



Artificial Intelligence and Curriculum Implementation of Science Education in Tertiary Institutions

Olamoyegun, Stephania Olabisi ¹, Ronald, Winifred Abhulimen ²

¹ Department of Science and Environmental Education, Faculty of Education, University of Abuja

² Biological Sciences Department, Faculty of Pure and Applied Sciences, Federal University Wukari

Abstract: This paper discussed the application of AI in curriculum implementation of science education in tertiary institutions. Secondary data were used in the paper presentation. The data were collected from online publications and print materials. The paper discovered that deployment of AI in tertiary institutions can aid effective delivering of lectures on science education programme, sets exam questions and conduct examinations on science education programme, aids research development on science education programme, aid engagement learning and collaboration learning in science education programme, assist lecturers to adopt different varieties of lecturing methods to teach science education programme, aid online teaching and learning and assist lecturers to compile and compute students on science education programme. Based on this discovery, the paper recommended increment in the funding of tertiary institutions for the development of artificial intelligence in all tertiary institutions across the country.

Keywords: Artificial intelligence and Curriculum Implementation of Science Education.

Introduction

Science education deals with sharing of science concepts and procedure with people who are not considered customarily to be individual from the empirical researchers; the people could be students, ranchers, advertiser, sales women or an entire network. Science education in Nigeria focuses on the teaching of science concepts, technique for teaching and tending to misconceptions held by learners with respect to science contents (Aiyedun, 2020; Ajemba, Ahmed, Ogunode, & Olatunde-Aiyedun, 2021). Science education is essential to the development of any nation that is the reason each nation must take it intense at all levels of learning. A significant number of the civilized world had the option to accomplish such a great amount in science and technology on account of science education (Kola, 2013; Orji, Ogar & Aiyedun, 2018; Abubakar et al, 2021). Science Education is the field concerned with sharing science content and process with individuals not traditionally considered part of the scientific community. The traditional subjects included in the standards are physical, life earth, space and human science. Science study requires a variety of unique instructional materials in addition to those materials common to all education.

Eze and Oluba (2010) postulated five main objectives of teaching science to the youths which include training the youths; To be able to observe, measure, record, collect, analyze data, hypothesize and predict data and events in an accurate and honest manner, these are the scientific skills necessary for further work in science later in life, to acquire the ethics of science which include honesty, skepticism, perseverance, objectivity, rationality etc, to give the youths sufficient doses of scientific literacy capable of preparing them for some worthwhile vocations in the fields of science

and technology, to groom a preponderant number of youths for future adult roles by equipping them with skills and competence to identify societal issues and problems and possible resolutions of such socio-scientific and technological problem, to produce a scientifically literate populace, some of whom will be professional scientists and technologists while others will be well informed, attentive citizens whose daily activities are guided by the products, ethics and processes they have acquired. Science education is one of the academic programmes offered in tertiary institutions globally. Alemu (2018) viewed tertiary education or higher education as an education that covers a wider range of higher learning institutions including the university. These higher learning institutions could be organized in different ways, commonly within a university and in a separate institution as university and other tertiary learning institutions (Alemu 2018). Tertiary education is defined by National Policy on Education (2013) as the education given after Post Basic Education in institutions such as Universities and Inter-University Centres such as the Nigeria French Language Village, Nigeria Arabic Language Village, National Institute of Nigerian Languages, institutions such as Innovation Enterprise Institutions (IEIs), and Colleges of Education, Monotechnics, Polytechnics, and other specialized institutions such as Colleges of Agriculture, Schools of Health and Technology and the National Teachers' Institutes (NTI).

