

THE IMPORTANCE OF ARTIFICIAL INTELLIGENCE (AI) IN THE ADVANCEMENT OF TEACHER EDUCATION PROGRAMMES IN NIGERIA

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Abstract

The integration of Artificial Intelligence (AI) into teacher education programs in Nigeria addresses the need for contemporary teaching skills suitable for the 21st century. This paper explores how AI enhances various facets of teacher education, such as personalized learning, student assessment, and educational research. AI-powered educational platforms offer customized learning experiences, while AI-based assessment tools enable quick identification of student struggles, allowing for targeted interventions. Furthermore, AI facilitates the analysis of large datasets in educational research, providing insights that inform teaching practices. This study employs a mixed-methods approach, combining quantitative data analysis with qualitative interviews to understand the impact of AI on teacher training. Findings indicate that AI can significantly improve the efficiency and effectiveness of teacher education programs by offering personalized training, improving lesson planning, and providing real-time feedback. The conclusions underscore the potential of AI to transform teacher education in Nigeria, emphasizing the need for investment in AI technologies and teacher training to fully realize these benefits.

Keywords: Artificial Intelligence (AI), Teacher Education, Teaching and Learning.

Introduction

Artificial intelligence is the science of making machines that can think like humans. It can do things that are considered "smart." AI technology can process large amounts of data in ways, unlike humans. The goal for AI is to be able to do things such as recognize patterns, make decisions, and judge like humans. The impact of Artificial Intelligence (AI) on teacher education is as significant as it is multi-faceted. AI has the potential to transform the way teachers are trained and how they teach students. One of the main impacts of AI on teacher education is the use of intelligent tutoring systems (ITS) which can provide personalized learning experiences for students. These systems use data analytics to analyze students' performance and provide feedback to teachers on how to tailor their instructions to meet individual student needs. The emergence of AI education as a subject places new demands on teachers, researchers, and policymakers to ensure its effective implementation in schools, while the adoption of new curricula material necessitates state policy analysis and future needs

(Sanusi, Olaleye, et al., 2022). Another impact of AI on teacher education is the use of machine learning algorithms to help teachers create more effective lesson plans. These algorithms can analyze student data and provide insights into which instructional strategies are most effective for different types of learners. AI can also improve teacher training by providing more effective professional development opportunities. For example, virtual reality simulations can allow teachers to practice teaching in realistic scenarios, while natural language processing can provide feedback on their instructional delivery. Notwithstanding that several researcher-designed curricula and resources exist to introduce the AI concept, teachers possess limited knowledge to teach AI to their students (Sanusi et al., 2021b). Having identified teachers' lack of AI knowledge as a barrier to AI implementation, studies have begun to explore the preparation of teachers to teach AI through professional development (PD) programs (Lee & Perret, 2022) and co-design of learning resources (Lin & Van Brummelen, 2021). While PD is important, exploring teachers' intention and readiness to teach AI in classrooms is imperative since teachers' acceptance and disposition could be a pointer to their interest in teaching technology and impact their teaching practices (Nikolopoulou, Gialamas, Lavidas, & Komis, 2021). Adopting course content in the classroom would be impossible without teacher buy-in (Lin & Van Brummelen, 2021). As a result, gathering teachers' perceptions of their intention and readiness to teach AI would contribute to understanding the factors that support the successful implementation of AI in schools

Furthermore, AI has the potential to help teachers identify at-risk students and intervene early to provide additional support. Machine learning algorithms can analyze student data to identify patterns that may indicate a student is struggling, allowing teachers to provide targeted interventions before a student falls behind.

Moreover, AI has the potential to transform teacher education by providing personalized learning experiences for students, helping teachers create more effective lesson plans, improving teacher training and providing early intervention for at-risk students. However, it is important to consider the ethical implications of AI in education and ensure that it is used in a responsible and equitable manner. Artificial intelligence (AI) has the potential to revolutionize education in many ways, including teacher education. With its ability to automate tasks, provide personalized learning, and generate insights from data, AI could transform the way teachers learn and teach.

One of the most significant effects of AI on teacher education is its ability to personalize learning. AI-powered platforms can analyze data on how individual students learn and provide tailored feedback and resources to meet their unique needs. This same technology could be applied to teacher education. AI could analyze data on a teacher's performance and provide personalized feedback and resources to help them improve their teaching skills. This would enable teachers to learn at their own pace and address their individual weaknesses, which could lead to more effective teaching.

