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IMPACT OF ARTIFICIAL INTELLIGENCE (AI) IN TRANSFORMING OF INDUSTRIAL TECHNOLOGY EDUCATION IN NIGERIA

Igwebuike E. Dimkpa[1] Adokor V. Mkinebari[2] Caroline N. Ogbowu[3]
Department of Electrical Electronics, School of Industrial Technology Education, Federal College of Education (Technical) Omoku Rivers State Nigeria

Abstract: *The importance of AI in education cannot be over-emphasized owing to its ability to enhance and positively impact teaching and learning in the 21st century. It has digitally transformed learning experiences among Nigerian students especially students of industrial technology education. AI, understood as the capability of computer systems to perform tasks that typically require human intelligence such as learning, reasoning, and decision-making, has emerged as a transformative tool across various sectors, including education. Within the Nigerian educational context, AI-driven technologies-such as machine learning, natural language processing, and intelligent tutoring system-are increasingly being utilized to enhance personalized learning, improve teaching efficiency, and facilitate data-driven decision-making. The study situates these developments within the broader concept of education as a continuous process that promotes knowledge acquisition, skill development, and societal advancement. Key roles of AI identified in the study include personalized instruction, automation of administrative tasks, improved student engagement, and the use of predictive analytics to enhance academic performance. While acknowledging challenges such as infrastructural deficits, limited digital literacy, and policy gaps in Nigeria, the study emphasizes that strategic implementation and adequate support systems are essential for maximizing AI's impact. The study concludes that as Nigeria continues to embrace technological advancement, a balanced and strategic approach to AI adoption will be essential to ensure that its benefits are maximized while minimizing its potential risks.*

Keywords: *Artificial Intelligence, Education and Industrial Technology Education,*

Introduction

Globally, AI is transforming knowledge delivery, access, and experience. Its impact is becoming more apparent in educational settings. AI offers a viable avenue for innovation in Nigeria, where issues like crammed classrooms, scarce teaching resources, and unequal access to high-quality education still exist. AI has the ability to customize education in ways that are frequently not possible with traditional approaches by enabling intelligent tutoring, automated assessment, and adaptive learning systems. This shift is not merely technological but transformative, as it redefines the roles of both teachers and students, encouraging a more interactive and learner-centered environment
(UNESCO, 2023).

Beyond customization, AI methods are increasing Nigerian students' access to education by bridging socioeconomic and geographic divides. Chatbots, virtual classrooms, and language processing system are examples of technologies that can help students in disadvantaged or rural locations by providing real-time support and educational resources without the need for a teacher to be present all the time. This is especially important in Nigeria, where inequalities in educational facilities continue to be a serious problem. Furthermore, AI-driven analytics can help educators identify learning gaps, monitor student progress, and design targeted interventions, thereby improving overall academic performance and retention rates (Luckin, Holmes, Griffiths, & Forcier, 2022; Adebayo & Olanrewaju, 2024).

Arising from the above, therefore it is glaring that AI possesses tremendous importance for the teaching of industrial technology education by making its content readily accessible to students. Promoting effective course as well as providing constructive cum feedback mechanisms necessary for measuring students can be judiciously utilized to create dynamic and interactive learning ambience capable of accommodating different learning styles with a view to improving students aptitudes.

AI has outstanding importance for teaching Industrial Technological Education (ITE) courses by developing a practical mechanism for evaluating students' understanding of the courses. This feedback mechanism would enable teacher of the courses to identify the weakness of students with a view to overcoming such weakness and promote easy comprehension in the learning of ITE courses. AI also facilitates the teaching of ITE courses by guaranteeing the availability and accessibility of rich courses. The provision of vast amount of literature will contribute greatly to deepening the understanding of teachers and make them grounded in ITE courses.

