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Artificial Intelligence in Nigerian Basic Education: A Philosophical and Historical Assessment of Opportunities and Challenges

[1]Dr. Bitrus Audu Sule; [2]Dr. Moga Ezekiel; & [3]Talatu Emmanuel Maimolo

[1]Department of Educational Foundations, Faculty of Education, Nasarawa State University, Keffi. [2]Department of Arts Education, Faculty of Education, Nasarawa State University, Keffi. [3]Department of History, College of Education, Zing, Taraba State
Corresponding Author: suleaudu15@gmail.com
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Abstract

The thrust of the study is on critical examination of the integration of Artificial Intelligence (AI) in Nigerian Basic Education through philosophical and historical lens. The study employed analytical research design, using literature review approach to explore the role of AI in enhancing the quality and accessibility of basic education in Nigeria, with a focus on addressing practical challenges such as inadequate infrastructure, acute shortage of teachers, under funding of basic education programmes and activities in schools, inadequate administrative practice and disparities in educational opportunities. The study notes that AI performs a transformative role in curriculum development, personalized learning and administrative efficiency which are vital for improving educational outcomes in all Nigerian basic schools. By integrating AI-driven tools like intelligent tutoring systems, data analytics for basic learners' performance, tracking and adaptive learning platform, Nigeria's education system can better cater to the diverse needs of learners, teachers and the entire administrative process. The study concludes that by addressing the aforementioned challenges, Nigeria as a nation can enhance quality of basic education, improve student outcomes, and prepare the next generation for success in an increasingly technology –driven world of the 21st Century and beyond.

Keywords: Artificial Intelligence, Basic Education, Nigeria, Philosophical and Historical approach

Introduction

Artificial intelligence (AI) has revolutionized various sectors of human endeavoursworldwide, with the Nigerian education inclusive. Artificial intelligence refers to the simulation of human intelligence in machines that are programmed to think and learn like human beings. It also means, the development of computer systems that perform tasks that typically require human intelligence such as learning, problem-solving, reasoning and perception.

The integration of AI in education especially in Nigerian education has the potential impact on transforming the teaching and learning experience, making it more personalized, efficient and effective. In the context of Nigerian basic education system, artificial intelligence performs a crucial role in promoting quality and sound education.

Nigerian basic education system comprises primary and junior secondary education, that are constrained by numerous challenges,including inadequate infrastructure, shortage of teachers, lack of access to quality educational resources and underfunding of the entire academic programme and activities. These challenges have resulted to poor learning outcome, increase high drop-out rate and a significant gap in the quality of education between urban and rural areas nationwide.

The entire paper is segmented as follows: Introduction, conceptual framework, philosophical thought of Artificial Intelligence, Historical timeline of Artificial Intelligence, benefits of Artificial Intelligence, challenges of Artificial Intelligence, conclusion, and way forward.

Artificial intelligence

Artificial intelligence (AI)conveys two different wordsartificial and intelligence. These words are defined by scholars differently depending on how they approach them. For instance, the question, what is the meaning of intelligence alone is a serious task for philosophers and psychologists who have developed various theories that have explained the nature of human knowledge.For us to explain the implicationsof artificial intelligence in education, it becomes obvious for us to define the two words separately before joining them together as 'artificial intelligence'.

Intelligence. Intelligence as a concept in educationis controversial in meaning and nature. The concept means quite a number of things to different people. Some people equate it to intelligence of a child. Others see it as a situation where a child is clever, brilliant, expert or gifted. But the point of discussion here is different from the common meaning of the word.It is based on these arguments that Goodfellow (2016), opined that the word intelligence is a general ability which involves mainly the induction of relations and correlations. This implies that the word intelligence is made of two components, the general intelligence and a correlate of specific cognitive intellectual skills.Lowhead cited Jean Piaget (2002), defined intelligence as a general term that indicates the superior forms of organization or equilibrium of cognitive structuring used for adaptation to the physical and social environment.

Based on the above definitions, the word intelligence means the capacity to learn, comprehend, think or reasoning. It also involves the capacity to apply reasoning on how to solve some particular issues. Intelligence as a concept is not fixed entity, but it involves a range of cognitive functions in order to fix the present with new way of doing things.

