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Artificial Intelligence and Implementation of Science Education in Tertiary Institutions in Nigeria

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Abstract: This study aims to discuss the impact of artificial intelligence on the implementation of science education in tertiary institutions in Nigeria. Through a review of current literature especially journals, books and note books in both online publications and hard copies, the major issues on benefits of using AI for teaching and learning of science education in tertiary institutions were identified. The study revealed that the integration of AI into the teaching and learning of science education in tertiary institutions in Nigeria supports; personalize the learning experience for students, data analysis tools, innovative teaching methods, effective assessment methods, support for different learning styles and needs, collaborative learning, professional development. Based on this finding, the government should increase the budgetary allocation to tertiary institutions in Nigeria to enable managers to provide adequate AI infrastructure facilities in the institutions. Private institutions and international organizations should support tertiary institutions in Nigeria with the provision of capacity for lecturers and students on AI usage and also support in the provision of AI facilities.

Key words: AI, Science education, Tertiary Education, Teaching and learning.

Introduction

Tertiary education is an organized educational system that is consciously designed for manpower production, in-service training and national development. Tertiary education is an education that advances teaching, research and community services for national development. Tertiary education is an education industry that is meant for the production of manpower and national development via implementation of teaching, research and provision of community services (Ogunode 2025). Tertiary education is the education received after post-secondary education. Higher education is an education that is anchored on teaching, researching and community services. According to the National Policy on Education (FRN, 2013), Higher Education is the Post -Secondary Section of the National education system, which is given by Universities, Polytechnics and Colleges of Technology including courses as are given by the Colleges of Education, Advanced Teachers Training colleges, Correspondence Colleges and such Institutions as may be allied to them.

The objectives of tertiary education according to Ogunode (2025) includes; to provide higher education opportunities via effective teaching, researching and provision community services; to develop produce students with specialized knowledge and skills for solving personal problem and national problem; to prepare student for national workforce and to contribute to societal and community development; to provide academic program of various disciplines; to provide quality instruction in field of studies and to conduct researches to generate new knowledge for national development and to solve complex problems. The realization of the objectives of tertiary education depends on the effective training of academic and non-academic staff of tertiary institutions.

Tertiary institutions in Nigeria offered many academic proramme in which science education is one of the academic proramme been offered under the faculty of education. Over the years, advancements in technology have played an important role in shaping various fields and the education sector is no exception. Integrating artificial intelligence (AI) into the classroom has emerged as a promising approach to revolutionizing education systems worldwide. AI, commonly known as artificial intelligence, involves the development of computer systems capable of performing tasks that normally require human intelligence. These tasks include, but are not limited to, speech recognition, visual perception, problem solving, and decision making. As AI technology continues to advance, its potential applications in education are becoming increasingly apparent (Borbajo, Malbas, & Dacanay, 2023). It is

import to explore the impact of artificial intelligence on the implementation of science education programme in tertiary institutions in Nigeria.

2.0 Review of Literature

2.1 Concept of Artificial Intelligence

Artificial intelligence (AI), according to Copeland (2023) is the ability of a digital computer or computercontrolled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience.Ogunode and Ukozor (2023) conceptualized AI as programs designed with human-like intelligence and structured in the forms of computers, robots, or other machines to aid in the provision of any kind of service or tasks to improve the social economic and political development of the society. Artificial intelligence (AI) as simulation of human intelligence by software-coded heuristics. Artificial Intelligence is a branch of science producing and studying the machines aimed at the stimulation of human intelligence processes (Frankenfield 2023). Artificial Intelligence is an application or program constructed to carry out tasks with human-like intelligence. Artificial intelligence (AI) as simulation of human intelligence by software-coded heuristics. Artificial Intelligence is a branch of science producing and studying the machines aimed at the stimulation of human intelligence processes (Frankenfield 2023). Artificial intelligence (AI) in this paper can be seen as machine designed with similar human intelligence to function and execute tasks that hum being can do.

Alagbe, Awodele, and Ayorinde, (2021) viewed AI as the ability of a computer or machine to mimic the capabilities of the human mind – learning from examples and experience, recognizing objects, understanding and responding to language, making decisions, solving problems – and combining these and other capabilities to perform functions a human might perform, such as greeting a hotel guest or driving a car.Artificial intelligence (AI) are machines with high level of intelligence similar to that of human being that enable them to carry out complex tasks and responsibilities. The integration of Artificial Intelligence (AI) into the educational management has gained significant attention in recent years as a potential catalyst for educational development especially in the university education. AI facilities are globally used in all aspect of the universities ranging from the administration, management to supervision and classroom management. In developed countries AI have been fully integrated into the accreditation process of the higher institutions. AI have seem very impactful in the supervision, quality assurance and accreditation programme of the higher institutions especially the university system

