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Implications of Artificial Intelligence in Early Childhood Education in Nigeria

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Abstract

The integration of Artificial Intelligence (AI) into early childhood education has ushered in a paradigm shift towards a more technologically driven background carefully devised plan of action to achieve a goal. The pervasive influence of computer technology has catalyzed a surge in online learning within the school environment, yielding positive philosophical outcomes. Despite these advancements, a large number of primary schools in Nigeria have yet to leverage of AI technologies. Recognizing the expanding significance of AI in Early Childhood education for educational philosophy development in Nigeria, this study aligns with the demand of AI implementation in Early Childhood Education from developed countries. The style employed involves an examination of current advancements in AI applications within the Nigerian educational context. The examination demonstrated the utilization of AI software tools and technologies, adhering to predefined exclusion and inclusion criteria. The study revealed that Artificial Intelligence (AI) can sound intimidating or futuristic. However, AI is already being used in small but meaningful ways in classrooms worldwide. At its core, AI simply refers to computer systems designed to perform tasks we have historically thought of as requiring human intelligence and decision-making. prevalent use of AI technologies in Early Childhood Education in Nigeria, encompassing evolutionary software modelling, multimedia e-learning platforms and frameworks, and the incorporation of Moodle learning. This discernible trend indicates a growing demand for the application of AI technology in the early childhood education in Nigeria

However, the study also highlights a discrepancy wherein more sophisticated AI techniques, such as intelligent tutoring systems, learnable robots or agents, web based educational systems, and learning management systems explored extensively in other nations were infrequently applied in the Nigerian context. In light of these observations, teachers should explore AI with cautious optimism, embracing the potential benefits while maintaining a sense of responsibility and carefulness. Together, teachers can shape AI applications to truly serve children and view AI as an empowerment tool to enhance the capabilities of Subject Matter Experts, not a replacement. Conversations should continue about thoughtfully integrating this technology into the classroom while keeping human experts and educational philosophers firmly in the loop.

Introduction

In 1956, artificial intelligence (AI), sometimes called machine intelligence was defined as “the science and engineering of creating intelligent machines” (McCarthy, 2007). AI refers to the science and engineering of making intelligent machines that solve different kinds of problems via natural language processing, [neural network](#) and machine learning (Mondal, 2020). At its core, AI simply refers to computer systems designed to perform tasks we have historically thought of as requiring human intelligence and decision-making. The key is that it is a tool, one that teachers can control and direct to fit educational goals, but one that needs to be used properly and responsibly. Teachers wield the power to harness AI’s capabilities to align with educational objectives of childhood care, emphasizing the importance of thoughtful integration and conscientious oversight. This the writers are of the believed that as we navigate the evolving landscape of childhood care education, embracing AI as a tool partner in the teaching process opens doors to innovative approaches and enriched learning experiences for pupils.

It is transforming every walk of life such as medicine, psychology, science and public policy (Xu et al., 2021). In educational fields, AI can help teachers to predict students' learning status and performance, recommend learning resources, and automate assessments to improve students' [learning experience](#) via intelligent agent systems, chatbots, and recommendation systems (Liang et al., 2021; Mousavinasab et al., 2021; Su et al., 2022; Zawacki-Richter et al., 2019; Zheng et al., 2021). Young children are growing up with these AI applications, yet little attention is paid to the important of developing AI literacy and its related impacts among them. They use AI products such as chatbots and recommendation tools to facilitate their everyday lives and study. Children may not know how to use AI, and the basic working principles behind these tools and they may have misconceptions about the technologies. Moreover, the writers believe that AI may threaten children safety when it gives wrong and misleading information or suggestions.

Artificial Intelligence (AI) can sound intimidating or futuristic. However, it is already being used in small but meaningful ways in classrooms worldwide. Kose et al., 2015, observed that due to its growing significance, researchers have recently adopted AI technologies to offer personalised learning guidance and support for individual students in a variety of courses, including engineering, computer science, and informatics and many more. Artificial Intelligence (AI) is revolutionizing industries worldwide and is now fully integrated into education. In Nigeria, where the education sector faces numerous challenges, such as inadequate infrastructure, lack of qualified teachers, and inconsistent access to learning resources, AI has the potential to bridge significant gaps. By integrating AI into education, Nigeria can enhance teaching, improve learning outcomes, and provide students with personalized educational

experiences. However, successful integration requires careful planning, infrastructure investment, and policy support.