Tertiary education is the final stage of education that handles the production of manpower for the social, economic and technological development of a country. Tertiary education is an organized education that deals with intensive teaching, research and provision of community services (Akin-Ibidiran, Ogunode & Ibidiran John 2022). For instance, a university, from the British perspective, is an institution with its power to award its own degree and is preeminent in the field of research (Allen, 1988). Ogunode, Edinoh & Okolie (2023f) conceptualized tertiary education as a planned and organized educational system designed for the total development of man/woman and for the total transformation of the society through the utilization of teaching, research and provision of community service. Tertiary education is post basic and secondary school education that embraces advanced teaching, research and community service. Tertiary education is an advanced educational system meant for human capital development through teaching, research and provision of community service. Tertiary education is the third tier of education that is designed for the production of skilled and professionals for the socio-economic and technology advancement.

Modern higher education is defined as an organized tertiary learning and training activities and institutions that include conventional universities such as arts, humanities, and science faculties and more specialized university institutions in agriculture, engineering, science, and technology (Alemu 2018). The concept of higher education also includes such post-secondary institutions like polytechnics, colleges of education, and “*grandes école*.” Under the umbrella of higher education come all forms of professional institutions. Even this wide spectrum does not exhaust the possibilities of forms of higher education (Assié-Lumumba, 2005). The goals of tertiary education according to the FGN National Policy on Education (2013), shall be to: contribute to national development through high level manpower training; provide accessible and affordable quality learning opportunities in formal and informal education in response to the needs and interests of all Nigerians; provide high quality career counseling and lifelong learning program that prepare students with the knowledge and skills for self-reliance and the world of work; reduce skill shortages through the production of skilled manpower relevant to the needs of the labor market; promote and encourage scholarship, entrepreneurship and community service; forge and cement national unity; and promote national and international understanding and interaction.

There are different material resources that can be deployed for the administration and management of tertiary institutions. Ogunode, Okwelogu, & Yahaya (2021) submitted that ICT can be used to administer tertiary institutions for the realization of the objectives. Ogunode, Abdulrazak, Abubakar (2023) affirmed that digital technologies can also be applied for effective management of tertiary institutions. It is imperative to discuss application of AI in curriculum implementation of Science education in tertiary institutions in Nigeria.

Curriculum Implementation of Science Education

There are different definitions of curriculum implementation by different schools. For instance, Mkpa (2007), curriculum implementation is the task of translating the curriculum document into the operating curriculum by the combined efforts of the students, teachers and others concerned. That is, curriculum implementation demands concerted efforts of end-users of the curriculum for its effective implementation at all levels to achieve the desired goals while Ekpo & Oka, (2009), defined curriculum implementation as the various steps involved in achieving the derived curriculum objectives of educational programs. Ejike, & Ejike (2018), curriculum implementation fosters curriculum evaluation and this guides the learning outcomes. The major implementers of the curriculum are the teachers. They set up learning opportunities aimed at enabling learners to acquire the desired knowledge, skills, attitudes, and values through the adoption of appropriate teaching methods and materials to guide students' learning. The curriculum planned and developed is implemented through the medium of instruction. This is why curriculum implementation is seen as the daily activities of school management and classroom teachers in the pursuit of the achievement of the objectives of the school curriculum, all in a bid to realize the national philosophy of education. Curriculum implementation of science education is the execution of science objective in higher institutions.

Akin-Ibidiran, Ogunode, & Ibidiran (2022) noted that tertiary institutions are saddled with the responsibilities of curriculum implementation. Curriculum implementation is the act of executing the planned curriculum in the school to modify behaviors of the learners. Tertiary institutions need deployment of materials and human resources for the implementation of various academic programmes. Ogunode, Edinoh, & Chinedu (2023) note that the implementation and realization of tertiary education goals depends on the availability of human resources and material resources. Artificial intelligence is one of the materials resources that can be deployed for effective management of tertiary institutions.

Artificial intelligence

Artificial intelligence is the intelligence of machines or software, as opposed to the intelligence of humans or animals. It is the subject of an eponymous field of study in computer science, which develops and studies intelligent machines. The term AI may also refer to the intelligent machines themselves (Wikipedia, 2023). Artificial Intelligence refers to the development of computer systems and machines capable of performing tasks that typically require human intelligence (AFSA, 2022; Ogunode & Gregory, 2023). Alagbe (2023) 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. Ogunode & Ukozor (2023) defined 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 is an application or program constructed to carry out tasks with human-like intelligence.

