

# ARTIFICIAL INTELLIGENCE(AI):IMPLICATION FOR TEACHING AND LEARNING IN THE 21<sup>ST</sup> CENTURY IN NIGERIA

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## Abstract

*The study examined artificial intelligence (AI): Implication for teaching and learning in the 21<sup>st</sup> century in Nigeria. Artificial Intelligence (AI) has rapidly grown over the years, and its application has been widespread across various fields and industries. The education sector has not been left behind, as AI has become a significant tool for enhancing the learning experience and making education more efficient. AI is used in education to improve the quality of education, customize learning experiences, automate administrative tasks, and support decision-making processes, among other applications. AI is the use of machines to perform tasks that would typically require human intelligence. This paper discusses the concept of Artificial Intelligence, implication and its application in teaching and learning. The paper also suggested that Artificial Intelligence should be incorporated in teaching and learning in schools as it helps in solving educational problems for a better society. School teachers should be trained on effective use of Artificial intelligence machine as it serves as a backbone to all the information science that enabled intelligent tutor systems.*

**Keywords:** Artificial Intelligence (AI), Importance and implication for Artificial Teaching and Learning

## Introduction

The importance of artificial intelligence in education cannot be overemphasized. Artificial Intelligence (AI) has rapidly grown over the years, and its application has been widespread across various fields and industries. The education sector has not been left behind as AI has become a significant tool for enhancing the learning experience and making education more efficient. Education plays a vital role in developing a country in every aspect, be it social, cultural or moral development. Education is the platform that brings about the needed manpower for national development. It is also important to note that the main purpose of education is to train individuals to meet the needs of the society and find better ways to boost the national development in the best possible ways. Therefore teaching and learning needs innovations and improvement to meet up ever demanding challenges of education. Teaching and learning are dynamic processes that can be continually improved. They

are interconnected processes that rely on effective communication, interaction and collaboration between teachers and learners. The use of innovative teaching method, technology and personalized approaches can enhance teaching and learning experience, leading to improved outcomes. Technology tools are resources to enhance learning and teaching experiences. Hence, AI platforms such as online platform, educational applications, simulations and multimedia materials can facilitate interactive and engaging learning environment.

AI has become increasingly relevant in education, with a focus on personalized learning, virtual assistants, supporting decision-making, using the automatic grading system, virtual instruction, adaptive learning, reading assistance, and as well as Intelligent campus system. Personalized learning uses AI algorithms to analyze student data and provide personalized learning plans that are tailored to the student's needs. These systems can identify areas of difficulty, provide targeted support, and track progress over time. Virtual assistants, such as chatbots, have also become popular in education. These systems can provide instant support to students, answering questions, providing feedback on assignments, and helping students navigate the Learning Management System. Chatbots can also be used to provide personalized learning experiences, such as recommending resources and providing customized study plans (Bosch & Li, 2022).

More so, AI models can make predictions based on historical data, enabling decision-makers to anticipate future outcomes and moderate risks. AI can be integrated into Decision Support Systems (DSS) to assist decision-makers in complex scenarios, combines AI techniques, data analysis, and decision models to provide interactive tools and visualizations that aid in exploring different options, assessing risks, and evaluating outcomes. These systems provide a framework for decision-making, enhancing efficiency and accuracy. AI can also be used to automate administrative tasks, such as grading, scheduling, and record-keeping. Automated grading using AI has been useful in providing faster and more accurate feedback to students. AI-powered virtual instruction can incorporate various techniques and technologies, such as: Intelligent Tutoring Systems, Natural Language Processing (NLP), Adaptive Learning Platforms, Virtual Reality (VR) and Augmented Reality (AR), Intelligent Grading and Assessment: Data Analytics and Predictive Models, Virtual Assistants and Chatbots. The enhancements in virtual instruction have the potential to improve accessibility, engagement, and learning outcomes for students.

Again, adaptive learning systems use machine learning algorithms to analyze the collected data and make predictions about the learner's future performance. These predictions inform the system's decision-making process, allowing it to dynamically adjust the learning experience in real-time. For example, if a learner is struggling with a particular concept, the system may provide additional explanations, examples, or practice exercises to reinforce understanding. AL systems can also incorporate feedback and input from teachers or instructors. Educators can review the learner's progress, provide additional guidance, or modify

the learning plan as needed. The system can integrate this feedback into its adaptive algorithms, further refining the personalized learning experience(Zhang & Zhang, 2017).

