Kashere Journal of Education 2024, 7(2):361-369 ISSN: 2756-6021 (print) 2756-6013 (online)
Dahiru, A & Zaitawa, M. A. (2024)

INTEGRATION OF ARTIFICIAL INTELLIGENCE IN IMPROVING SECONDARY SCHOOL EDUCATION IN NIGERIA

Aliyu Dahiru
Department of Arts and Social Science Education,
Faculty of Education,
Federal University of Kashere, Gombe State

And
Mukhtar Aminu Zaitawa (PhD)
Department of Arts and Social Science Education,
Faculty of Education,
Federal University of Kashere, Gombe State

Abstract
This paper discusses how emerging educational environments in secondary education are shaped by artificial intelligence (AI) in education. This paper examines the possibilities of applying artificial intelligence technologies in the shift of instructional methods, adopting learner-centred approaches, and enhancing such instructional processes in Nigerian secondary schools. Nigeria's educators have to teach large classes with regard to diverse students' learning needs and impediments they experience; they work with a severe shortage of resources that AI can overhaul. With the help of AI technologies, teachers will be able to personalise content presented in the lesson and increase the level of students' participation especially in episodic subjects like math, science, language, etc. There are few areas in the applications of AI in secondary education that are discussed in this paper and these have to do with adaptive learning system which delivers personalised content, automated grading system for prompt feedback, and learning systems for self-learning by the students. AI can also provide teachers with decision support where by analysing student performance data patterns and intervene where necessary to help the teachers make sound instructional decisions.

Keywords: Integration, Artificial Intelligence, Improving, Secondary School Education

Introduction
Artificial Intelligence AI is revolutionalising many sectors ranging from health and finance among others by providing power tools and customised experiences. In education, AI can improve students' learning needs by delivering instruction tailored to their needs, as well as managing other paper works (Adefila & Adepoju, 2023). This level of technological advancement will benefit the most Nigerian secondary schools that have an unrelenting problem regarding; huge student enrollment ratio, scanty teaching aids, and students' heterogeneous learning difficulties (Onyebuchi & Nwachukwu, 2021). These barriers are worser in the rural and hard-to-reach areas, since the inequalities in access to education may be even bigger due to poverty constrains (Yeboah & Kwaku, 2021).

These challenges have posed difficult tasks for the Nigeria secondary education system to overcome with the conventional practises. However, studies have it that AI has tools that the teachers could use to apply to their students with the purpose of makes the learning content relavant to every student and hence promote engagement and understanding even when it is carried out in large classrooms

(Akinyele & Oladipo, 2023). For example, adaptive learning system in teaching can present information according to each student's speed understanding level and course content intelligent tutor systems, provide education beyond classrooms (Okeke & Yusuf, 2022). Besides, M-learning can help in automating grading and invoking analytic systems that will enable the teacher to keep track of a student's progress and provide feedback and make necessary changes to his or her instructional approach in a timely manner (Ogunlana, 2022).

The paper discusses the following promises of AI for the enhancement of secondary education in Nigeria: Deepening instructional quality; Fostering learner-centred education types; and Redressing resource limitation. This research is expected to marry the many potential uses as well as the opportunities and strategic policy recommendation aiming at contributing to the future attempts in education innovation. It also supports the policy of cooperation, both at the state and federal levels, between Government, education institutions and IT providers so that everyone gets equal and appropriate opportunities for application of AI in education in Nigeria (Edozie, 2023; Omotayo, 2022).

Challenges faced in the Teaching and Learning in Nigeria Secondary Education include the following. Among the most pressing problems one can list such factors as overcrowding, which remains a major concern in a large number of Nigerian schools, primarily in large cities. Researches suggest that when classroom is overcrowded, the teacher is unable to attend to various students, thus, there is low level engagement plus performance (Adejumo & Adewale, 2020; Okonkwo, 2021).

It is also important to note that the classrooms in Nigerian context are highly heterogeneous in terms of learning needs. This is because learners belong to different venses, and have different learning rates and abilities, making it almost impossible for instructors to set fixed rates of learning. Several studies have insisted on the need for differentiation because of students' diverse learning needs but it has been pointed out that differentiation demands resource and training which are scarce (Eze, 2019; Olayinka & Afolabi, 2020).