Artificial Intelligence

AI can be seen as the invention of computer-based machines to transmit electronic data, manipulate as well as store it. It can also be defined as the technological creation of machines to perform specific tasks effectively and efficiently in relation to ones immediate surroundings. Artificial Intelligence (AI) refers to the capability of computer systems to perform tasks that normally require human intelligence such as learning, reasoning, decision-making, and problem-solving. In recent academic literature, AI is conceptualized as a system of algorithms and computational models designed to analyze data, identify patterns, and make autonomous or semi-autonomous decisions in dynamic environments AI has emerged as one of the most transformative technologies in the modern business landscape, reshaping traditional approaches to strategy formulation and decision making. According to Amuzat (2025) AI is used to analyze building data, predict the risks of building types and determine whether a city could drop certain inspections. By leveraging AI-driven tools such as machine learning, natural language processing, and predictive analytics, organizations are increasingly able to process vast amounts of data, detect patterns, and generate actionable insights in real time (Luke & Akpan, 2025). With the help of AI, the companies can create some aspect of complex language translation and pattern recognition by disparate independent algorithms in an effort to implement some business globally. (Ikpe & Gold, 2026).

Concept of Education

The concept of education refers to a structured and continuous process through which individuals acquire knowledge, skills, values, attitudes, and competencies necessary for personal development and societal participation. Education is fundamentally a method or practice aimed at teaching new skills and principles, thereby sharpening the mind and building moral character in an individual (Sambo et al, 2019). It is a lifelong process that begins at birth and extends throughout life, taking place in both formal institutions such as schools and informal settings like the home and community. Education is not merely the transmission of information; it also involves the cultivation of critical thinking, creativity, ethical reasoning, and social responsibility (Biesta, 2020).

According to Nwachukwu, Ezeji & Ohalete (2023) Education is defined as a method or practice that aims at teaching an individual a new skill or new principles. Furthermore, this sharpens the minds and builds moral principles in an individual. Formal, informal, and non-formal forms of education can be generally classified. Formal education is structured, curriculum-based, and taught by qualified professionals in schools and colleges. Informal education occurs naturally through daily experiences, interactions, and observations, while non-formal education includes organized learning activities outside the formal system, such as vocational training and adult literacy programs (UNESCO, 2021). These forms collectively contribute to holistic human development.

Industrial Technology Education

Technology according to Dimkpa and Osaji (2024) is the scientific study of mechanical and applied sciences. It is also the subject that has their practical application in industry. Technology can be said to be: science of industrial arts or organization and management of a country's industrial resources by experts for the good of the whole community. UNESCO (2021) for instance, defines technology education as education designed at upper secondary and lower tertiary levels to prepare middle level

personnel technicians, middle management etc.) and at university level, to prepare engineers and technologists for higher management positions.

Industrial technology education includes general education, scientific and technical studies and related skill training. The components of industrial technology education may vary considerably depending on the type of personnel to be prepared and the education level concerned". The National Policy on Education regarded industrial technology education as an integral part of general education in Nigeria.

Industrial Technology education is used as a comprehensive term referring to those aspects of the educational process involving, the study of technologies and related sciences and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life.

Purpose of Industrial Technology Education (ITE)

1. To provide manpower in applied science, technology and commerce particularly at sub- professional levels.
2. To provide the technological knowledge and vocational skills necessary for agriculture, industrial, commercial, and economic development.
3. To provide people who can apply scientific knowledge to the improvement and solution of environmental problems for the convenience of man.
4. To give an introduction to professional studies in engineering and other technologies.
5. To give training and impart the necessary skills leading to the production of craftsmen, technicians, and other skilled personnel who will be enterprising and self-reliant, and to enable young men and women to have an intelligent understanding of the increasing complexity of technology.

Impact of AI in Transforming Learning Experiences in Industrial Technology Education

Artificial Intelligence (AI) has become a transformative force in education, drastically altering educational experiences at all levels. Its power stems from its capacity to increase teaching effectiveness, tailor instruction, and offer data-driven insights that lead to better learning outcomes. Since 2020, the quick development of AI technologies-like machine learning, natural language processing, and intelligent tutoring systems has sped up the incorporation of digital resources into classrooms, increasing accessibility, adaptability, and interactivity.

Personalized learning is one of AI's most significant contributions to education. In order to customized educational content, AI-powered systems may assess students' learning styles, strengths, and shortcomings. This customized method enhances comprehension and retention by allowing students to learn at their own speed. According to Zawacki-Richter (2020), AI applications such as adaptive learning platforms and intelligent tutoring systems have demonstrated significant improvements in student engagement and academic performance. Because these technologies offer instant feedback, students can make corrections and improve their comprehension in real time.

