

INFLUENCE OF ARTIFICIAL INTELLIGENCE (AI) DRIVEN MECHANISM ON BASIC EDUCATION IN NIGERIA

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Abstract

Artificial Intelligence (AI) is increasingly being integrated into education, with significant potential to transform basic education in Nigeria. This research unveiled the potential of AI-driven tools such as personalized learning platforms, intelligent tutoring systems and data analytics enhance learning outcomes and teaching methodologies. These technologies create adaptive learning experiences tailored to individual children's needs, enabling effective tracking of progress, identifying learning gaps, and providing targeted interventions. AI also offers access to high-quality content, even in remote and underserved areas, promoting educational equity. Also, AI supports teachers by automating administrative tasks, facilitating professional development, and offering real-time feedback on teaching practices. This allows educators to focus more on instruction and student engagement. However, challenges such as infrastructure limitations, digital literacy gaps among educators and students, and concerns about data privacy and security remain significant obstacles. The research emphasizes that collaboration among government, educational institutions, technology providers, and other stakeholders is crucial to overcoming these challenges and maximizing AI's potential in Nigerian basic education.

Keyword: Influence, Artificial Intelligence, Driven Mechanism, Basic Education

Introduction

Artificial Intelligence (AI) has become a transformative force across various sectors, including education. In Nigeria, the potential of AI to revolutionize basic education is immense. Thus, where the education system faces significant challenges such as inadequate infrastructure, a shortage of qualified teachers, and limited access to quality education, AI-driven mechanisms offer promising solutions (United Nations Educational, Scientific and Cultural Organization, 2020). Indeed, Artificial intelligence (AI) is an advanced technological framework involving the development of computer systems capable of performing tasks that typically require human intelligence (Aina, et.al, 2023). These tasks include problem-solving, learning, language understanding and visual perception.

AI has gained significant prominence in recent years, revolutionizing the way various industries operate. In the field of education, AI presents numerous opportunities to enhance the learning process. Intelligent systems can adapt to the unique needs of each learner, offer personalized learning experiences and provide instant feedback (Aina et al., 2023). Applications of AI in education include adaptive learning platforms, intelligent tutoring systems, and virtual simulations. By utilizing artificial intelligence, educators can create dynamic and interactive learning environments that cater to the diverse learning styles and abilities of students.

However, Basic education, which encompasses early childhood education through primary and lower

secondary education, is crucial for laying the foundation for lifelong learning and development. The Nigerian education system struggles with issues like overcrowded classrooms, insufficient learning materials and disparities in educational access between urban and rural areas. AI technologies can address these challenges by providing personalized learning paths, automating administrative tasks and enabling remote and hybrid learning models Nigerian (Federal Ministry of Education, 2022).

One of the most significant advantages of AI in education is its ability to offer personalized learning experiences. AI-driven platforms can analyze individual student data to tailor instructional content, pace and methods to each student's unique needs. This personalization helps in identifying learning gaps early and providing targeted interventions, which is particularly beneficial in a diverse and populous country like Nigeria (World Bank, 2021). Also, AI-powered tools such as Intelligent Tutoring Systems (ITS) and automated grading systems can reduce the workload on teachers, allowing them to focus more on interactive and creative aspects of teaching. ITS can provide instant feedback and additional practice opportunities for students, fostering a more engaging and effective learning environment (Khanna, et.al, 2015).

Despite these potential benefits, the adoption of AI in Nigeria's basic education system is not without challenges. The digital divide, characterized by unequal access to technology and internet connectivity, poses a significant barrier to the widespread implementation of AI-driven educational tools. The cost of AI technology, lack of adequate training for teachers, and concerns about data privacy and security are critical issues that need to be addressed (Shobita, 2019). Therefore, this study aims to unveil the influence of AI-driven mechanisms on basic education in Nigeria

Artificial Intelligence (AI):

Artificial Intelligence (AI) is a branch of computer science that aims to create systems capable of performing tasks that normally require human intelligence. These tasks include reasoning, learning, problem-solving, perception and language understanding (Russell & Norvig, 2020). Artificial Intelligence (AI) in education involves using advanced technology, such as machine learning algorithms and computational models, to improve the learning process, enhance educational outcomes, and tailor instruction to each student's unique needs (Schueller, et.al 2017).

AI applications can include intelligent tutoring systems, adaptive learning platforms, and virtual simulations. These technologies aim to analyze students' learning patterns, provide personalized feedback, and create dynamic educational experiences (Smith, 2018). AI in education utilizes various techniques like natural language processing, computer vision, and data analytics to create a flexible and adaptive learning environment. It goes beyond traditional teaching methods by utilising computing power to adapt to individual students' strengths and weaknesses, promoting a more personalized and effective educational experience (Okeke, 2017).