AI has revolutionized reading assistance by providing innovative tools and technologies that enhance reading experiences, improve accessibility and personalize content delivery. It has opened up new possibilities for individuals with diverse reading needs, making reading more inclusive and engaging (Huang, 2019). Intelligent campus refers to the application of artificial intelligence (AI) and other smart technologies in the context of a university or college campus. It involves using advanced technologies to enhance various aspects of campus operations, facilities management and students experiences

### **History of Artificial intelligence (AI)**

Artificial intelligence (AI) has a long history in education, dating back to the early days of computing. An American scientist John McCarthy invented the term Artificial Intelligence and he has credit of founder of Artificial Intelligence in 1955 and proposed in computer conference in 1956 by exploring how a computer machine can learn and reason like human being. But in the 1940s and 50s, many scientists from diverse fields like mathematics, psychology, engineering, economics and political science started making artificial mind which work like human. Researchers began exploring the potential for using computers to teach and learn, and early applications of AI in education focused on creating intelligent tutoring systems (Dorfler & Pfister, 2022).An intelligent tutoring system (ITS) is a computer system that aims to provide immediate and customized instruction or feedback to learners without requiring human teacher intervention. One of the earliest attempts of intelligent tutoring system was the Southern Alberta Institute of Technology system, developed in 1960 by Patrick Suppes at Stanford University. Southern Alberta Institute of Technology system used a computer program to teach students algebra, providing immediate feedback and adapting to the student's level of understanding.

Moreover, in the 1970s and 1980s, research into intelligent tutoring systems continued to advance. One notable development was the PLATO system, founder of academic he was an ancient Greek, which was developed at the University of Illinois in 1972. The PLATO system used AI to provide personalized instruction to students in a wide range of subjects, including mathematics, science and language arts. In addition to intelligent tutoring systems, the 1980s saw the rise of expert systems in education. Expert systems are AI applications that can provide expert-level advice and guidance in a specific domain. In education, expert systems were used to provide guidance on course selection, career planning, and college admissions (Alqahtani, 2022)

Again, in the 1990s and 2000s, AI continued to evolve in education, with a focus on automated grading and e-learning. Automated grading systems used AI algorithms to analyze student essays and provide instant feedback on grammar,

spelling, and content. These systems were used in large-scale standardized testing, such as the Graduate Record Examination (GRE) and the Test of English as a Foreign Language (TOEFL). E-learning also takes off in the 1990s, with the development of learning management systems (LMS) and online courses. These systems used AI to provide personalized learning experiences, such as adaptive learning algorithms that adjust to the student's level of understanding (Han & Yan, 2022)

### **Artificial Intelligence**

Artificial intelligence is the combination of two words: artificial and intelligence. Artificial means 'not real or natural' while intelligence means 'the ability to reason, to activate new thoughts, ability to learn or think to solve problems'. Lin (2022) contributed that artificial intelligence is an area that mainly focuses on using artificial machines to work and give reactions like human beings. It is combination of many activities which includes designing the artificial in computers that are like-recognizing the speech, learning, planning and solving a problem. In other words, it can be seen as machine programming which can think and act with some level of human intelligence resulting in efficiently use of limited resources.

Artificial intelligence can be defined as making computer programmes to solve complex problems as human beings do solve. So, it is also divided into two parts one is to solving complex problems by the machine and second is same like human beings. Artificial intelligence is also used to describe a property of machines or programs. Artificial intelligence (AI) is a broad term that describes machines or computer systems that can observe or gather data, analyze it, and make decisions based on the information available (Klim & Lee, 2022). Artificial intelligence can also be defined as machines that can perform cognitive functions in a manner associated with the human's mind, such as problem-solving and learning. AI is the use of machines or computer to perform tasks that would typically require human intelligence (Gobbo & Pavan, 2022). In education, AI is used to develop and deliver personalized learning experiences, improve administrative efficiency and support teachers in decision-making processes. The use of AI in education has been widespread across various applications, including natural language processing, machine learning, and robotics, among others. AI systems are designed to be able to learn from the input they receive, adjust their behaviour accordingly and respond in ways similar to humans. AI has been applied in fields such as healthcare, manufacturing, finance, education, etc. In educational settings this technology can help students learn more quickly and effectively by providing personalized instruction tailored to each individual student's needs.

Artificial intelligence is combination of science and engineering for making a machine behaves in intelligent manner. It includes the learning from past experience, reasoning for the decision making, inference power and quick response. Also it must be able to take decisions on the basis of priorities and tackle complexity and ambiguity. Machines programmed to carry out tasks, just like humans would

require intelligence, are said to possess artificial intelligence. Computers and machines use AI techniques to understand, analyze and learn from data through specifically designed algorithms (Huang et al., 2022).

