. Moreover, AI algorithms can adapt instructional content in real-time based on students' progress, ensuring that each learner receives a customized learning experience that maximizes their understanding and retention of scientific principles.

Chatbots applications in science and technology education extend beyond personalized learning to immersive and interactive experiences that enhance student engagement and comprehension (Meyer and Norman, 2020). Virtual and augmented reality (VR/AR) simulations powered by AI algorithms allow students to explore scientific phenomena in a simulated environment, enabling hands-on experimentation without the need for physical laboratories. These immersive experiences not only make science education more engaging and enjoyable but also enable students to visualize abstract concepts and develop a deeper understanding of scientific principles through experiential learning. Additionally, AI-driven adaptive tutoring systems can provide real-time guidance and support to students as they

8. INTERNATIONAL ANKARA MULTIDISCIPLINARY STUDIES CONGRESS

navigate complex scientific problems, fostering independent problem-solving skills and critical thinking abilities.

Awareness refers to the knowledge and understanding that pre-service science and technology teachers have regarding the existence, functionalities, and potential benefits of artificial intelligence chatbots for learning. Awareness of chatbots by science education pre-service teachers varies according to their pedagogical belief, research experience, prior experience using educational technology, and the effectiveness and necessity of a particular technology, all of which can influence their willingness to adopt new educational technology (Gilakjani *et al.*, 2013; Ryu and Han, 2018). Studies on the impact, potential, awareness and deployment of artificial intelligence in education have revealed that AI imparts positively on education, the potential is high. Despite these positive expectations of artificial intelligence chatbots, learners are not aware of the AI chatbots Adebayo *et al.* (2021). So, there is need for learners to understand how to use technology and, most importantly, how to successfully integrate it for learning. They also need to understand the importance of artificial intelligence and the affordances that it can bring to instruction so that they are open to integrating advanced technology into their lessons. Consequently, before a successful application of an artificial intelligence chatbots into education for teaching and learning, it becomes necessary for science and technology pre-services teachers to first utilize it themselves so that they can fully understand how it can scaffold teaching and learning (Cheng and Tsai, 2019). The impact of the artificial intelligence chatbots will be known depends on how well pre-service science and technology teachers utilized the technologies.

Utilization is the extent to which pre-service science and technology teachers actively use or engage with artificial intelligence chatbots for learning purposes. It includes their frequency of interaction with chatbots, the types of learning activities they engage in, and the level of integration of chatbot technology into their learning practices. Utilization of AI chatbots will give the pre-service science education teachers access to large amount of information, engagement, communication, improved assessment, evaluation and efficient use of time (Peicheva, 2021). This gives the pre-service teachers more opportunities to learn and make research on their own and gain more access to varieties of information needed for adequate understanding of the subject matter concepts. Additionally, when the pre-service teacher use technology in an exploratory/inquiry sense, they are actively engaged in their learning because they are interacting through a technological medium of learning. While technology enhances the learning environment, the technological advancements of the late 20th and early 21st centuries have created an environment in which technology has become increasingly intertwined with curriculum and pedagogy (Gilakjani *et al.*, 2013; Ryu and Han, 2018). Despite the benefits of AI chatbots, they are still not in use (Stanley *et al.*, 2024). Digital tools have been a long-time partner for teachers in education delivery. It enables learn and make research functions faster and easier, making them more effective and efficient. Indeed, technology enhance pre-service teachers' self-efficacy.

1.2 Statement of the Research Problem

In contemporary education, the use of advanced technologies, including Artificial Intelligence (AI) chatbots, is becoming increasingly significant. Ideally, pre-service science and technology teachers should be equipped with the awareness, skills, and confidence to utilize these tools effectively for academic purpose. AI chatbots are designed to enhance learning by offering personalized, interactive, and adaptive support, enabling learners to engage more deeply with educational content. These tools can also help teachers manage tasks such as content delivery, and providing instant feedback, aligning with global trends in technology-driven education.

However, there is poor academic performance of students in science subjects in Nigeria (Sani *et al.*, 2024). Several researches indicated that poor teaching methodology, poor learning and lack of appropriate science and technology equipment among other factors are linked to poor academic performance in science subjects. To mitigate this poor performance menace, there is need to have personal learning, interactive learning and adaptive learning which will boost performance of the students and increase understanding of subject concepts among learners. This can be achieve with the use of Artificial intelligence chatbots which can improve personalised learning and provision of interactive teaching tools that can enhance learning of science concepts. Therefore, it is important that

8. INTERNATIONAL ANKARA MULTIDISCIPLINARY STUDIES CONGRESS

pre-service science and technology teachers in Niger State possess the knowledge and ability to leverage these technologies to meet the demands of modern education.