Moreover, Nigerian schools have various troubling concerns which include among; inadequate teaching learning resources including books, ICT facilities and qualified teachers. These constraints hinder the teachers from applying effective learner-centred teaching practises and learning delivery as well as customised to suit every learner's needs; this thereby increases the learning inequity (Babalola, 2021; Yusuf & Ibrahim, 2018).

Recently, the use of artificial intelligence (AI) is increasing across different fields, and it is also focused on the educational application. When understood and effectively deployed AI can play a very useful role in improving the teaching and learning process in Nigerian secondary education. Therefore, AI in education includes technologies that help systems identify learning needs of individual learners, as well as personalise their learning experience (including materials, feedback, and quizzes) and automate administrative work (Holmes, 2019). This is one major advantage which AI brings in Nigerian classrooms that it provides personalised learning to the students. In the context of learning platforms, AI can track the progress of learning indicating both strengths and areas of improvement of individual students to provide for needed content. It is especially helpful in large population capacities within which

tutors may not be in a position to individualise their attention to learners (Afolabi, 2020).

AI also provides remedies to resource scarce situations. For example, in consideration of grading, the automatic grading system can lower the teachers' burden as the grading will be done without teaching them, but instead taking maximum time in planning, and student's tutoring. ITS can also offer the student guided support outside class time especially in difficult subjects such as mathematics and sciences encouraging the students to use the web for independent learning and problem solving skills (Smith & Kelleher, 2021).

The Need for AI in Nigerian Secondary Education

i) Large Student-to-Teacher Ratios

Over crowed classroom and high student / teacher ratio characterise majority of the secondary schools in Nigeria this restrict teacher from giving personalised treatment to students. This burden shifts a lot of pressure towards teachers to manage the classroom and deal with each learner, which is nearly impossible (Ogunleye, 2020).

ii) Diverse Student Learning Needs

This is so because students from Nigerian secondary schools are from diverse cultural, linguistic and economic status. These differences result in sharp variation in learning behaviours and speeds; hence need to adopt teaching methods that can suit the various learning capabilities. However, culture diversity poses a challenge to traditional instructional methods to foster learning achievements needed to enhance specification of diversity, which may lead to a shortfall in the understanding and participation (Chinwe, & Adeola, 2019).

iii) Resource Constraints in Classrooms

Nigerian schools are known to be under-equipped; they do not have the current requisite materials such as textbooks, teaching utilities, and appropriate structures as well. These constraints limit teacher's options to effectively teach student with creative strategies and activities and this enlarges the achievement gap. The teacher training also suffers due to lack of funds for the acquisition of trainer, particularly training on use of new technologies and effective methods for teaching.

Role of AI in Overcoming These Challenges

There remain these monumental problems that AI can solve by providing tools to make teaching more efficient, usable to facilitate differentiated instruction and not marred by resource constrictions. Below are some specific ways AI can play a transformative role in Nigerian secondary education:

a. **Alleviating High Student-to-Teacher Ratios**: AI can be used in doing some of the time-consuming repetitive task like grading, attendance among others so that the teacher is left with more time in delivering their tasks effectively. Besides, intelligent tutoring systems can also avail for students' other help outside class hours, thus supplementing the teacher in large class settings (Adewale, 2021).
b. **Meeting Diverse Learning Needs**: When incorporated to personal learning environment, AI can adjust the pace and kind of material provided so that all learners, even the fast learner or the slow learner, can remain interested. This makes it possible for teachers to have focused correction of students that require nearly all their attention, thus creating an environment that embraces every student's abilities (Ibrahim, 2022).

c. **Addressing Resource Constraints**: AI technologies will be the virtual counterparts of physical materials that students can get scarce access to for learning. Facilities such as cyberspace ensembles, electronic books, and virtual recreations can act as substitutes to conventional means and ensure that students acquire books and other learning materials even in low technology environment. In addition, AI makes it possible for teachers to develop their professional competencies by creating, sharing, and implementing information on new teaching approaches from a distance, or from any location (Adetunji & Musa, 2021).