In general, Laskowski (2022) noted AI systems work by ingesting large amounts of labeled training data, analyzing the data for correlations and patterns, and using these patterns to make predictions about future states. In this way, a chatbot that is fed examples of text can learn to generate lifelike exchanges with people, or an image recognition tool can learn to identify and describe objects in images by reviewing millions of examples. New, rapidly improving generative AI techniques can create realistic text, images, music and other media. These tasks include learning, reasoning, problem-solving, perception and natural language understanding. Artificial Intelligence technologies encompass various techniques and approaches, such as machine learning, deep learning, natural language processing, computer vision and robotics. These technologies enable computers to analyze vast amounts of data, recognize patterns, make predictions and automate complex processes. Artificial Intelligence has applications across numerous fields, including health care, finance, transportation, customer service and education. It has the potential to transform industries, improve

efficiency and create new opportunities (AFSA 2022). AI programming focuses on cognitive skills that include the following:

Learning. This aspect of AI programming focuses on acquiring data and creating rules for how to turn it into actionable information. The rules, which are called algorithms provide computing devices with step-by-step instructions for how to complete a specific task.

Reasoning. This aspect of AI programming focuses on choosing the right algorithm to reach a desired outcome.

Self-correction. This aspect of AI programming is designed to continually fine-tune algorithms and ensure they provide the most accurate results possible.

Creativity. This aspect of AI uses neural networks, rules-based systems, statistical methods and other AI techniques to generate new images, new text, new music and new ideas (Laskowski, 2022).

Deployment of Artificial intelligence for Curriculum Implementation of Science Education

Deployment of AI in tertiary institutions can aid effective delivering of lectures, set exam questions and conduct examinations, aid research development, aid engagement learning and collaboration learning, assist lecturers to use varieties of teaching methods, aid online teaching and learning and assist lecturers with result compilation and computation.

Effective Delivering of Lectures

Deployment of AI in tertiary institutions can aid effective delivering of lectures of science education. Science academics are saddled with responsibilities of lecture planning and lecture delivering to the students. AI has many facilities aiding effective presentation of lectures in tertiary institutions. Bordia (2023) concluded that lecturers in tertiary institutions can use AI-powered chatbots to provide uninterrupted learning to students. As chatbots are available, students can use them to resolve doubts in real time. Moreover, chatbots can also be used by school authorities to provide information to parents and students. For example, details on fees, new admissions, classes etc. can be passed on to parents and students through AI- powered chatbots. 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; Borbajo et al., 2023)). AI integration empowers teachers to use AI as a tool to enhance instruction (Singh & Jain 2022; Ogunode, Agbade & Basse 2023b). Ogunode, Edinoh & Chinedu (2023) opined that Artificial intelligence can be deployed to solve various problems hindering the effective implementation of teaching programmes in tertiary institutions across the country. The teaching programme is a core programme of tertiary institutions and is very critical to the attainment of tertiary institutions. The teaching programme covers the preparation of lecture notes, presentation of lectures, assessment of student's academic programmes via tests and examinations, marking of students' scripts, preparation of students' results, integration of resources into lecture presentations and classroom management. These entire things that constitute teaching programmes can be easily done by deployment of Artificial intelligence.