### **AI and its Implication for Teaching and Learning in the 21<sup>st</sup> Century**

The world is evolving rapidly, driven by technological advancements and global interconnectedness. Teaching and learning help equip students with the knowledge, skills, and attitudes necessary to thrive in this ever-changing landscape. Traditional education focused on rote memorization and information recall, but the demands of the 21st century require a broader set of skills. Hence, teaching and learning in modern education emphasize critical thinking, creativity, collaboration, communication, digital literacy, and cultural competence. These skills enable students to navigate complex challenges, work collaboratively, and succeed in various domains. In the past, education often relied on teacher-centered approaches, where the teacher was the primary source of knowledge and students played a passive role (Ajayi, 2020). However, the use of AI in the 21st-century education paradigm emphasizes student-centered approaches. It recognizes the individuality of learners, promotes active engagement, and encourages personalized learning experiences tailored to students' interests, strengths, and needs. The advent of AI technology has revolutionized the way information is accessed and processed. Teaching and learning in the 21st century leverage educational technology to enhance the learning experience. The world has become more interconnected, and today's students need to develop a global perspective. Education equips students with the skills to engage with people from different backgrounds, appreciate cultural diversity, and address global challenges collectively. AI plays a vital role in equipping students with the knowledge and awareness of these issues and empowering them to become active contributors to positive change. Teaching and learning provide opportunities to explore and understand these challenges, encouraging students to develop innovative solutions and contribute to a sustainable and inclusive future. The ability to think creatively and innovate is highly valued in the 21st century with AI support. Teaching and learning in education encourage students to explore their creative potential, think outside the box, and develop innovative solutions to real-world problems. By nurturing creativity, education prepares students to contribute to advancements in science, technology, arts, and other fields in the 21<sup>st</sup> century. Every student has unique strengths, weaknesses, and learning styles. 21st-century education recognizes the importance of personalized learning experiences. Teaching and learning methods are tailored to individual student needs, allowing for differentiated instruction, adaptive learning technologies, and personalized feedback. This approach maximizes student engagement, motivation, and academic growth. In addition to academic knowledge, 21st-century education prioritizes the holistic development of students with the support of AI (Liu & Liu, 2020).

AI can facilitate personalized learning experiences by adapting educational content and resources to individual students' needs and preferences. This can help address the diverse learning styles and abilities present in Nigerian classrooms, allowing students to learn at their own pace and receive targeted support. AI-powered intelligent tutoring systems can provide students with personalized feedback and guidance, mimicking the role of a human tutor. These systems can offer immediate assistance, track student progress, and identify areas where additional support is needed, thereby enhancing the quality of education in Nigeria. In a country as large and diverse as Nigeria, access to quality education is a significant challenge. AI can help bridge this gap by providing access to educational resources and materials through online platforms and distance learning. AI can analyze large volumes of educational data, such as student performance, attendance records, and learning patterns, to generate insights for educators and policymakers. These insights can inform evidence-based decision-making, allowing for the implementation of targeted interventions and improvements in educational policies and practices. AI-powered language learning platforms can assist Nigerian students in acquiring foreign languages. Additionally, AI translation tools can help overcome language barriers and facilitate communication among students and educators from different linguistic backgrounds within Nigeria (Sahin & Yilmaz 2022).

## **Importance and Application of Artificial Intelligence in Education**

### **Personalized Learning**

One of the importance of AI in education is the development of personalized learning experiences. AI can analyze student data, such as their academic performance, learning style, and interests, to develop a tailored learning experience. The use of AI in personalized learning can help students to learn at their own pace, improve their engagement and enhance their learning outcomes. AI can also be used to develop adaptive learning systems that adjust to the student's needs and provide real-time feedback. The adaptive learning system can adjust the difficulty level of the learning content based on the student's performance, ensuring that the student is challenged enough to learn but not overwhelmed (Guo et al., 2022)

Personalized learning can improve student engagement and performance, as students are more likely to be motivated when they feel that their learning experience is tailored to their individual needs. AI can also help identify students who are struggling and provide targeted support to help them catch up.

AI algorithms can analyze student essays and assignments and provide instant feedback on grammar, spelling, and content. This can save teachers time and help students get immediate feedback on their work, which can improve their learning experience. It can also analyze student data to predict which students are at risk of lacking behind or to drop out. This can help teachers intervene early and provide targeted support to students who need it the most. Predictive analytics can

also help schools identify trends in student performance and make data-driven decisions about curriculum and teaching methods. It can create smart content that adapts to a student's learning level and preferences. For example, textbooks can be enhanced with AI algorithms that provide interactive learning experiences, such as simulations and quizzes. This can make learning more engaging and effective for student (Bosch & Li, 2022). Virtual assistants, such as chatbots, can also be used to provide students with immediate support. Chatbots can answer common questions, provide feedback on assignments and help students navigate the learning management system. This can help students get the support they need when they needed, without having to wait for a teacher or administrator to respond.