Despite the benefits of Artificial intelligence chatbots, there are limited research on pre-service science and technology teachers' awareness and utilization of Artificial intelligence chatbots for learning in Niger state. Their self-efficacy is essential as it will influence the adoption of Artificial intelligence chatbots. These challenges, coupled with insufficient training in pre-service teacher education programs, intensify the gap between the potential of AI technologies and their practical utilization in education. If these challenges are not addressed, the poor academic performance in sciences will continue to climb.

This study aims to address these issues by investigating the awareness, utilization, and self-efficacy of pre-service science and technology teachers regarding AI chatbots. The findings will guide the design of targeted interventions, such as training workshops and curriculum enhancements, to equip pre-service teachers with the necessary skills and confidence. Ultimately, this study seeks to empower future educators to integrate AI chatbots into their learning practices, fostering more effective and engaging learning environments in Niger State.

1.3 Aim and Objectives of the study

The aim of the study is to awareness, utilization and self-efficacy of university pre-service science and technology teachers towards artificial intelligence chatbots for learning in Niger state. Specifically, the objectives were to:

1. determine the university pre-service science and technology teachers awareness of artificial intelligence chatbots for learning in Niger state.
2. examine the university pre-service science and technology teachers utilization status of artificial intelligence chatbots for learning in Niger state.

1.4 Research Questions

The following research questions are raised to achieve the stated objectives of the study:

1. What is the university pre-service science and technology teachers awareness of artificial intelligence chatbots for learning in Niger state?
2. What is the university pre-service science and technology teachers utilization status of artificial intelligence chatbots for learning in Niger state?

RESEARCH METHODOLOGY

3.0

3.1 Research Design

The study adopted the descriptive survey research design. Descriptive survey research design aims at accurately and systematically describing a population, situation or phenomenon in a given period of times (McCombes, 2023). This research design is adopted due to the nature of this study which seeks to examine awareness, utilization and self-efficacy of university pre-service science and technology teachers towards artificial intelligence chatbots for learning in Niger State.

3.2 Population of the Study

The total population of the study consisted of two thousand nine hundred and sixty one (2961) pre-service university science and technology teachers in Niger State. The target population used for this study consisted 732 the final year university science and technology pre-service teachers.

3.3 Sample and Sampling Techniques

The sample of the study includes two hundred and forty-eight (248) final year pre-services science and technology teachers in Niger-state. The sample size was determined using a guideline given by Krejcie and Morgan (1970). A purposive sampling technique was used to select a particular level of pre-service university science and technology teachers to participate in this study. Final year level is more favourable because they have accumulated substantial knowledge and experience in their study.

8. INTERNATIONAL ANKARA MULTIDISCIPLINARY STUDIES CONGRESS

3.4 Research Instruments

The instrument used for data collection in this research study is a structured research questionnaire developed by the researcher. The questionnaire was titled "Questionnaire on Awareness, Utilization and Self-Efficacy of University Pre-service Science and technology Teachers towards Artificial Intelligence Chatbots for learning in Niger state." (AIAUSQ). The instrument is divided into four sections (4) sections which are as follows: Demographic Data/information section (A), section (B) is Awareness with Fifteen (15) items, utilization with Fifteen items (15) section (C), self-efficacy with Fifteen items (15) section (D). The questionnaire was developed using Four-point Likert scale ranging HA = highly aware, MA= moderately aware, SA= slightly aware, UA = unaware for awareness, HU = highly utilized, MU= moderately utilized, SU=slightly utilized, NU = not utilized for utilization and SA = strongly agree, A = agree, D = disagree, SD = strongly disagree. The questionnaires were administered to 248 respondents in the targeted area.

3.5 Validity of the Research Instrument

The questionnaire was validated by three (3) experts from Federal University of Technology Minna Niger State. One (1) from the Department of Science Education, one (1) from Department of Educational Technology and one (1) from the Department of Industrial and Technology Education. All corrections and observations made by the experts were used to produce the final instrument that was used for this research.

3.6 Reliability of the Instrument

A pilot study was conducted using the designed instrument to establish the reliability of the instrument. The pilot test was carried out on thirty (30) pre-service university science and technology teachers selected from Usman Danfodio Federal University affiliated with College of Education, Minna, which is part of the population of the study but not part of the sample selected. The data collected was analysed using Cronbach Alpha. The Reliability coefficient of the instrument is 0.81. Therefore, the reliability coefficient obtained for this instrument is considered acceptable for this research.