Key Applications of AI in Secondary Education

i) Adaptive Learning Systems

Computer adaptive learning systems adapt content in accordance with the learners' performance utilising Artificial Intelligence, thereby coming up with unique learning environments that correlate to the learner's rate and understanding level. In a Nigerian classroom where the classes are large and personal contact is almost impossible due to constraints such as time and faculty ratio adaptive technologies can come in handy. These systems enable learners to progress through knowledge domains at their rates but guarantee that while the most intelligent learner is challenged, the slowest learner does not become lost in the process (Onyeka & Abayomi, 2021). Other adaptive learning software solutions such as DreamBox and Khan academies have been effective all over the world. Similar technologies when applicable to the Nigerian environment could make instruction fair as well as efficient.

ii) Automated Grading Systems

Automated grading systems employ grammars as a way through which the results of offerings and works done by students are scored. Such tools can provide for the quantitative evaluation of correct responses and, depending on the format of the question, give feedback on the qualitative results as well. This is contributed by their large load of work, which makes it hard for the Nigerian teachers to score within the shortest time possible thus providing feedback to those students. This they say reduces the burden of grading, making it possible for the teacher to offer much more feedback. It can be proved beneficial especially to those courses such as mathematics and sciences where instant feedback fosters the retention of knowledge (Bello, 2020). Writing and grading assignments for large classes is eased by Systems such as Gradescope, in use across diverse learning formats.

iii) Intelligent Tutoring Systems (ITS) in self-learning

Intelligent Tutoring Systems (ITS) are systems anchored on Artificial Intelligence technologies that offer students Individual Learning Environments. These systems mimic the one on one tutorage by providing the students with suggestions, elaborations, and feedback on input provided by the learner. From the ITS perspective, there is the ability to promote independence to the students and let them practise and learn severe concepts beyond classrooms. Since there might not always be a teacher that can attend to the students' needs with extra tutorials in Nigerian secondary schools, ITS can complement and become a means through which students can study on their own and at any time they desire (Eze & Chukwuemeka, 2019). Some education tools like Carnegie Learning and ALEKS have shown effectiveness due to personalization of

content to each learner, a system that will go well in Nigeria's schools.

iv) Decision Support for Teachers

Student information is processed through artificial intelligence technologies and is used to assist educators in making sound practical decisions regarding the approaches that they apply to students and student behaviour. It becomes almost impossible for a teacher in large Nigerian classroom to reach every student and know his or her achievement. The effective use of digital decision support tools in teaching facilitates the selection of learners that require further support or learning intervention, and assist in providing those specific interventions where they are most useful (Musa, 2021). Tools such as BrightBytes give teachers relevant information about learners' performance and participation to facilitate improvement of the overall teaching methods.

Implementation Challenges and Considerations

i) Infrastructure and Cost Constraints

AI technology can face a great deal of financial and structural challenges in Nigerian secondary schools when being adopted. Lack of easy connectivity to infrastructure facilities including internet and electricity acts as a restraint – especially in the rural regions. Furthermore, the cost of acquisition and management of such systems is somewhat expensive for education institutions as well as the government. Funding could work through partnerships with private organisations, NGOs, and tech companies for the needed digital infrastructure. AI solutions that could be run under low resource environments that are also compatible with offline operations can also help to support gradual uptake (Ademola & Akinyi, 2022).

ii) Data Privacy and Security

Most AI solutions for education work based on the students' data which is why data is big in educational technology. However, the gathering and storing of students' data had some concern of violation of the privacy of the student since there was no well-developed legislation on data protection in Nigeria. Some of them include formulation of clear policies on data governance as well as use of good, secure data management systems. The public should be informed by educators and administrators fully on how data is collected, utilized and how it will be protected. Although the use of frameworks based on global standards like GDPR can partly minimise privacy risk (Ogunlana, 2021).

iii) Preparing teachers for teaching and training

To say the least, AI should not be a tool that is implemented in class and the teacher is either aware of it, or not, it has to be a tool the teacher recognises and is not apprehensive to use. However, the problem that many Nigerian teachers receive little to no training on both digital literacy and AI application instruments means that AI implementation may be hampered in schools. Effective training models specifically for the teachers is the need of the hour to ensure that everyone is AI ready. Learner and educational could also enhance the possibility of implementing long-term professional development programmes that entails teachers with AI practical knowhow. Another way that teachers could be helped as they adopt these new technologies is through peer mentoring and partnership with ed-tech organisations (Bola & Ndubuisi, 2020).

iv) Ethical Concerns in AI Deployment

AI in education has its measures of ethics among which are the making of bias especially in a given process. They found that if not properly done in that an AI training algorithm may on one hand, replicate current educational disparities, or

on the other, be skewed by the data feeds used. Solving these ethical questions demands a more thoughtful method of designing algorithms as well as the continuing assessment of AI interventions in learning environments. Biases can be avoided by using localised data and models and the context in particular, while on the same note, AI systems should be audited periodically to ensure that all students' needs are met fairly (Chukwu & Bello, 2021).