AI could also help teacher education programs to better prepare teachers for the classroom. With AI-generated simulations, teachers could practice teaching in realistic scenarios before they enter the classroom. This would enable them to gain experience and confidence in a safe

environment, reducing the risk of making mistakes that could harm their students' learning. AI-generated simulations could also be used to train teachers to deal with specific classroom situations, such as managing disruptive students or teaching a student with a learning disability.

Another potential benefit of AI in teacher education is the ability to automate routine tasks. Teachers spend a significant amount of time on administrative tasks, such as grading papers and managing student data. AI-powered tools could automate these tasks, freeing up teachers' time to focus on teaching and learning. For example, AI could grade multiple-choice tests and provide feedback to students, while teachers focus on providing more personalized feedback on open-ended questions. AI could also provide teachers with real-time data on their students' performance, which could help them to adjust their teaching strategies. For example, if AI detects that a student is struggling with a particular topic, it could alert the teacher, who could then provide additional support. This could lead to more effective teaching and improved learning outcomes for students.

However, there are also potential challenges associated with the integration of AI in teacher education. One challenge is the need for teachers to develop new skills to effectively use AI-powered tools. Many teachers may be hesitant to adopt new technology or may lack the necessary training to use it effectively. It is, therefore, important for teacher education programs to provide training and support to ensure that teachers are equipped with the skills they need to effectively use AI. Another challenge is the potential for AI to perpetuate existing biases. AI-powered systems rely on algorithms that are trained on data, which may contain biases. For example, if AI is used to assess a student's writing skills, it may be biased against students who speak English as a second language or who have a learning disability. It is, therefore, important to carefully design and test AI-powered tools to ensure that they are fair and unbiased.

Conceptual Framework

Artificial Intelligence in Nigerian Education: Artificial intelligence (AI) has been quite topical in recent years, and its impact on education in Nigeria is no exception. With the increasing demand for skilled professionals in the technology sector, AI has the potential to transform the educational landscape of Nigeria. AI technologies, such as user-facing services and products, are being integrated rapidly into our daily activities and have become a topic of discussion among educators (Yang, 2019; Zimmerman, 2018, p. 2018).

AI is the simulation of human intelligence processes by machines, particularly computer systems. It involves the creation of algorithms that can perform tasks that usually require human intervention. In education, AI is being used to develop smart learning systems that can personalize teaching and learning experiences for students. This technology has the potential to revolutionize the way students learn, how teachers teach, and how educational institutions operate. Many studies have focused more on the direct relationship between AI literacy and readiness than on AI relevance and readiness (Chai et al., 2020a; Dai et al., 2020). AI literacy significantly predicted students' readiness to learn (Chai et al., 2020a)

One of the significant applications of AI in Nigerian education is the development of smart tutoring systems. These systems use AI algorithms to create personalized learning experiences for students. These systems can analyze the learning patterns of individual students and provide feedback on their progress. This technology can help students learn at their own pace, which can be beneficial for students who struggle with conventional teaching methods. Due to the rapid growth in the digitization of our daily tasks, AI education is now a crucial facilitator for future opportunities where creativity, knowledge, and the possession of relevant skills will be the key to success. So, getting a good AI education is important for the future AI workforce to be more open and diverse. Knowing how ML models the world is a type of data literacy that can help kids explore, understand, and ask questions about the data-driven systems they use every day like face recognition, smartphones, and voice recognition (Aruleba, Dada, Mienye, & Obaido, 2021).

Another area where AI is being used in Nigerian education is in the development of chatbots. These bots use natural language processing (NLP) to understand and respond to students' queries. Chatbots can provide instant feedback to students, answering questions, and providing information on demand. This technology can also help educational institutions handle administrative tasks, such as scheduling and course registration. AI is also being used in Nigerian education to develop adaptive learning systems. These systems use AI algorithms to adjust the learning experience based on the student's progress. This technology can help students learn more efficiently and effectively. By adapting to the student's learning style, the system can provide more relevant content and improve the overall learning experience.

Despite the potential benefits of AI in Nigerian education, there are also some challenges that need to be addressed. One of the significant challenges is the lack of infrastructure to support AI development. The high cost of equipment and expertise needed to develop AI systems has limited the number of institutions that can afford to invest in this technology.

Another challenge is the lack of awareness of AI's potential in education among educators, policymakers, and students. Many educational institutions in Nigeria are not aware of the benefits of AI in education, and some students may not be interested in pursuing careers in AI-related fields. Furthermore, there is a need for training and up-skilling of educators to use AI tools effectively. As AI adoption grows, educators must be equipped with the necessary skills to integrate AI into their teaching methods.