The vast potential of AI in early childhood education is undeniable. By drawing insights from the experiences of our peers in higher education, we recognize the unique context surrounding the integration of AI in early childhood education. While discussions in higher grades often revolve around mitigating the influence of AI on student-created work and writing abilities, early education presents a distinct opportunity. Here, AI can serve as a valuable ally to teachers, streamlining tasks and freeing up valuable time for them to prioritize what truly matters-nurturing relationships with their wards. By leveraging AI tools effectively, teachers can enhance efficiency, allowing for a more focused and enriching early education experience for teachers and wards. That is to say, Teachers can leverage AI in early childhood education to help adapt or personalize their lessons, jump start professional development, gather research, get ideas for activities, help save time on day-to-day tasks, and much more. Furthermore, AI is a type of artificial intelligence that can create new data or content, such as text, images, or even music, by learning patterns and generating output based on what it has been trained on. It essentially “creates” things based on its understanding of existing examples. You may have heard of **OpenAI’s ChatGPT** and **Google’s Gemini**. Based on an extensive library of previously created text (referred to as its “training data”), can make relationships between words to create new text in response to prompts—be it a grocery list based on a meal list, or a lesson plan based on a specific standard.

Using AI in early childhood education is like building a puzzle, one piece at a time, finding the next logical piece based on the patterns it has learned and can recognize. However, it does not have real-time information or a deep understanding of the world beyond its training, so it can sometimes produce incorrect, out-of-context, or just made-up responses. The paper is of opinion that understanding the limitations and risks of AI is essential in determining the role that this innovative software can play within a classroom setting. For example, the most popular and most accessible for beginners is ChatGPT, which is free to use for the base level- ChatGPT is a conversational AI model developed by OpenAI that is designed to engage in text-based conversations with users. ChatGPT is trained on vast text data from the internet, allowing it to generate human-like responses to a wide range of queries and prompts. It can be used for various purposes, including answering questions, providing information, offering recommendations, and even engaging in creative dialogue.

ECE is technologically upgraded

Digital technologies are increasingly being used for teaching and learning in the early years. Several review studies were conducted to ascertain the relationship between digital technology and ECE from the perspectives of technology-enhanced environment, learning achievement, and other aspects (Herodotou, 2018; Liu & Hwang, 2020; Mantilla & Edwards, 2019). Liu and Hwang (2020), for example, investigated the use of touch screen mobile devices in ECE. They revealed that the most common application of digital technology in ECE was the use of touch screen mobile devices to assist young children in developing their language skills. This finding is also confirmed by 2021 survey in Singapore showing that digital technology use would affect children’s reading abilities in their early years (Mah et al., 2021)⁸. Berson et al. (2021) argue that the integration of digital technologies into ECE also implies that children have varying opportunities to learn and explore digitally, which would lead to unequal educational outcomes. Therefore, it is necessary to promote all sorts of digital technologies in ECE to ensure

an early start of equity and social justice in the human society. However, AI technologies have not been emphasized in the previous reviews in terms of linking technology to ECE. Moreover, as stated by Yang (2021), most of the studies focusing on technology-enhanced ECE lack support from the curriculum theories and practices, leaving it less known whether technology integration in ECE is appropriate for young children.

In early childhood education, AI-powered toys are made to provide students with a playful experience to learn and interact with the robots and kits, and teach coding skills. With well-designed AI toys and services, young children could develop their AI literacy even at a kindergarten level. They experience AI-driven robotic toys and services (e.g., PopBots, Quickdraw) (Williams, 2018; Williams et al., 2019) to explore AI related concepts (e.g., knowledge-based systems, supervised machine learning, generative AI). Although young children may not know and understand the knowledge behind, they can explore and appreciate these AI technologies, and foster their digital literacy in their everyday lives.

Some may challenge whether kindergarteners and junior primary students are too young to explore and learn AI knowledge (Su et al., 2022). However, previous studies have brought AI tools into early childhood education (ECE) classrooms and shown their promising effects (e.g., Lin et al., 2020; Tseng et al., 2021; Williams et al., 2019). In fact, early AI literacy is important for young children to improve many aspects of child development, such as theory of mind skills, creative inquiry, emotional inquiry and collaborative inquiry (Kewalramani et al., 2021; Su & Yang, 2022). For example, Kewalramani et al. (2021)¹⁵ investigated the use of interactive AI to cultivate inquiry literacy in early childhood education settings. However, only a few research efforts had been done on how AI literacy for children aged 3–8 years in ECE level relative to other age groups (e.g., kindergarten, Nursery and primary 1–6) to support the potential of AI literacy education for ECE settings.