Policy and Strategic Recommendations

Developing a Supportive Policy Framework

1. This paper submits that there is the need for a robust policy to support the integration of AI in Nigerian Secondary Education. Therefore, it is essential for the policymakers to draft the regulations for the development of such technologies also at the same time maintaining the fairness and access throughout different sectors, protecting individual's data, as well as securing it from malicious use. The government should set national standards for AI education that define how data should be used, protected, and who ought to have access to AI tools. Policies should promote the development of sand inclusion of region-specific AI projects for the less-served areas. Furthermore, the authorities for education should encourage those schools which use AI technologies in an appropriate manner and should come up with principles on the nonuse of prejudice when it comes to AI tools (Akinyele & Oladipo, 2023).
2. Teacher Training Programs
   It can be looked at from the perspective of possibly arming teachers with competencies in the application of AI tools. Thus, although the latest breakthroughs in AI can be employed to complement classroom learning when they are not properly trained, they cannot perform optimally. CTE [College and Teacher Education] preparation ought to center on information technology that is sensibly applied in the application of AI-based learning instruments. Examples of training activities could span from incorporation of teaching training, seminars, on line learning and teacher-training within the school setting to enhance the teachers. Government or other sponsors could make the training affordable or offer it free to teachers, leaning toward sustainable teaching and training (Okeke & Yusuf, 2022).
3. Public-Private Partnerships (PP) can offer many tangible and intangible resources as well as financial support required for the successful AI integration in schools, especially, if the governmental support is not enough. The Nigerian government may involve other tech companies, NGOs and international educational organizations to embrace the teaching of AI in schools. Strategic partnerships might be launching donations of AI software, support the sponsoring of an AI training for teachers, as well as the creation of AI solutions that are not depending on internet access. They could also enable the conduct of studies that identify best-fit applications of AI in Nigerian settings (Edozie, 2023)
4. Monitoring and Evaluation. Thus, continuous monitoring and evaluation of AI applications are crucial to make sure they would make tangible and proliferation-oriented contribution to the educational outcomes. This will

maintain record of the status of their integration into classrooms alongside any development indicators as mechanisms for fine-tuning the utilization of the AI tools to mitigate any arising challenges. Local education departments should put in place benchmarks that can measure effects of AI tools on learners. Research ones include preservice and postservice pilot studies as well as impact assessments for ongoing policy reviews. The community of schools and teachers must give regular feedback on the AI tools which will enhance continuous improvement (Omotayo, 2022).

Conclusion

Taken under context that Nigerian secondary education is now facing new challenges, artificial intelligence becomes a hopeful solution. This paper has looked at how AI can help promote effective instructions, adoptability of teaching to individual students, and efficiency of the use of resources in learning institution to deal with challenges like generality of large classes, students' diversity, and scarcity of resources. From the late 1990s, approaches in specific domains such as AI for adaptive learning, intelligent tutoring systems will go through reforms, which means that the application of the AI technology in education sector will gradually realize greater development and support teachers to offer high-quality education.

Nonetheless, to obtain these benefits and apply AI in secondary schools in Nigeria fully, there are several challenges of implementating AI as follows; infrastructure issues, data privacy issues, teacher training needs and ethical issues. Another way through which AI can be integrated into Nigeria is through developing supportive environment through partnerships between the government, business and educational institutions. Finally, to keep up with the developing technologies and applying them in the second-degree school for the learners' benefit, the following ideas are suggested: To continually invest in the improvement of the secondary education, there must be innovation regarding how the AI is invoked in the learning process; Secondly, there is a need to improve student access to enhancing and more effective learning methods. As Nigeria begins this journey, more empirical investigation and resource commitment to effective AI-based educational interventions will be important as it seeks to navigate around these challenges and harness the gains of AI to foster change towards more effective education for all.

References

Adefila, J., & Adepoju, F. (2023). *Artificial intelligence in education: Innovations for learning personalization and student engagement*. *International Journal of Educational Technology, 15*(2), 123-140.

Adejumo, T., & Adewale, B. (2020). *Challenges of large class sizes in Nigerian secondary education and their implications on quality of learning*. *Journal of Educational Research, 15*(3), 214-230.