Set Exam Questions and Conduct Examinations

Science academics are also responsibilities for setting exams questions for their respective course they lectured in the course of the semesters while tertiary institutions management handle examinations. AI technologies has proven to be useful in assisting lecturers to set examination questions and also aid institutions to conduct effective examinations. AI can help grade exams using an answer key; but it can also "compile data about how students performed and even grade more abstract assessments such as essays. Ogunode & Gregory (2023) asserted that AI can assistant teachers and lecturers especially exam officers prepare students result very fast and reliable. Also, Ogunode, Edinoh & Chinedu (2023) submitted that AI can help conduct fair exams with the use of AI-powered remote proctoring. With its help, school authorities can easily conduct exams for remote learners. The authorities can prevent cheating during exams by analyzing the images/video streams produced by AI proctors. These proctors keep an eye on the candidate by detecting voices or the

presence of another person apart from the examinee. Lecturers can also use AI to manage their course materials. Bordia (2023) asserted that one of how this technology can be used is to improve the quality of courses offered online and offline. Research has shown that the dropout rates in online courses are relatively high. Also, the dropout rate in schools is on the higher side. It can happen due to multiple reasons like lack of clarity in understanding different concepts or the inability of teachers to identify the gaps in learning materials/lectures. AI can fill these gaps by analyzing how students interact with different course materials. Using this data, the course quality can be improved.

Aid Research Development

Science academics are also saddled with responsibilities of conducting research. Ogunode, & Ade (2023) noted that the three cardinal programmes of the universities are teaching programme, research programme and community services. Research programme is the second cardinal programme of the universities. It is among the criteria used for measuring the performance of the universities. The aim of research programme of the universities is to aid the social, economic and technological advancement of the country. The academic staff is saddled with the responsibilities of carrying out researches in the universities. Conducting research is one criterion for measuring their performance. Ogunode, Edinoh & Chinedu (2023) and Khedkar (2023) maintained that researchers can use AI tools for writing a research grant, a book, or even academic journal articles. Some AI-powered tools can help researchers to edit their articles and use grammatically correct English. Analyzing data from the experiments conducted is an important aspect of research. AI-powered data analysis tools can help researchers analyze data more efficiently and make the process free of any bias. Researchers can save hundreds of hours by using AI tools that can read complex papers and summarize them. Researchers can also make use of AI tools for citing literature and keeping their sources organized. AI-powered research tools for reading, annotating, and note-taking can make the process of acquiring knowledge considerably more efficient. Such tools can provide the user excerpts from the literature source, with the most relevant information highlighted, and help one decide whether an article is worth reading. This can help the user quickly locate relevant information in research articles, determine which paragraphs to read in-depth and compile notes on the subject. To use such an AI-powered tool most effectively for research, the users should critically assess the output without accepting it as „the truth“ and read the original text instead of simply relying on AI-generated summaries. To use AI tools effectively for creating experimental design models, researchers must design models that take a wide range of variables and parameters into account. By inputting specific criteria into such models, researchers can generate optimal designs that maximize their study effectiveness.

Aid Engagement Learning and Collaboration Learning

Deployment of AI in tertiary institutions can aid effective learning engagement and collaboration among learners. Westagilelabs (2022) asserted voice assistants that are an engaging and convenient way to bring learning at home while also helping users schedule study calendars, listen to coaching instructions while on the go, and give instant answers to students' basic questions in class. The benefits of voice assistants in education include: efficient saving of time for students and teachers, providing community learning opportunities, and providing personalized education within seconds.

These AI-powered voice assistants can be used in apps on smartphone even if they don't have smart speakers. Also, in area of personalized learning, AI tools can assist learning through tailor-made study schedules and customize learning based on the specific needs of individual learners. They identify the gaps in knowledge, creating instructions, testing and feedback systems for learners from preschool to college. AI-powered software, games and tools can set a strategy for students to learn at their speed, time and requirements for repeated practice. This machine-assisted classroom environment can help teachers customize individual lesson plans based on students' individual needs and go a long way in differentiated and adaptive learning that can build a solid foundation for all kinds of learners. For example, a personalized learning system might identify that a student struggles with a particular concept in mathematics. The system would then provide the student with additional resources and support, such as targeted practice problems or videos, to help them master the concept. As the student progresses, the system would continue to adjust the instruction to meet their changing