Implications of AI in Early childhood education in Nigeria

AI education has posed challenges and opportunities to early childhood education (or kindergarten education) in Nigeria, including why young learners should learn AI in their early years, the subset of key AI concepts that can be understood by children, and how children were engaged in a meaningful experience for them to acquire these concepts could help students create personalized learning outcomes (Yang, 2022). The question here is ‘how can AI help to educate children?’ The Integration of AI can provide students with individualized learning paths based on their abilities, learning styles, and progress. This is particularly important in Nigeria, where classrooms are often overcrowded, and teachers may struggle to cater to each student’s unique needs. AI-powered platforms, such as intelligent tutoring systems, can adapt content, provide real-time feedback, and suggest additional learning materials to enhance student comprehension. AI can enable the creation of advanced e-learning platforms that simulate classroom experiences. For students in remote or underserved areas, this can provide access to quality education even with few qualified teachers. AI can facilitate virtual classrooms, interactive discussions, and automated assessments, allowing students to learn from anywhere.

AI can streamline administrative processes such as grading, attendance tracking, and scheduling. This can free up teachers’ time, allowing them to focus more on actual teaching. For example, AI systems can quickly assess student assignments, detect patterns in student performance, and generate reports that can help teachers identify areas where students may need additional support. AI can empower teachers with tools for lesson planning, content delivery, and

student assessment. Platforms using natural language processing and machine learning can analyze vast amounts of educational content and present it in ways that enhance teaching efficiency. In turn, this allows teachers to focus on interacting with students rather than spending excessive time on preparation. The vast potential of AI literacy in early childhood education is undeniable as captured above. The writers recognize the unique context surrounding the integration of AI in early childhood education. While discussions in higher education often revolve around mitigating the influence of AI on student-created work and writing abilities, early education presents a distinct opportunity. Here, it can serve as a valuable ally to educators, streamlining tasks and freeing up valuable time for them to prioritize what truly matters—nurturing relationships with their children. By leveraging AI tools effectively, it enhances teachers' efficiency, allowing for a more focused and enriching early education experience for children. Teachers can leverage AI in early childhood education to help adapt or personalize their lessons, jump start professional development, gather research, get ideas for activities, help save time on day-to-day tasks, and much more.

Although Nigeria faces a shortage of qualified teachers, particularly in early childhood education, AI-based teaching tools, such as virtual teaching assistants and chatbots, can supplement teaching in subjects needing more expertise. This can help fill the gap in early childhood education and ensure students receive the instruction they need to succeed in a rapidly evolving world. AI systems can analyze vast amounts of educational data to provide insights into student performance, teaching effectiveness, and institutional efficiency. For education policymakers in Nigeria, this data can help make informed decisions about curriculum improvements, resource allocation, and interventions to boost educational outcomes.

Using AI: How to write good prompts

Vilppu, Heimonen, Hakkala, Björne, & Farooq (2022) stated that the purposes of writing prompt are to encourage the student's interest in a topic and encourage them to write about it in a thoughtful and creative way. While an effective prompt introduces and limits the writing topic, it should also provide clear instructions about the writing task. Writing prompts are instructions so your AI tool can create the kind of content you want, and writing good prompts is critical to generating higher-quality responses. Improper prompting can leave too much room for the AI to interpret and fill in gaps unintended, introduce biases, develop less helpful responses, etc. Once you get used to prompting, it will start feeling pretty natural! Then, you can adjust this to fit your needs and workflow according to what works better in the given context.

“Gotchas” of Pure Tech/AI Tools to Watch Out For

In programming, Kim (2020) opined that a gotcha is a valid construct in a system, programme or programming language that works as documented but is counter-intuitive and almost invites mistakes because it is both easy to invoke and unexpected or unreasonable in its outcome as cited in Wikipedia. AI in early childhood education exhibits remarkable capabilities, from crafting engaging children's stories to analyzing data and devising lesson plans. However, when deployed without tailored training for early education contexts, the outcomes may prove misleading, incomplete, or erroneous. Instances abound where AI-generated content reflects biases or inaccuracies due to inadequate training or incomplete datasets. Despite advancements, AI inherently lacks the contextual understanding and nuanced comprehension characteristic of human educators and experts, making errors inevitable. Thus, while AI in early childhood education offers invaluable assistance to educators, it must be supplemented by human oversight

to navigate nuanced situations effectively and mitigate the risks of misinterpretation or misrepresentation.