Artificial. The word artificial mean human efforts to transform the natural environment to sort the present way of life. The term can also be described as man-made materials or unnatural way of doing things using some current inventory such as computer machine in solving vast issues particularly educational programmes and activities in schools.

From etymological perspective, the term artificial is a derivation of Latin word, 'artificia' which connotes skill or craft. Aside the above, when referring to the context of technology, it can be described as technological-based machines that are made by human brain to help in solving human issues within a shorter period.

Artificial intelligence (AI) is sometime called machine intelligence because of its performance in almost human development. In the educational context, it demonstrates clearly how AI technology addresses the traditional method which is full of rote learning. The new machine can perform tasks similar to that of human intelligent within a short period of time. Artificial intelligence as a new driven force in educational practice is an area of computer science with the help of digital electronics that lay more emphasis on creation of intelligent that works and response to issues quickly. It is based on this that(Cool-ham& McCarthy 2007), categorizes artificial intelligence as follows:

1. Analytical intelligence that dealswiththe analysis of issues and events, problem-solving skills, evaluation, critical thinking and logical reasoning.
2. Practical intelligence; this encompasses the capacity to function in a variety of setting, handle responsibilities and comprehend social circumstances.
3. Creative intelligence which suggests the ability to think creatively and to come up with original ideas of solving human problems in a multi-dimensional range.
4. Emotional intelligence; this encompasses the capacity to identify, comprehend, and regulate one's own emotion as well as those of others.

Rossi & Pati 2023, argues that AI is the imitation of human intellect in machine with cognitive, adaptive and learning capacities comparable to that of human brain.This system can perform tasks that often require human intellect such as speech, recognition, visual perception, decision making and language translation(Kingsley 2020).

AI has continuously evolved into influencing various stages of transformative processes of different institutions and different field of study. The academic community has also aligned with the novel advantage of AI as it becomes obvious that AI machine serves as a driven force in modern educational practice.

Philosophical thought of Artificial Intelligence

The current application of AI in education had it root from Golden Age philosophers namely, Socrates, Plato and Aristotle. The foundations of artificial intelligence were laid by these

scholars through their principles and methods of teaching and learning in the school system.For instance, Socrates used questions and answers to challenge assumptions and expose contradiction to new knowledge and wisdom which significantly impact on the current educational practice. Socrates further says, questioning can be an undeniable powerful teaching approach and this has direct link with the use of AI on educational matters. In the light of this, when teachers ask higher order questions and give students opportunities to develop deep understanding, learning is enhanced. Higher order questions often start with questions stems such as why, what caused, what if, how does it compare or what is the evidence of claims. When teachers ask higher order questions and encourage explanations, they are helping their students to develop critical thinking and problem-solving skills. By modeling good questioning skills in modern education, it encourages students to ask themselves some questions that demand the use of technologies.

In Socratic dialogues as seen in Plato dialogues, the primary focus is on the original thinking of the respondent as they try to answer Socrates questions. Students experience their own original thinking in the context of examining their own ideas within themselves.

The essence of every educational system in Nigeria includes the cultivation of enthusiastic intellectually motivated, effective, rational, and attentive human person(Pati & Nicole 2023). In the quest to move the nation education forward and in the bid to proffer solutions to educational and societal problems in Nigeria which education is a necessary tool, Socratic pedagogies are highly regarded as tools for development of critical thinking and problem-solving skills. Therefore, this method is an effective way to help the Nigerian educational system achieve her goals.

In view of the above, systematic engagement in ideas is a vital component of truth-seeking enterprise that is overlooked in contemporary educational practice. By incorporating Socratic pedagogies in the classroom and broadly in the Nigerian educational system, the teacher's contribution will extend beyond just teaching students but to help them develop the ability to solve life problems within themselves. The Golden Age Philosophical ideas has laid the foundations of the use of digital technologies in education system globally.

Historical timeline of Artificial Intelligence

The history of Artificial Intelligence (AI) began in antiquity with myths, stories, and rumors of artificial being endowed with intelligence or consciousness by master craftsmen (Turing, 1956). The earliest substantial work in the field of AI was done in the mid-twentieth century by the British Logician, and computer pioneer Alan Mathison Turing (McCarthy, 2007). In 1935, Turing described an abstract computing machine that consisted of a limitless memory and a scanner that moves back forth through the memory, symbol by symbol, reading what it finds and writing further symbols (Kaplan &Haeniein, 2019).