### **Supporting Decision-making**

Artificial intelligence can be used to support decision-making processes in education, such as predicting student outcomes, identifying at-risk students and providing recommendations for academic programs. Rambe (2022) noted that AI can automate repetitive and time-consuming tasks, emancipating decision-makers to focus on higher-level thinking and strategic planning. For example, in finance and accounting, AI-powered systems can automatically process invoices, reconcile accounts, and generate financial reports, reducing manual effort and improving accuracy. By analyzing patterns and trends, AI algorithms can forecast market trends, customer behavior, and potential risks, assisting in making proactive decisions and optimizing strategies. It can analyze student data, such as academic performance and behaviour patterns, to predict the likelihood of a student's success or failure. It can identify students who are at risk and provide interventions to prevent them from failure. It can also provide recommendations for academic programs based on student data. For instance, AI can recommend courses or extracurricular activities that align with a student's interests and academic goals. The use of AI in decision-making processes can help teachers and administrators to make data-driven decisions that improve the quality of education (Echeverría & Ruiz-Espejo, 2022).

### **The Automatic Grading System**

The automatic grading system is an artificial intelligence based professional computer program that simulates the behaviour of a teacher to assign grades to student tasks in an educational setting. It assesses student knowledge; the program analyzes their answers, provides feedback and develops personalized training programs. Many artificial intelligence education apps are using this program. Through the test of learning, the system automatically provides the learner evaluation score. This method can help teachers to better understand the learning situation of their students, and students, on the other hand, are made more aware of their level of learning achievement and knowledge mastery. AI can also be used to schedule classes and allocate resources such as classrooms and teachers, thereby

improving the administrative efficiency of educational institutions and also improves students' performance in school (Liu & Liu, 2020)

### **Virtual Instruction**

Virtual instruction, also known as virtual learning or online learning, refers to the delivery of educational content and instruction through digital platforms and technologies. It enables students to access educational resources, interact with instructors, and participate in learning activities remotely, without the need for physical presence in a traditional classroom setting. Sahin and Yilmaz (2022) contributed that artificial intelligence can play a significant role in enhancing virtual instruction by providing personalized learning experiences and intelligent tutoring systems. AI algorithms can analyze student data, such as their performance, learning styles, and preferences, to adapt the instructional content and pace to individual needs. This individualization promotes more effective learning outcomes as students receive tailored instruction and support.

The virtual teacher answers the questions step by step for students and adjusts the answer according to the feedback of the students until the student masters the knowledge learned. At the same time, the system also provides real-time reporting for parents, so that they can keep track of their child's learning progress and understand better whether they can keep up with the progress of the school or have difficulties during the learning process. The system also allows parents to encourage and even reward their children through online interaction, in which parental supervision of children is also taken into account in the program.

**Adaptive Learning:** Adaptive Learning (AL) refers to the use of technology and data to personalize and customize the learning experience for individual learners. It involves dynamically adjusting the learning content, pace, and strategies based on the learner's needs and progress (Trushkina et al 2020). The concept of adaptive learning is closely related to artificial intelligence (AI) and machine learning (ML) techniques. AL systems gather data about the learner's performance, preferences, and behavior, and then use this information to make informed decisions about what and how to teach. In adaptive learning, artificial intelligence is gradually used to collect and analyze student learning data, outline learning styles and characteristics of each student, and then automatically adjust the teaching content, mode, to best suit their needs (Wu, 2019). Platform that integrates curriculum design, online learning, real-time feedback, adaptive learning, big data analysis, online collaborative learning, and intelligent coaching are designed for adaptive learning. Teachers can use the tools and content library online platform to design courses, and each part of the teaching process can add elements of interaction with students, so that students can master the knowledge through completing some "tasks" in the course. Through these interactions, the system can collect student learning data at any time, track the

progress of students, and discover the bottlenecks and difficulties of student learning, thus giving real-time feedback and reinforcement.

Lipton et al. (2018) recorded that the goal of adaptive learning is to optimize the learning process, improve learner engagement and motivation, and ultimately enhance learning outcomes. By tailoring the learning experience to individual learners, AL can accommodate different learning styles, preferences, and paces, allowing each learner to reach their full potential. It is important to note that adaptive learning is an evolving field, and advancements in AI and ML technologies continue to shape its development. As more data is collected and analyzed, and as algorithms become more sophisticated, adaptive learning systems are expected to become even more effective in providing personalized and engaging learning experiences.