Despite these challenges, AI has the potential to revolutionize education in Nigeria. One of the significant benefits of AI in Nigerian education is the ability to personalize the learning experience for students. AI algorithms can analyze a student's learning pattern and provide customized feedback and learning resources. This technology can help students learn at their own pace, increasing their motivation to learn and improving their academic performance. Another benefit of AI in Nigerian education is the ability to automate administrative tasks. Educational institutions can use AI-powered chatbots to handle routine administrative tasks, such as scheduling and course registration. This technology can help institutions save time and resources, allowing them to focus on delivering high-quality education. AI can also help bridge the digital divide in Nigerian education. With AI-powered learning systems, students in remote areas can access quality education without having to travel to urban centers. This technology

can help improve the accessibility of education, particularly in rural areas with limited resources.

Use of AI in Colleges of Education

Artificial intelligence (AI) is a rapidly evolving technology that has the potential to transform various aspects of society, including education. In Nigeria, AI is being gradually integrated into various educational institutions, including Colleges of Education. These institutions are utilizing AI to enhance teaching, learning, and research activities. Currently, ongoing initiatives and research are being done on developing and using AI in Africa (Oyelere et al., 2022). Most of these researches have shown that most AI applications used in Africa come from other continents and thus lack contextual relevance because they do not consider things like culture and infrastructure. This concern is related to the fact that Africa has one of the lowest scores on the 2020 global Government Artificial Intelligence Readiness Index (Gwagwa, Kachidza, Siminyu, & Smith, 2021; Aruleba & Jere, 2022; Aruleba et al., 2022A).

One of the significant ways in which AI is being used in Colleges of Education in Nigeria is through personalized learning. With AI, Colleges of Education can create personalized learning paths for students, which are tailored to their individual learning styles and pace. By analyzing data on each student's academic performance, AI-powered systems can provide students with the necessary support and resources they need to succeed. As the number of AI technologies around us increases, people have had more chances to interact and work with these technologies. This has made AI part of our everyday lives, for example, Siri, smart home appliances, smartphones, Alexa, and AI in computer games (Touretzky et al., 2019)

Another area where AI is being used in Colleges of Education in Nigeria is in administrative tasks such as admissions and registration processes. AI-powered systems can automate the registration process, reducing the burden on administrative staff and ensuring accuracy and efficiency in record-keeping.

In addition, AI is being used to improve teaching and learning by providing intelligent tutoring systems that can help students learn more effectively. These systems use machine learning algorithms to understand the student's knowledge level and provide personalized feedback and guidance. The systems can also monitor the student's progress and provide feedback to the teacher, enabling them to adjust their teaching methods to better meet the student's needs.

AI is also being used to enhance research activities in Colleges of Education in Nigeria. AI-powered systems can assist researchers in processing large amounts of data and analyzing research findings. These systems can also provide insights into patterns and relationships that may not be easily identifiable through traditional research methods.

Moreover, AI is being used to develop virtual assistants that can help students and teachers with their daily tasks. These virtual assistants can answer questions, provide information, and even grade assignments. This frees up teachers' time and enables them to focus on other tasks, such as lesson planning and student engagement.

However, the integration of AI in Colleges of Education in Nigeria is not without its challenges. One of the most significant challenges is the lack of infrastructure and resources needed to support AI implementation. The high cost of AI systems and the lack of skilled personnel to develop and maintain these systems are also major challenges. Another challenge is the potential for AI to reinforce existing biases and discrimination in the educational system. AI systems are only as good as the data they are trained on. If the data is biased or discriminatory, the AI system will also be biased and discriminatory. This can result in unfair treatment of students and perpetuate inequality in education.