Concept of Basic Education

Basic education refers to the minimum level of education that all individuals should receive to ensure literacy, numeracy, and basic life skills. It typically includes primary and lower secondary education, ensuring that individuals develop the foundational skills necessary for personal and social development (United Nations Educational, Scientific and Cultural Organization (UNESCO, 2023). In the Nigerian context, basic education is defined as the 9-year compulsory education, which consists of 6 years of primary education and 3 years of junior secondary education. This level of education is aimed at providing fundamental skills in literacy, numeracy, and life skills that are essential for citizenship and further education (Federal Republic of Nigeria, 2013).

Basic education ensures that individuals acquire essential knowledge and skills, such as reading, writing, and arithmetic, which serve as the foundation for lifelong learning and personal development. The aim is to equip learners with the tools to become active participants in society (World Bank, 2020).

Universal Basic Education emphasizes free, compulsory education for children of school-going age, focusing on eliminating illiteracy, ignorance, and poverty. The UBE program was introduced in Nigeria to ensure every child completes basic education without financial constraints (World Bank, 2020). Basic education goes beyond academic knowledge to include the development of social and emotional skills. It promotes holistic development by integrating cognitive, emotional, and physical learning, preparing individuals to face future societal challenges (Delors, 2016).

Types of AI:

Narrow AI (Weak AI): Designed for a specific task, such as speech recognition or playing chess. These systems operate under a limited pre-defined range of functions. It excels in executing singular tasks with high efficiency and accuracy but lacks the ability to perform beyond its programmed capabilities or transfer knowledge from one domain to another. The examples of Narrow AI are; speech recognition, playing chess and image recognition. Speech Recognition is a systems like Apple's Siri, Amazon's Alexa, and Google Assistant utilize Narrow AI to understand and process human speech. These systems can recognize voice commands, interpret them and perform tasks such as setting reminders, playing music, or providing weather updates. They rely on vast datasets of spoken language and sophisticated algorithms to discern context and improve accuracy over time (Jurafsky & Martin, 2019).

Also, playing chess is AI systems like Deep Blue, which famously defeated world chess champion Garry Kasparov in 1997, exemplify Narrow AI. Deep Blue was specifically programmed to play chess by evaluating millions of possible moves and outcomes using advanced algorithms and vast computational power. Despite its proficiency in chess, it had no capability to perform tasks outside this domain (Campbell, et.al, 2012). Lastly, Image Recognition is a narrow AI powers image recognition technologies used in applications such as facial recognition, medical image analysis, and automated tagging of photos on social media. These systems are trained on large datasets of labeled images to identify and categorize objects, people, or patterns within new images with high precision (Goodfellow et.al. 2016).

General AI (Strong AI): General AI, also known as Strong AI, refers to a hypothetical form of artificial intelligence that possesses the ability to understand, learn, and apply knowledge across a wide range of tasks in a manner similar to human intelligence. Unlike Narrow AI, which is limited to specific tasks, General AI would exhibit the flexibility and adaptability of human cognition, enabling it to perform any intellectual task that a human can do (Bostrom, 2014). General AI is classify as; versatility, learning and adaptation and understanding and reasoning.

Versatility: General AI would be capable of performing a vast array of tasks, from playing chess to composing music, diagnosing diseases, and engaging in meaningful conversation. It would not be confined to predefined functions and could seamlessly switch between different activities.

Learning and Adaptation: A key feature of General AI is its ability to learn from experience and adapt to new situations. It would employ advanced learning algorithms to acquire knowledge, recognize patterns, and make decisions based on incomplete or ambiguous information, much like humans do.

Understanding and Reasoning: General AI would possess a deep understanding of the world, allowing it to reason, infer, and apply knowledge in a coherent and contextually appropriate manner. It would be able to comprehend abstract concepts and engage in higher-order thinking.

Super intelligent AI: refers to a hypothetical form of artificial intelligence that surpasses human intelligence across all cognitive abilities and domains. Unlike Narrow AI, which is specialized, or General AI, which mimics human-like versatility, Super intelligent AI would far exceed human capabilities in terms of reasoning, learning, problem-solving, creativity, and other intellectual tasks (Russell, 2019). Super intelligent AI has the following features:

Cognitive Superiority: Super intelligent AI would possess cognitive abilities that surpass those of the

most intelligent humans. It would excel in understanding complex problems, synthesizing information from disparate sources, and generating innovative solutions (Yudkowsky, 2008).