needs (Westagilelabs 2022). Also, Borbajo, Malbas, & Dacanay (2023a) discovered that the integration of AI technologies in the classroom was found to enhance student engagement and motivation. AI-based educational tools, such as adaptive learning platforms and intelligent tutoring systems, provide personalized and interactive learning experiences. These technologies adapt to individual student needs, pacing, and learning styles, fostering greater student engagement and intrinsic motivation. Students showed increased interest and active participation in their learning process, leading to improved learning outcomes. On enhanced Personalized Learning, Ogunode & Ukozor (2023) and Borbajo et al (2023a) also found out AI integration facilitated personalized learning experiences by tailoring instruction to individual student abilities and preferences. Intelligent algorithms analyzed student data and provided adaptive feedback, suggesting targeted learning materials and activities. This personalized approach allowed students to learn at their own pace and focus on areas where they needed additional support. Consequently, students demonstrated improved comprehension, retention, and mastery of academic content.

Assist Lecturers to Use Varieties of Teaching Methods

Deployment of AI in tertiary institutions can assist lecturers to use varieties of teaching methods to teach science education in the tertiary institutions. Borbajo et al (2023a) ascertained that 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 assistive technologies, which provided tailored interventions and accommodations, enabling them to access and engage with the curriculum more effectively.remarked that AI systems can “gauge a student’s learning style and pre-existing knowledge to deliver customized support and instruction.” According to an article in The Atlantic, Artificial intelligence promises personalized education for all, artificial intelligence holds the potential to “enhance human teachers’ abilities to tailor lessons to each student without knocking their class schedule off track,” eliminating the need for educators to “teach to the middle,” as often happens when their students have a range of skill levels and learning abilities.

Aid Online Teaching and Learning

AI in tertiary institutions has aided many tertiary institutions to move from traditional method of delivery teaching to an online platforms. Westagilelabs (2022) maintained that using VR technologies, students can directly connect to their mobile devices or laptops and access content interactively. Virtual learning environments can offer group educational experiences, provide student counseling services, and facilitate an immersive learning experience. VR headsets can help students with ADD/ADHD by blocking out distractions and increasing attention spans. Additionally, learners can also aid learners in soft skill coaching, life skills, and self-development with interactive virtual simulations. Also, Bordia, (2023) asserted that with the help of AI, students can learn from anywhere at their own pace without having to attend physical classes. They can connect with learners from all over the world and participate in similar courses. AI is modifying education models and teaching-learning techniques around the globe. As learners can quickly access information, they can resolve their doubts in a short time. This powerful technology is also promoting the culture of lifelong learning by empowering students with the required information in a span of a few seconds.

Assist Lecturers with Result Compilation and Computation

AI can assistant assist science academic to compile and compute student’s data to prepare students result. AI technologies can be use it to process vast amounts of data about learners, about teachers, about teaching and learning interactions. AI can “help teachers understand their students more accurately, more effectively.” AI can assistant teachers and lecturers especially exam officers prepare students result very fast and reliable (). Westagilelabs (2022) observed that AI-powered grading software combines Machines Learning to create calculating systems after it collects important data on metrics for grading assignments from papers that have been graded by teachers/professors. The tools are designed to understand and replicate the teachers’ human grading process earlier. Teachers’ inputs + AI combination can grade essays, papers and tests in seconds,

even in different languages. They can easily integrate them into an existing virtual environment or cloud-based platform. They are handy when the number of papers is significant so that the teachers can be occupied by more value-based work instead of wasting hours in grading.

Conclusion and Recommendations

This paper discussed the application of AI in curriculum implementation of science education in tertiary institutions. Secondary data were used in the paper presentation. The paper discovered that deployment of AI in tertiary institutions can aid effective delivering of lectures on science education programme, sets exam questions and conduct examinations on science education programme, aids research development on science education programme, aid engagement learning and collaboration learning in science education programme, assist lecturers to adopt different varieties of lecturing methods to teach science education programme, aid online teaching and learning and assist lecturers to compile and compute students on science education programme. Based on this discovery, the paper recommended increment in the funding of tertiary institutions for the development of artificial intelligence in all tertiary institutions across the country.

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