3.7 Method of Data Collection

First week, an introductory letter was collected from the head of the department (H.O.D) which was used to obtain permission from the various institutions. The second week, the researcher visited all the institutions for briefing on the study. Third week, the researcher administered the questionnaire with the help of three research assistants. The copies of the questionnaire were administered and collected from the respondents through direct delivery and recovery method to achieve a high rate of return. Fourth week, all filled instruments were coded and was subjected to data analysis.

3.8 Method of Data Analysis

The data collected from administration of the questionnaires, was analysed using descriptive. The research questions were answered using mean and standard deviation. The criterion 2.50 mean score was used.

4.0 Results and Analysis

Research Question one: What is the university pre-service science and technology teachers' awareness of artificial intelligence chatbots for learning in Niger state?

To answer this research question, mean and standard deviation were used and the result is presented in Table 4.1

8. INTERNATIONAL ANKARA MULTIDISCIPLINARY STUDIES CONGRESS

Table 4.1: Mean and Standard Deviation of University Pre-service Science and Technology Teachers Awareness of Artificial Intelligence Chatbots

S/NO	Items	Mean	SD	Decision
1	ChatGPT	3.24	.990	Aware
2	Google Bard	2.52	1.106	Aware
3	You.Com	2.31	1.089	Not Aware
4	Pi AI	2.48	1.162	Not Aware
5	Perplexity AI	1.98	.990	Not Aware
6	Microsoft Bing	2.77	1.130	Aware
7	MATHia	2.02	1.081	Not Aware
8	Quilbot	2.22	1.113	Not Aware
9	DeepSeek	2.12	1.118	Not Aware
10	META AI	3.30	1.045	Aware
11	ALEXA	2.58	1.118	Aware
12	Elsa speak	2.23	1.102	Not Aware
13	Siri	2.70	1.262	Aware
14	Gauth	1.76	.990	Not Aware
15	Replika	1.74	.892	Not Aware
	Grand Mean	2.40	1.08	Not Aware

Table 4.1 shows the mean and standard deviation of university science and technology pre-service teachers' awareness status towards artificial intelligence chatbots for learning. The decision mean of 2.50 was used as the benchmark. The mean score less than 2.50 is considered Not aware while the mean score 2.50 and above are considered as Aware. Consequently, six (6) items had the mean scores ranging from 2.52 to 3.24 which are above the benchmark of 2.50 indicating that the respondents are aware of ChatGpt, Google Bard, Microsoft Bing, META AI, ALEXA, and Siri. While nine (9) items had the mean scores ranging from 1.74 to 2.48 which is lower than the benchmark indicating that the respondents are not aware of You.Com, Pi AI, Perplexity AI, MATHia, Quilbot, Deepseek, Elsa speak, Gauth, and Replika. The Grand mean score was 2.40 with Standard deviation of 1.08, which indicates that university science and technology pre-service teachers are not aware of artificial intelligence chatbots.

Research Question Two: What is the university pre-service science and technology teachers' utilization status of artificial intelligence chatbots for learning in Niger state?

To answer this research question, mean and standard deviation were used and the result is presented in Table 4.2.

Table 4.2: Mean and Standard Deviation of University Pre-service Science and Technology Teachers Utilization status of Artificial Intelligence Chatbots

S/NO	Items	N	Mean	SD	Decision
1	ChatGPT	248	3.14	1.115	Utilized
2	Google Bard	248	2.74	1.178	Utilized
3	You.Com	248	2.31	1.071	Not utilized
4	Pi AI	248	2.48	1.152	Not utilized
5	Perplexity AI	248	2.03	.989	Not utilized
6	Microsoft Bing	248	2.60	1.098	Utilized
7	MATHia	248	1.95	1.076	Not utilized
8	Quilbot	248	2.11	1.099	Not utilized
9	DeepSeek	248	1.92	1.075	Not utilized
10	META AI	248	2.95	1.118	Utilized
11	ALEXA	248	2.40	1.193	Not utilized
12	Elsa speak	248	2.10	1.080	Not utilized
13	Siri	248	2.46	1.236	Not utilized
14	Gauth	248	1.69	.845	Not utilized
15	Replika	248	1.62	.779	Not utilized
	Grand mean	248	2.30	1.07	Not utilized