2.2 Concept of Science Education

Science as systematic investigations of nature with a view to understudy and harnessing them to serve human needs (Okoro in Abubakar, Ogunseye, & Ogunode, 2021). Science education involves the study of science in depth and in addition, educational knowledge and concepts are learnt and verified. It has been recognized worldwide as a pre-requisite in technological development (Okoli et. al. 2013). Science education identifies natural phenomena appropriate to child interest and skills. Also, he went on to say that science education equips teachers, learners and the society with knowledge, skills, equipment and freedom to perform noble task useful for improving socioeconomic standard. In addition, he added that science education courses are designed to produce capable scientists who contribute meaningfully to academic excellence of the society to raise the economic level of nations (Lewis 2015).

Science education is a veritable instrument for national development (Dajal, & Mohammed, 2019). Science is a way of seeking information (process) and also an accumulated knowledge resulting from research (products) (Okon – Enoh, 2008). Science education is described by Pember & Humbe (2009) as a process of teaching or training especially, in school to improve one's knowledge about environment and to develop one's skill of systematic inquiry as well as natural attitudinal characteristics. This implies that no country can be globally recognized without talking about its scientific advancements. Science education is the field concerned with sharing scientific knowledge and methods with people not traditionally considered part of the scientific community. Science education has introduced a lot of changes in our world today and it will continue to do so in the future (Orukotan, 2007). Science education is the mother of all sciences. It comprises of chemistry, physics, mathematics, biology, physical and health, and computer science. Olatunde-Aiyedun and Ogunode (2021) observes that Science Education is the main component of school curricula in almost every country. Hence, it is essential to maintain and develop the technical infrastructures, national securities and economic prosperities for the future. If well developed and executed, Science Education can provide a stable flow of graduates into high-level jobs that require advanced scientific knowledge and expertise (Millar, in Dajal, & Mohammed, 2019).

Science education promotes intellectual respect for Mother Nature. This action can inform choices with regard to how technology is used to enhance the current living conditions for humans and other living things. Science education encourages learners to reason critically so as to make decisions that are well informed. There are no shortcomings in science education, good knowledge of science principles and facts are vital for a comprehensive education (Harry, 2011). Although there has been tremendous increase in the net enrolment of learners, the question is whether this increase has translated to qualitative education (Emechebe, 2012).

The search, collaboration, reporting and communication skills provided by science education can yield a whole generation of people who are more prepared for their careers, such people can make better contributions to the society. Furthermore, learners who have an in-depth knowledge in science education are more willing to use new ideas and technologies that can enhance and strengthen the economy. Through explaining and emphasizing the reliance of living organisms on one another and also on the environment, science education promotes intellectual

respect for Mother Nature, This action can inform choice with regards to how technology is used to enhance the current living conditions for both humans and other living things (Christine & Hayatu, 2014).

The achievement that came about due to science education have resulted in longer and healthier lives. People who understand and honor or celebrate past scientific achievement are more likely to herald future inventions and discoveries that will enhance mental and physical health, beside, a healthier general public means a highly productive society. Science education encourages learners to reason critically so as to make better decisions that are well – informed. This makes them even more enlightene voters. The caution and responsibility provided by science education also assists people to become more responsible parents. There are no shortcomings of science education. In fact, good knowledge of science principles and facts is vital for a comprehensive education (Christine et al 2014).

3.0 Methods

This paper is a position paper with the aims of the impact of artificial intelligence on the implementation of science education programme in tertiary institutions in Nigeria. The paper employed systematic literature review-based report method. It has collected and reviewed the related previous literature from various online sources. It has collected secondary information to generate knowledge on this topic. It has followed the qualitative narrative design. The researcher has visited different online sites to collect the previous literature and analyze universal basic education literature in Nigeria (Adapted from Ogunode, 2025).