Ademola, T., & Akinyi, L. (2022). *Cost-effective approaches to implementing AI in under-resourced educational systems*. *Journal of African Educational Technology*, *14*(1), 91-104.

Afolabi, B. O. (2020). *The impact of adaptive learning technologies in addressing diverse educational needs in African schools*. *Journal*

of African Educational Technology, 13(2), 45-58.

Akinyele, M., & Oladipo, J. (2023). *Policies for AI integration in African education: Ensuring ethical and equitable practices. Journal of African Educational Policy, 10*(1), 55-72.

Babalola, T. A. (2021). *Educational inequalities in Nigerian secondary schools: The impact of infrastructure and teacher training shortages. Nigerian Journal of Education Policy, 8*(3), 182-196.

Bello, A. (2020). *Automated grading systems in secondary education: Reducing workload and improving feedback. Nigerian Journal of Educational Innovation, 14*(3), 77-88.

Bola, J., & Ndubuisi, K. (2020). *Preparing teachers for the digital age: Professional development in AI for Nigerian educators. Journal of Teacher Education in Africa, 16*(3), 67-81.

Chinwe, E., & Adeola, R. (2019). *Understanding the diverse learning needs in Nigerian classrooms: Challenges and prospects. International Journal of African Educational Development, 15*(4), 210-225.

Chukwu, D., & Bello, M. (2021). *Ethical considerations in AI-powered education: Ensuring fairness and equity. African Journal of Ethics in Technology, 7*(3), 201-214.

Edozie, U. (2023). *Public-private partnerships for advancing educational technology in Nigeria: The role of AI. African Journal of Educational Innovation, 20*(2), 81-95.

Eze, C., & Chukwuemeka, J. (2019). *Self-learning and student autonomy: The role of intelligent tutoring systems in developing countries. African Journal of Digital Learning, 11*(2), 56-69.

Eze, O. K. (2019). *Differentiated instruction in Nigerian secondary schools: Potential and limitations. International Journal of Educational Studies, 24*(1), 98-110.

Holmes, W. (2019). *AI and education: Guidance for policymakers*. United Nations Educational, Scientific andCultural Organization (UNESCO).

Ibrahim, F. (2022). *Adaptive learning systems as tools for inclusive education in Nigerian secondary schools. International Journal of Digital Learning, 17*(2), 89-105.

Musa, I. (2021). *Data-driven instruction: Supporting Nigerian teachers with AI-based decision support systems. Educational Insights in Africa, 9*(4), 29-42.

Okeke, E., & Yusuf, I. (2022). *Empowering teachers for AI integration: A case for digital literacy in Nigerian schools. Nigerian Journal of Digital Learning, 13*(4), 99-112.

Okonkwo, J. C. (2021). *Exploring barriers to individualized instruction in overcrowded classrooms in Nigeria. African Journal of Education, 10*(2), 45-60.

Ogunlana, A. (2021). *Data privacy concerns in the digital age:*

Implications for Nigerian educational institutions. *Nigerian Journal of Information Security, 9*(2), 35-48.

Ogunleye, T. (2020). *The effects of high student-to-teacher ratios on learning outcomes in Nigerian schools*. *Journal of Education in Africa, 23*(2), 178-193.

Omotayo, T. (2022). *Evaluation frameworks for AI-driven education in developing nations*. *International Journal of Education Monitoring, 15*(3), 45-60.

Onyebuchi, C., & Nwachukwu, K. (2021). *Addressing inequalities in Nigerian secondary education: Opportunities for AI integration*. *Journal of African Educational Technology and Policy, 12*(3), 51-67.

Onyeka, K., & Abayomi, T. (2021). *Personalized learning in large classrooms through adaptive learning technologies: An African perspective*. *Journal of Educational Technology in Africa, 18*(1), 102-115.

Smith, A., & Kelleher, C. (2021). *Artificial intelligence in education: Challenges and opportunities for developing countries*. *Educational Technology Review, 34*(4), 210-225.

Yeboah, S., & Kwaku, A. (2021). *AI in resource-constrained environments: Adaptive solutions for African classrooms*. *Journal of Technological Innovation in Education, 9*(4), 204-217.

Yusuf, M., & Ibrahim, H. (2018). *Educational technology and the future of personalized learning in Africa*. *Journal of African Educational Development, 12*(2), 156-174.