The writers furthermore observed that in the EdTech which is refers to new technological implementations in the classroom. In-classroom tablets, interactive projection screens and whiteboards, online content delivery, and MOOCs are all examples of EdTech that AI in early childhood education can help “equalize” education, as it can help offset the current high turnover and give more inexperienced teachers the tools and guidance they need to bridge the gap compared to more experienced and well-trained teachers. Eguchi & Muto (2021) added that AI can help bring efficiencies and empower teachers in their day-to-day in unique ways, AI alone can cause more harm in that area, widening the gap instead by not providing them with the proper information, understanding, and ability to impact sustained learning. Ultimately, AI in early childhood education alone cannot replace a quality and efficacious curriculum designed and vetted to teach and support student learning for long-term success pedagogically and certainly, never replace a great teacher. Although this AI software is new, but the industry is working on solutions and guidelines to ensure safe and fair usage, including ethical and safety considerations! Recently, the White House issued an Executive Order on AI to create protections over personal data for AI tools, and the US Department of State and the Nigerian Federal Ministry of Communications, Innovation, and Digital Economy hosted more than 200 stakeholders from the private and public sectors, nonprofit executives, and academia for a “Global Inclusivity and AI: Africa” conference in Lagos, Nigeria in September, 16 2024. The conference allowed participants to discuss the deployment and use of AI and how to strategically incorporate and harmonise AI governance strategies between the United States and African nations. In the same leg, US Dept. of Education’s Office of Educational Technology released a guide on integrating AI into classrooms in early 2023. This is why having humans in the loop, training and verifying the output with subject matter experts, is essential, and using such technologies needs to be treated not as an opportunity but as a responsibility. This can be done in various ways- including standards and sub-standards in training data, using appropriate curriculum as example output, and having experts be integrated in verifying and approving content before it makes it to a teacher’s classroom and influences children

Challenges

While the potential of AI in Nigeria’s education sector is immense, several challenges must be urgently addressed. For example, many Nigerian schools, particularly rural ones, lack basic digital infrastructure such as internet connectivity, electricity, and computers. The successful implementation of AI will require significant investments in infrastructure. Teachers and students must be digitally literate to benefit from AI-based educational tools. Comprehensive training programmes will be necessary to equip educators with the skills needed to integrate AI into their teaching practices. SDRuga, Christoph, & Ko, (2022) believe that AI tools and systems are often expensive to implement and maintain. Acquiring and sustaining AI technology may be prohibitive for schools in underfunded regions without government support or public-private partnerships. As with any technology, there are ethical concerns around AI, such as privacy, data security, and the risk of bias in AI systems. Ensuring that AI applications are used responsibly, with clear regulations and oversight is essential to preventing potential misuse.

The Government of Nigeria at the Federal, State, and Local levels has critical roles in integrating AI into early childhood education. The Nigerian government must prioritize AI

integration in education through policy frameworks encouraging innovation, collaboration with tech companies, and investment in digital infrastructure. The government can partner with private tech firms to provide schools with the tools and resources to adopt AI-based solutions. Teachers must be trained in using AI tools effectively. Professional development programs focusing on digital literacy, AI applications, and pedagogical innovation will ensure that educators can harness AI to improve teaching and learning outcomes. Collaborating with technology firms, AI startups, and international organizations can provide the expertise, funding, and infrastructure necessary to implement AI in Nigerian education. These partnerships can also facilitate the development of localized AI solutions tailored to the unique challenges of the Nigerian education system. AI integration should prioritize access for underserved communities, including rural schools and marginalized students. Programs should be developed to ensure that all students, regardless of socioeconomic background, can benefit from AI-enhanced education. This could include providing affordable digital devices and internet access in underserved areas.

Conclusion and Recommendations

In conclusion, Integrating AI into early childhood education system presents a transformative opportunity to improve learning outcomes, enhance teacher effectiveness, and bridge the gaps in access to quality education. AI gives teachers of philosophy of education some fantastic new capabilities, but it cannot replace vetted curricula or quality teachers. Like any technology, it requires watchful eyes and wise use. Teachers should explore AI with cautious optimism, embracing the potential benefits while maintaining a sense of responsibility and carefulness. Together, teachers can shape AI applications to truly serve teachers and children and view AI as an empowerment tool to enhance the capabilities of Subject Matter Experts, not a replacement. Conversations should continue about thoughtfully integrating this technology into the classroom while keeping human experts and educators firmly in the loop.

- 1) When utilizing AI in early childhood education, carefully evaluate AI tools for safety, privacy, and age-appropriateness before adopting them.
- 2) Using AI thoughtfully as a complement to, not a replacement for, skilled human teachers. The teacher should remain the heart of the classroom.
- 3) Looking for bias in data/algorithms and ensuring AI does not inherit harmful stereotypes.
- 4) Giving transparency into how AI applications work so teachers and children can develop informed views.
- 5) The Nigerian government should establish clear guidelines for the ethical use of AI in education.

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