The actions of the scanner were dictated by a programme of instructions that also stored in the memory in the form of symbols. To validate his invention, Turing delivered a public lecture in London, in 1947 where he mentioned computer intelligence saying "what we want

is a machine that can learn from experience", and that the "possibility of letting the machine alter its own instructions provides the mechanism for this"(Turing, 1950).

The field of AI was officially named and established during 1956 summer programme at Dart Mouth College. During this time, attendees of the workshop focused on creating rule-based systems and developed early AI programming languages like LISP. Many of the attendees also predicted that machines as intelligent as humans would exist within a generation. In line with this prediction, the United States government provided millions of dollars with the hope of making this vision come true (Kaplan &Haenlein, 2019).

In 1974, criticism from James Lightthill and pressure from the United States of America Congress led the United States and British governments to stop funding undirected research into Artificial Intelligence. Seven years later, a visionary initiative under the auspices of Japanese government and the success of expert systems reinvigorated investment in AI, and by the late 1980s, the industry had grown into a billion-dollar enterprise (Kaplan &Haenlein, 2019). However, investors' enthusiasm waned in the 1990s following a critical report by professor James Lighthill that led to a reduced funding and interest, a period known as the first "AI Winter"(Buchanan, 2005).

In the early 2000s, machine learning was applied to a wide range of problems in academia and Industry. This significant success was due to the availability of powerful computer hardware, the connection of immense data sets, and the application of solid mathematical methods (Buchanan, 2005). Soon after, deep learning proved to be a breakthrough technology, eclipsing all other methods.

Investment in AI boomed in the 2020s. The recent AI boom initiated by the development of transformer architecture led to the rapid scaling and public releases of large language models (LLMs) layChatGPT. These models exhibit human-lie traits of knowledge, attention, and creativity, and have since been integrated into various sectors, fueling exponential investment in AI. Today, AI is central to discussions about technology with unspeakable growth driven by deep learning, which powers applications like image and speech recognition and natural language processing.

Benefits of Artificial Intelligence in Basic Education in Nigeria

Artificial Intelligence (AI) holds significant promise for enhancing basic education in Nigeria by addressing both systemic challenges and pedagogical gaps. One of such benefits is personalized learning and differentiated instruction. Intelligent tutoring systems (ITS) help adapt content to the needs, pace, and style of individual learners, thereby accommodating the diversity that characterize many classrooms teaching and learning process. Luckin R. Holme W G & M Forcer (2016). In crowded classrooms where a teacher may struggle to attend to each student's learning level, AI can provide tailored learning paths, remedial tasks, and scaffold feedback, which can significantly enhance comprehension and retention.

Another benefit is on improved access and equity as AI-empowered platforms can extend the reach of quality education into underserved or remote regions of Nigeria. By leveraging e-

learning tools, virtual classrooms, and AI catboats, students in rural areas with limited access to qualified teachers can benefit from interactive instructions and continuous support (The Cable, 2024). Moreover, predictive analytics can help identify students at risk of dropping out or struggling, enabling early intervention (ALHUB, 2025).

The promotion of efficiency in assessment and administrative tasks is another laudable benefit of AI. AI can automate many administrative processes that traditionally burden teachers, such as grading, attendance tracking, and scheduling(Cleopas, 2023). Automated assessment systems not only reduce teachers' workload but can also provide immediate, data-rich feedback to students. This efficiency frees educators to devote more time to pedagogical engagement and mentoring, aligning with a philosophical ideal of the teacher as a facilitator rather than mere evaluator.

Teacher professional development and skill enhancement speaks volume of the benefit of AI in Basic Education. Arguably, when teachers develop competence in AI, they are better equipped to integrate AI tools in pedagogy, design adaptive lesson plans, and guide students ethically (Ewa, 2024). Empirical studies in Nigeria show that teachers' understanding of AI and their use of AI devices significantly predict enhancements in their instructional skills (Ewa,2024). From philosophical perspective, this aligns with the notion of continuous professional growth and the Socratic ideal of lifelong learning.

AI promotes engagement and cultural thinking. Throughintelligent tutoring systems, virtual assistants, and interactive simulations, AI fosters more engaging learning environments. These tools encourage students to ask questions, explore concepts at deeper levels, and engage in problem-based learning. This not only makes learning more enjoyable but also cultivates critical thinking and metacognitive skills, resonating with classical philosophical ideals of inquiry and reflection (Asogwa&Isiwu, 2022).