By improving instructional design and automating repetitive chores, AI also improves the efficacy of instruction. Teachers can use AI tools to monitor student progress, grade assignments, and produce insights that guide instruction. This lessens the administrative load and frees up teachers to concentrate more on mentoring and critical thinking exercises. Holmes (2021) notes that AI-driven analytics enable educators to identify learning gaps early and implement targeted interventions, thereby improving overall classroom outcomes.

Furthermore, Artificial Intelligence (AI) has quickly changed educational settings and has both positive and negative effects on students' academic achievement. Students' access to information, engagement with the material, and demonstration of comprehension have all changed as a result of its incorporation into teaching and learning processes.

Personalized learning is one of the major benefits of AI for academic achievement. Adaptive learning platforms and other AI-powered systems assess students' learning speed, strengths, and shortcomings in order to provide customized content. This customized method improves understanding and memory, which results in better academic performance. According to Zawacki-Richter (2020), AI applications in education support differentiated instruction by providing real-time feedback and customized learning pathways, which significantly boost learner achievement.

Additionally, AI makes educational resources more accessible. Outside of typical classroom settings, learners can receive quick feedback and support through tools like virtual assistants, automatic grading, and intelligent tutoring systems. Holmes (2021) notes that AI-driven tutoring systems can simulate one-on-one instruction, helping students grasp complex concepts more effectively. Additionally, by assisting students with impairments through text-to-speech, speech recognition, and other assistive technologies, AI promotes inclusive education and enhances their academic performance and participation.

AI also promotes engagement and active learning. Interactive tools like chatbots, simulations, and gamified learning environments make learning more interesting and dynamic. These tools encourage active student participation, which is strongly associated with improved academic achievement. A study by Chen (2022) found that students using AI-based learning platforms demonstrated higher levels of engagement and improved test scores compared to those in traditional learning environments.

Roles of AI in Education (Industrial Technology Education)
Artificial Intelligence (AI) has significantly transformed the education sector by improving teaching methods, enhancing student learning experiences, and increasing efficiency in educational systems.

1. Personalized Learning
Personalized learning is one of AI's most significant contributions to education. AI systems examine how students learn in order to customize instructional materials to meet each student's needs. Instead than adhering to a set curriculum, this enables pupils to learn at their own pace. Algorithms are sued by adaptive learning platforms to suggest exercises, classes, and other materials based on a learner's skill level. Students benefit from a more successful educational experience as a result. According to Ahmad. (2021), personalized learning improves academic performance and satisfaction by enabling advanced learners to grow more quickly while helping failing students catch up.

2. Intelligent Tutoring Systems
Through intelligent tutoring systems (ITS), which offer students real-time direction and assistance, artificial intelligence (AI) plays a critical role. Outside of the classroom, these technologies serve as virtual tutors, providing clarifications, answers, and feedback. AI-driven chatbots and tutoring programs guarantee that students can get assistance at any time and from any location, decreasing reliance on instructors (Xu & Ouyang, 2021). In large classrooms where individual attention is scarce, this is advantageous. Additionally, intelligent tutoring systems monitor student progress and modify training to promote independent learning and improved conceptual understanding.

3. Automation of Administrative Tasks
By automating time=consuming and repetitive administrative chores like scheduling, attendance tracking, and grading, artificial intelligence (AI) benefits instructors. Natural language processing is used automated grading systems to assess written and multiple-choice answers, saving teachers a significant

amount of time. This frees up teachers to concentrate less on regular paperwork and more on teaching, mentoring and student participation. AI is also capable of effective managing student records and producing performance reports. AI increases productivity and facilitates improved decision-making in educational institutions by lowering workload (Zawacki-Richter., 2019).