### **Reading Assistance**

Reading assistance is an area where artificial intelligence (AI) has made a significant impact. AI-powered tools and technologies have transformed the way students read, comprehend, and interact with written content. AI enables the conversion of written text into spoken words through text-to-speech technology. This has benefited individuals with visual impairments or reading difficulties, allowing them to listen to written content instead of reading it. AI-powered natural language processing techniques help in analyzing and understanding written text. These techniques enable features like language translation, summarization, and sentiment analysis, enhancing reading comprehension and providing assistance to readers. AI algorithms are employed to curate and filter large volumes of written content, making it easier for readers to discover relevant and high-quality information (Zhu et al., 2022). AI-powered recommendation systems can present readers with curated articles, news, or research papers based on their interests and reading behaviour. AI-driven language translation tools have greatly improved the accessibility of written content across languages. These systems utilize machine learning and neural networks to provide accurate and fluent translations, enabling readers to access information from different parts of the world. AI algorithms are used to analyze reading preferences and patterns to provide personalized book recommendations. By understanding a reader's interests and reading history, AI can suggest relevant books, articles, or related content, making reading experiences more engaging and tailored to individual preferences.

**Intelligent Campus:** With the help of leading artificial intelligence technology, intelligent campus aimed to improve teaching quality as well as campus management and services, to provide a more systematic and secure environment for students (Yan, 2018). AI plays a crucial role in creating an intelligent campus which enable automation, data analysis, and decision-making processes (Ali & Alrawais, 2020).

AI-powered video surveillance systems can monitor campus areas in real-time and automatically detect suspicious activities or potential security threats. This can

enhance the overall safety of the campus and enable quick responses to incidents. AI-powered chatbots can be deployed on campus websites or mobile apps to provide instant assistance and information to students, faculty, and staff. These chatbots can answer common queries, provide campus directions, offer course recommendations, and assist with administrative tasks, freeing up human resources for more complex inquiries

AI-based navigation systems can help students and visitors find their way around the campus efficiently. These systems can provide real-time directions, inform about events and activities happening nearby and suggest the fastest routes based on current conditions. AI algorithms can analyze large volumes of data collected from various campus sources, such as student records, research activities, and operational data. These analytics can provide valuable insights for decision-making processes, helping optimize resource allocation, identify trends, and improve overall campus performance (Singh et al., 2021). Deakin University in Victoria, Australia, the development of smart campus is in full swing, as a teacher's aide, the intelligence behind it comes from IBM's Watson supercomputer system. Once the project is completed, the Smart Campus will be able to answer all questions related to the student's campus life such as how to find the next lecture hall, how to apply for the next semester course, how to get homework, where to find a parking lot or how to contact an instructor are all that artificial intelligence campus robots will be able to solve.

**Distance Learning:** In distance education, artificial intelligence technology is used to support distance education, or different intelligent systems can be used to improve distance education. Distance education is the process of providing education where the instructor is geographically separated from the student or any instructional arrangement in which the teacher and learner are geographically separated to an extent that requires communication through media such as print or some other form of technology Ajayi (2020). Distance education was established to allow and increase access to education to those who are unable to attend the regular colleges. In distance education, the student does not have a direct face to face contact with the teacher but can use various ways to access education, like e-learning, video conferencing, e-mail among others (Miller & King, 2013).

## **Conclusion**

In conclusion, AI has influenced many sectors and education. It is a contemporary method of tutoring or teaching and learning, which can address and resolve many issues related to learning. It can resolve issues, such as content accessibility, teacher deficiency where a student can learn without stress or impacting others. AI technologies are not limited to smart learning, tutoring systems, and social robots; there are many other intelligent technologies, such as virtual facilitator, intelligent campus, adaptive learning, learning management systems, and

learning analytics, which also contribute significantly to education sector. Artificial Intelligence should be implemented and also incorporated in teaching and learning as it serves as a backbone to all the information science that enabled intelligent tutor systems and students' performance in school.

### **Recommendations**

- 1) Artificial Intelligence should be incorporated in teaching and learning in schools as it helps in solving educational problems for a better society.
- 2) School teachers should be trained on effective use of Artificial intelligence machine as it serves as a backbone to all the information science that enabled intelligent tutor systems.
- 3) Artificial Intelligence should be implementation so as to meet the demand of the 21st in century in education

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