Promotion of STEM skills and Economic Transformation is another benefit derivable from AI. Particularly in science education, AI has shown to support the development of 21st Century skills such as problem-solving, computational thinking, and digital literacy (Imoniri, 2025). By integrating AI into science education at the basic level, Nigeria can lay a stronger foundation for a workforce that is ready for technological and economic transformation. This is philosophically significant as well, as it aligns with the Aristotelian concept of phronesis (practical wisdom): educating students not just in theory, but in skills that serve their personal flourishing and the common good.

Other than the aforementioned, data-driven decision making is another benefit derivable from AI. AI systems can analyze large volumes of student data (e.g., performance metrics, and engagement logs) to provide actionable insights for teachers, administrators, and policymakers (Asogwa&Isiwu,2022). These insights can inform curriculum design, resource allocation, and interventions, aligning with a pragmatic philosophical approach that values informed action and continuous improvement.

In another dimension, integration of AI in basic education ensures efficiency and institutional effectiveness. At a systemic level, AI can support efficient school management through

predictive analytics, optimized scheduling, and resource management (Cleopasi, 2023). By automating repetitive tasks and providing real-time data, AI supports more rational and effective institutional decision-making which from a philosophical stand-point, echoes utilitarian ideals- maximizing benefits for students and educators alike.

Challenges of AI inBasic Education in Nigeria

The integration of Artificial Intelligence in Basic Education in Nigeria is constrained by several challenges as follows:

1. Infrastructural challenge. The integration of AI in education requires significant investments in digital infrastructure, including reliable electricity, internet connectivity and modern devices. Many Nigerian basic schools lack the basic infrastructural resources to support the A I- powered education (UNESCO report 2020)
2. Digital literacy. This problem affects both teachers and learners. Digital literacy is a prerequisite for effectively utilizing AI tools in teaching and learning. Comprehensive training programmes and capacity-building initiatives are essential for bridging the digital skills gap.
3. Equity concerns. There is the risk that the adoption of AI could exacerbate existing inequalities in education. For instance, wealthier schools and urban centers may have access to AI technologies leaving learners in rural and low-income communities far behind, potentially widening the gap between the two. (UNESCO 2000)
4. Cultural adaptation. AI application in education may not align with the cultural and socio-economic realities of Nigeria (AFSA 2022). Tailoring AI system to reflect local contexts and values is necessary for their acceptance and effectiveness.
5. Nigerian government lacks a comprehensive policy framework that guides the adoption and integration of AI in Basic Education system, making it tasking to ensure consistency and quality.
6. High cost of implementation and shortage of instructional materials. Implementation of AI requires significant investment in software, hardware and maintenance. Many basic schools centers in Nigeria operate with limited budgets and may find it challenging to afford these technologies (Alagbe J, Awodele&Ayorinde J 2021).
7. Absence of capacity training programme. Most Nigerian teachers are not information technology literate (UNESCO 2000). AI is an emerging field of learning that requires training and retraining to effectively integrate AI- powered tools into their teaching practices.

Conclusion

The study revealed that the integration of Artificial Intelligence (AI) in Nigerian Basic Education system has the potentials to revolutionize the way students learn and teachers teach. However, integrating AI into the Basic Education system is most time constrained by the challenges of infrastructure, digital literacy, equity concerns, cultural adaptation, and

limited government support, and policy framework. By addressing these aforementioned challenges, Nigeria as a Nation can enhance the quality of Basic education, improve student outcomes, and prepare the next generation for success in an increasinglytechnology-driven world of the 21st Century and beyond.

The way forward

1. The Federal Government should develop context-based AI-powered educational tools for basic education regardless of their geographical location fostering the unique culture of Nigeria.
2. The Federal Government should organize and provide digital literacy and AI training for both primary and junior secondary school teachers and their respective administrative process.
3. The Federal Government should address all infrastructural problems, such as access to devices and internet connectivity for smooth implementation.
4. The Federal Government should promote and develop a cost effective for localized AI tools that can help in both urban and rural areas.
5. The Federal Government should develop a clear policy by providing financial implications for supporting AI in basic education with legal backup.

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