Rapid Learning and Adaptation: Unlike humans, who learn over years through experience and education, Superintelligent AI could rapidly acquire and integrate vast amounts of information, continuously updating its knowledge base and skills.

Creative and Abstract Thinking: It would exhibit creativity and the ability to generate novel ideas, insights, and solutions to challenges that may be beyond human comprehension or imagination.

Unlimited Scope: Super-intelligent AI would not be limited to specific domains or tasks but could potentially apply its intelligence across a wide range of disciplines, from scientific research and engineering to philosophy and art.

Influence of AI in Basic Education

Artificial Intelligence (AI) offers numerous benefits in the field of basic education, enhancing both teaching and learning experiences. Therefore, the following are some of the benefits:

Personalized Learning: AI can tailor educational content to meet the individual needs of students. Adaptive learning platforms use AI to analyze a student's strengths and weaknesses, providing customized lessons and resources. This approach helps ensure that each student can learn at their own pace and receive targeted support where needed (Baker & Inventado, 2014).

Enhanced Engagement: AI-powered tools, such as interactive tutoring systems and gamified learning platforms, can make learning more engaging and enjoyable. These tools often include multimedia elements, interactive exercises, and instant feedback, which can motivate students and improve retention (Kulik & Fletcher, 2016).

Efficient Administrative Tasks: AI can automate routine administrative tasks such as grading, scheduling, and attendance tracking. This reduces the workload for teachers, allowing them to focus more on instructional activities and student interaction (Luckin et al., 2016).

Access to Quality Education: AI can help bridge educational gaps by providing access to high-quality educational resources in remote or underserved areas. Online AI-driven platforms can offer a wide range of subjects and courses, often for free or at a low cost (West, 2012).

Data-Driven Insights: AI systems can analyze large amounts of educational data to identify trends, patterns, and areas for improvement. Educators can use these insights to enhance curriculum design, identify at-risk students, and implement effective interventions (Siemens, 2013).

Support for Special Needs: AI can provide tailored support for students with special needs. For instance, speech recognition software can help students with speech impairments, and AI-driven text-to-speech and speech-to-text tools can assist those with reading or writing difficulties (Blake, 2018).

Challenges and Limitations of AI Driven Mechanism

Artificial Intelligence (AI) has the potential to revolutionize basic education in Nigeria, but several challenges and limitations must be addressed to fully realize its benefits. The following are the challenges and limitations to support the discussion:

Infrastructure Deficiency: Many schools in Nigeria, especially in rural areas, lack the necessary infrastructure such as electricity, internet connectivity, and computer hardware required for AI-driven education

Teacher Training and Capacity Building: There is a significant shortage of teachers who are trained in using AI tools and integrating them into their teaching methodologies (Afolabi, 2019)

High Costs: Implementing AI-driven mechanisms in education requires significant financial investment, which many schools and governments may not be able to afford (Eze, 2020).

Data Privacy and Security: The use of AI in education involves the collection and analysis of large amounts of student data, raising concerns about data privacy and security (Nwankwo, 2021).

Curriculum Relevance: The existing curriculum may not be adequately designed to incorporate AI-driven learning tools and methodologies (Adamu, 2022).

Digital Divide: There is a significant digital divide between urban and rural areas, with students in rural areas having limited access to digital resources and technologies (Ikechukwu, 2019).

Resistance to Change: There is often resistance to adopting new technologies among educators and administrators who are accustomed to traditional teaching methods (Olaniyi, 2020).

Conclusion

The integration of AI-driven mechanisms in basic education in Nigeria holds great promise for enhancing learning outcomes, increasing access to quality education, and improving administrative efficiency. However, addressing the challenges of infrastructure, funding, teacher training, and data privacy is crucial for the successful implementation of AI in the Nigerian educational system. By investing in these areas and fostering collaboration, Nigeria can harness the full potential of AI to transform its education sector and prepare students for the future.

Recommendations

The following recommendations were proffered:

The government and private sector should invest in improving infrastructure to support AI implementation in schools. Ensuring reliable internet access and electricity is crucial for the success of AI-driven education.

Comprehensive training programs should be developed by school administrators to equip teachers with the skills needed to use AI tools effectively. Continuous professional development will help teachers stay updated with the latest advancements in educational technology.

Collaboration between the government, educational institutions, and tech companies can facilitate the integration of AI in education. Public-private partnerships can provide the necessary resources and expertise for successful implementation.

Efforts should be made to ensure that AI-driven education benefits all students, regardless of their socio-economic background. Special attention should be given to bridging the digital divide and providing equal access to technology.

Clear guidelines and policies should be established to protect student data and ensure ethical use of AI in education. Transparency and accountability in data management are essential to maintain trust and compliance with regulations.

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