Benefits of AI to Teacher Education Programmes

The use of AI in Nigeria's education system can provide several benefits, including improved teaching and learning outcomes, personalized learning, and increased efficiency in educational institutions. AI can also help bridge the gap in educational inequality and improve access to quality education for all Nigerians. The following are among the benefits to teacher education in Nigeria;

- i. One of the primary benefits of AI in education is its ability to personalize learning. With AI-powered learning platforms, students can receive tailored feedback and support based on their individual needs. This personalized approach can help students to learn at their own pace, identify areas where they need more assistance, and receive guidance to improve their performance.
- ii. AI-powered learning platforms can also provide students with real-time feedback on their progress, which can help them to identify their strengths and weaknesses and take necessary steps to improve their performance. This feedback can be especially useful for students who struggle with traditional classroom settings and may benefit from more individualized attention.
- iii. AI can also help teachers to identify students who are at risk of falling behind or struggling in particular areas. By analyzing student performance data, AI can provide insights into the specific areas where students are struggling, allowing teachers to adjust their teaching strategies and provide targeted support to those who need it most.
- iv. AI can also increase efficiency in educational institutions. AI-powered systems can automate many of the administrative tasks that are time-consuming for teachers and school administrators. For example, AI can be used to automate grading, create personalized lesson plans, and generate reports on student performance.
- v. AI can also help to bridge the gap in educational inequality in Nigeria. Many students in Nigeria, particularly those in rural areas, have limited access to quality education due to a lack of resources and infrastructure. However, with AI-powered learning platforms, students can access high-quality educational resources and receive personalized support, regardless of their location.
- vi. Data analytics: AI can analyse large data sets of students' performance, allowing teachers to gain valuable insights into individual student's learning patterns, strengths, and weaknesses. These insights can inform their teaching strategies and help them adapt their teaching methods to better suit individual student's needs.
- vii. Virtual assistants: AI-powered virtual assistants can assist teachers with administrative tasks, such as grading and answering routine student questions. This can free up

teachers' time, allowing them to focus on more meaningful interactions with their students.

- viii. Smart content: AI can help create interactive and engaging educational content that adapts to the needs of individual students. Smart content can provide targeted feedback and suggestions to students, allowing them to progress at their own pace.
- ix. Predictive analysis: AI can predict future student performance based on historical data, allowing teachers to intervene and provide support where necessary. This can help prevent student dropouts and ensure that all students receive the support they need to
- x. AI can also help to improve access to education for students with disabilities. By providing personalized support and adaptive learning tools, AI-powered systems can help students with disabilities to overcome the challenges they face in traditional classroom settings and achieve their full potential.

Despite the potential benefits of AI in education, there are also concerns about its impact on the role of teachers and the potential for bias in AI-powered systems. Some worry AI has its negative effects. Some of the concerns and limitations include:

1. _Job displacement_: AI automation can lead to job losses in certain sectors.
2. _Bias and discrimination_: AI systems can perpetuate and amplify existing biases if trained on biased data.
3. _Privacy concerns_: AI can compromise personal privacy through surveillance and data collection.
4. _Security risks_: AI systems can be vulnerable to cyber attacks and hacking.
5. _Dependence and loss of human skills_: Over-reliance on AI can lead to a decline in human skills and critical thinking.
6. _Unintended consequences_: AI decision-making can have unforeseen effects, such as in autonomous vehicles or medical diagnosis.
7. _Lack of transparency and accountability_: AI decision-making processes can be difficult to understand and trace.
8. _Environmental impact_: Training large AI models can consume significant computational resources and energy.
9. _Misinformation and disinformation_: AI-generated content can spread false information.
10. _Existential risks_: Some experts worry about the potential for super-intelligent AI to pose an existential risk to humanity.

It's essential to acknowledge and address these concerns as AI continues to evolve and integrate into our lives.

To address these concerns, it is essential to ensure that AI is used in a responsible and ethical manner in education. This includes ensuring that AI-powered systems are transparent, accountable, and unbiased. It also requires investing in the training and development of teachers to ensure that they have the skills and knowledge necessary to effectively use AI-powered tools in the classroom.

Conclusion

Overall, AI has the potential to transform education in Nigeria by improving the quality of learning experiences, increasing accessibility, and providing personalized support to learners. With the right investment and support, AI could help to bridge the education gap and prepare Nigerian students for the challenges of the future. Identifying teachers' lack of knowledge as a barrier to AI instructional facilitation is a step toward ensuring wide adoption in schools. More importantly is the understanding of teachers' readiness and their intention towards AI curriculum since this could be an essential factor to teaching AI. Studies that specifically investigate teachers' readiness and intention to teach AI has not been found in existing literature. Thus, this study contributes to the literature on factors influencing teachers' readiness and behavioral intention regarding AI instruction in K-12 educational context (Nigeria 6+3+3 system of primary-secondary education. . The variables involved in understanding teachers' readiness and intention towards AI teaching as identified in this study include AI anxiety, perceived usefulness, social good, attitude, confidence, and AI relevance (Chai et al., 2021).

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