4.0 Result and Discussion

Personalize the learning experience for students

One major benefit of using AI in science education is the ability to personalize learning for each student. With the help of AI, teachers can tailor lessons and materials to the individual needs and learning styles of their students. This not only makes the learning process more engaging and effective, but also allows for better retention of knowledge (Bordia, 2023 Ogunode & Olowonefa 2023). One of the key areas where AI has made an impact is in the teaching and learning process. With the use of AI-powered tools, teachers are now able to personalize the learning experience for students by analyzing their individual needs and providing tailored materials and exercises. This has led to a more efficient and effective learning experience for students (Cordona,, Rodriguez, & Ismail. 2023; Ogunode, & Ejike, 2023). AI can help identify areas where students may be struggling and provide targeted interventions to improve their understanding. This can save teachers time and effort in tracking individual student progress, and allow them to focus on providing personalized support where it is needed most. One of the primary advantages of integrating AI in the classroom is its potential to personalize instruction (Chen, Li, Li, & Li, 2021; Ogunode, & Gregory, 2023c). AI-powered tools and platforms can adapt to individual students' needs, learning styles, and progress, providing tailored recommendations and interventions. For example, adaptive learning algorithms can analyze students' performance data to identify areas of strength and weakness, enabling educators to deliver targeted interventions and personalized support (Muñoz, et al., 2023). This personalized approach promotes student engagement, motivation, and academic success (Ogunode, Okolie, & Chinedu, 2023).

Data analysis tool

Another significant impact of AI on science education in Nigeria is in the realm of research. AI-powered algorithms and data analysis tools have enabled researchers to process and analyze massive amounts of data in a fraction of the time it would have taken before. This has not only sped up the research process, but also allowed for more accurate and insightful findings (Ogunode, Idoko, & ThankGod, 2024).

Innovative teaching methods

The integration of AI in science education has also led to the development of innovative teaching methods and resources. Virtual and augmented reality simulations, for example, have become increasingly popular in science education, providing students with a more engaging and creative learning experience. AI can also assist teachers in creating more interactive and engaging lessons. Through the use of virtual reality and simulations, students can have a more hands-on experience with scientific concepts, leading to a deeper understanding and interest in the subject (Ogunode, & Ukozor 2023). Another benefit of integrating AI in education is the potential for immersive and interactive learning experiences. Virtual reality (VR) and augmented reality (AR) technologies, powered by AI, create simulated environments that enable students to explore complex concepts in a hands-on and engaging manner. For instance, VR simulations can recreate historical events or scientific phenomena, allowing students to experience them firsthand. This experiential learning approach enhances students' understanding, retention, and critical thinking skills (Alkhabra, et al., 2023).

Effective assessment methods

In addition, the use of AI can also lead to more efficient and effective assessment methods. By automating the grading process, teachers can save time and provide students with real-time feedback on their work. This allows for more timely and targeted interventions for students who may need additional support. The automation of administrative tasks through AI technology frees up valuable time for teachers, allowing them to focus on student-centered activities. Tasks such as grading assignments, generating reports, and managing administrative paperwork can be automated, leading to increased efficiency and improved teacher-student interactions (Chen, et al., 2020). This shift in workload enables educators to provide individualized attention, guidance, and feedback to students, fostering their cognitive and socio-emotional development.

Support for Different Learning Styles and Needs:

AI integration in the classroom offered support for diverse learning styles and individual needs. Through the use of natural language processing and machine learning algorithms, AI tools could accommodate various learning preferences, such as visual, auditory, or kinesthetic. Students with learning difficulties or special needs also benefited

from AI-powered assiTtive technologies, which provided tailored interventions and accommodations, enabling them to access and engage with the curriculum more effectively (Oluyemisi, 2023).

Facilitation of Collaborative Learning

AI technologies facilitate collaborative learning experiences among students. Virtual collaborative platforms, intelligent chatbots, and AI-based discussion forums enable students to engage in collaborative problem-solving, peer feedback, and knowledge sharing. AI tools can also assist in the formation of student groups based on complementary skills or learning needs. This integration of AI promotes collaboration, communication, and critical thinking skills, enhancing the overall learning experience.

Aids Professional Development:

The role of teachers in AI-integrated classrooms evolves from being the sole source of knowledge to becoming facilitators and guides. Teachers need adequate professional development and training to effectively incorporate AI technologies into their instructional practices. It is crucial to ensure that teachers have the necessary skills and knowledge to leverage AI tools to enhance teaching and learning (Borbajo, et al 2023).

4.1 Findings

The study revealed that integration of AI into the teaching and learning of science education in tertiary institutions in Nigeria support personalize the learning experience for students, data analysis tools, innovative teaching methods, effective assessment methods, support for different learning styles and needs, support collaborative learning, aids professional development

4.2 Conclusion and Recommendations

In conclusion, the integration of AI into the teaching and learning of science education in tertiary institutions in Nigeria support, personalize the learning experience for students, data analysis tools, innovative teaching methods, effective assessment methods, support for different learning styles and needs, support collaborative learning, aids professional development.

Based on this finding, the government should increase the budgetary allocation to tertiary institutions in Nigeria to enable managers to provide adequate AI infrastructure facilities in the institutions. Private institutions and international organizations should support tertiary institutions in Nigeria with the provision of capacity for lecturers and students on AI usage and also support in the provision of AI facilities.

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