8. INTERNATIONAL ANKARA MULTIDISCIPLINARY STUDIES CONGRESS

Table 4.2 shows the mean and standard deviation of university science and technology pre-service teachers' utilization status of artificial intelligence chatbots for learning. The decision mean of 2.50 was used as the benchmark. The mean score less than 2.50 is considered as Not utilized while the mean score 2.50 and above are considered utilized. Consequently, four (4) items had the mean scores ranging from 2.60 to 3.14 which are above the benchmark of 2.50 indicating that the university science and technology pre-service teachers utilized ChatpGpt, Google Bard, Microsoft Bing, and META AI. While Eleven (11) items had the mean scores ranging from 1.62 to 2.48 which is lower than the benchmark indicating that the university science and technology pre-service teachers does not utilized You.Com, Pi AI, Perplexity AI, MATHia, Quilbot, Deepseek, Elsa speak, Siri, Alexa, Gauth, and Replika. Hence the Grand mean score was 2.30 with Standard deviation of 1.07 which indicates that the university science and technology pre-service teachers does not utilized artificial intelligence chatbots for learning.

Discussion of Finding

Findings from this study on university science and technology pre-service teachers' awareness level towards artificial intelligence chatbots for learning indicating university science and technology pre-service teachers are not aware of artificial intelligence chatbots for learning. This is in line with the findings of Adeboyo *et al.* (2021) whose study examined university students' awareness of, access to, and use of artificial Intelligence chatbots for learning in Kwara State. But this present study is not in line with the findings of Vamshi and Hima (2022) whose study investigate assessment of knowledge and awareness of artificial intelligence chatbots and its utilization in dentistry among dental students in Saveetha University, Tamilnadu, India. The results indicate that the students were aware of artificial intelligence.

The finding that university science and technology pre-service teachers not utilizing artificial intelligence (AI) chatbots aligns with previous studies of Stanley *et al.* (2024) who examined awareness and utilization of Artificial intelligence tools for enhancing research among postgraduate students in universities in Benue state. Some of the results from Stanley *et al.* (2024) indicated that there are challenges associated with the utilization of Artificial intelligence tools for enhanced research among postgraduate students in universities in Benue. This present research is also in supported by the findings of Adeboyo *et al.* (2021) whose study examined university students' awareness of, access to, and utilization of artificial Intelligence chatbots for learning in Kwara State. In the findings of Adeboyo *et al.* (2021) it was indicated that majority of the student are not utilizing Artificial intelligence chatbots which is could be premised on the fact that AI is relatively new to Nigeria learning community. This is in contrast to the findings of Sila *et al.* (2023) whose finding indicate that, there is high utilization of Ai chatbots among students.

Conclusions

This study investigated the awareness, utilization, and self-efficacy of university pre-service science and technology teachers towards artificial intelligence (AI) chatbots for learning in Niger State, Nigeria. The findings revealed critical insights into the current status of AI chatbot adoption and perceptions among pre-service teachers. Overall, the study concludes that:

University pre-service science and technology teachers are awareness of AI chatbots. While there is high awareness of familiar AI tools like ChatGPT, Google Bard, Microsoft Bing, and META AI, awareness of less popular platforms such as You.com, Pi AI, and others remains not aware. This indicates a need for increased exposure to the diverse AI chatbot tools available for educational purposes. Utilization of AI chatbots among university pre-service science and technology teachers is also very low, with only a few tools like ChatGPT and Google Bard being actively used. This reflects a gap between awareness and practical application, suggesting that even when pre-service teachers are aware of AI tools, they may lack the knowledge or motivation to integrate these tools into their learning processes.

Recommendations

Based on the findings, the following recommendations are proposed:

8. INTERNATIONAL ANKARA MULTIDISCIPLINARY STUDIES CONGRESS

1. Universities managements should implement awareness campaigns and workshops to introduce pre-service teachers to a wider range of AI chatbots and their potential applications in education. Special emphasis should be placed on underutilized tools to ensure comprehensive exposure.
2. AI chatbot usage should be integrated into teacher education curricula to familiarize pre-service teachers with these tools in practical contexts. This could involve incorporating AI tools into teaching methodologies, assignments, and research activities.
3. Structured training programs focusing on AI literacy, prompt engineering, and chatbot functionalities should be developed to bridge the gap between awareness and practical utilization. These programs should address both male and female pre-service teachers to ensure equitable skill development.
4. Targeted interventions should be designed to address gender-based disparities in AI adoption such as encouraging female pre-service teachers to build confidence and self-efficacy through mentorship and peer-led training.
5. Universities should provide free or subsidized access to AI tools and platforms for pre-service teachers. This could involve partnerships with AI developers or open access to educational AI tools.
6. Beyond pre-service training, ongoing professional development opportunities should be available to help pre-service teachers stay up-to-date with advancements in AI and its application in education.

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8. INTERNATIONAL ANKARA MULTIDISCIPLINARY STUDIES CONGRESS

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