4. Enhanced Student Engagement and Interaction

AI makes learning environments more immersive and engaging, which increases student engagement. Learning is made more engaging and dynamic by technologies like AI-driven simulations, gamified learning platforms, and virtual assistants. As explained by Sambo, Sunday & Ekpo (2021). Learning within a problem based learning curriculum hinges around examples of the ill structure problems that typically occur in real life situation. As noted by AI- Rzoky & Abdulredha (2025), instant feedback from AI systems helps students stay motivated and engaged in their study. Additionally, AI enhances teacher-student contact by providing prompt answers to questions and tailored suggestions, which keeps students engaged in the educational process.

5. Instant Feedback

Students may make corrections and reinforce learning in real time since they get immediate feedback on their performance.

6. Data Driven Insights

By producing useful data and analytics on student performance AI helps teachers understand how well their lessons are working, how well their students are progressing and where they can make improvements.

7. Improved Inclusivity and Accessibility

Using AI in education has many advantages including increased accessibility and inclusion. AI has the ability to close the gap and provide students with special needs or impairments equal opportunity.

Negative Impact of AI in Teaching and Learning

There are drawbacks to using AI in the classroom that could have a detrimental impact on students' academic achievement.

1. Over-reliance on AI tools is one of the main issues. Students' critical thinking and problem- solving abilities may be diminished if they rely too much on AI for solutions. According to Kasneci (2023), excessive reliance on AI tools like automated writing assistants can hinder the development of independent learning skills and academic integrity.
2. The digital divide. Academic achievement varies because not all students have equal access to AI technologies. Furthermore, the physical and academic environment in which a student learns plays a decisive role; school environmental factors have a documented influence on students' academic interest and their achievement in core science subjects (Sambo & Sunday, 2024). When compared to their peers who have access to cutting-edge AI tools, students in under-resourced environments may be at a disadvantage.
3. Data privacy and ethical use of AI in education can also impact students' trust and engagement with these technologies (UNESCO, 2021), leading to hesitance in utilizing AI tools that could enhance their learning experience.
4. Academic Theft: One of the problem of using AI is it promote academic theft. Lecturers and students can download other people work to be their original work. This implies that the use of AI promotes plagiarism as the ideas generated from AI specifically chat GPT does not acknowledge where the idea emanate from.
5. The use of AI facilitates docility. This implies that the incessant reliance on AI to tech can make lecturer to be lazy in preparing his/her lecture note as well as discouraging him/her from consulting textbooks.

6. The use of AI retards the proper development of the Lecturer. When the lecturer relies too much on AI without consulting other relevant materials on the course, he/she is likely going to stagnate his/her cognitive development and this trend is unhealthy for a scholar (Ogugua, Kanu & Ogugua 2025).

Conclusion

In conclusion, the integration of Artificial Intelligence into the Nigerian education system (Industrial Technology Education) holds significant promise for transforming learning experiences by enhancing personalization, improving access, and supporting data-driven teaching practices. The significance of AI for effective teaching of Industrial Technology Education courses consists in facilitating enhanced collaboration and interaction leading to robust exchange of ideas/knowledge. AI also has remarkable importance in entrenching a constructive and feedback mechanism necessary for evaluating students' understanding. This feedback mechanism can help in identifying areas of students' weakness and how to improve on it vis-à-vis promoting a serene ambiance for increased learning outcomes. While AI offers innovative solutions to long-standing educational challenges such as limited resources and unequal opportunities, its successful implementation depends on addressing critical issues including infrastructure deficits, digital literacy, and ethical considerations. As Nigeria continues to embracetechnological advancement, a balanced and strategic approach to AI adoption will be essential to ensure that its benefits are maximized while minimizing potential risks, ultimately fostering a more inclusive, efficient, and future-ready educational system.

Suggestions

1. The Nigerian government should invest significantly in digital infrastructure, including stable electricity and internet connectivity, to create an enabling environment for effective AI integration in schools, particularly in rural and underserved areas.
2. Educational policymakers should develop clear national frameworks and guidelines for the ethical use of AI in education, addressing concerns such as data privacy, security, and algorithmic bias.
3. Schools and institutions especially industrial Technology Education should prioritize continuous training and capacity-building programs for teachers to enhance their digital literacy and ability to effectively utilize AI-powered tools in teaching and learning processes.
4. Lecturers must ensure that academic dishonesty is discouraged when using AI in teachingIndustrial Education courses.

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