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**Integrating Artificial Intelligence at Basic Education Level in Nigeria:
Opportunities and Challenges**

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Abstract

Integrating Artificial Intelligence (AI) in Basic education promises an edge with manifold opportunities but, at the same time, it goes along with some big challenges that require solutions. AI in basic education is poised to revolutionize conventional pedagogical approaches at the primary and post-primary school levels, personalize learning experiences, and ease administrative tasks. But it also deals with the challenges on implementation, pertaining to issues of accessibility, bias, error, cheating, isolation, and inability of students to explore their full potential due to unnecessary waste of time on the internet. The opportunities afforded by AI in education are immense and transformative. AI-driven technologies can tailor instruction to pupils and school learning styles, thereby improving pupil engagement and learning outcomes. Further, AI tools can perform administrative work, Additionally, it promotes immersive learning environments through the use of virtual and augmented reality applications. This paper look into the opportunity of using AI at the foundational level of education and discusses benefits, challenges, and the potential it brings to effective learning experiences at that level. With the introduction of AI and related tools, it has become possible to use them in almost all aspects of life, and education was not an exception-though it has a very wide scope and with it a bunch of challenges that come along. The integration of AI into education opens up unparalleled opportunities for innovation and enhancement in teaching and learning, it is prudent that such challenges are judiciously overcome with few recommendations suggested below.

Keywords: Artificial intelligence, basic education, opportunities, challenges

Integrating Artificial Intelligence at Basic Education Level in Nigeria: Opportunities and Challenges

Artificial Intelligence has revolutionized industries in recent times, and education cannot be exempted. AI is rapidly transforming the way teachers teach and enhance how student learn nowadays, especially in shaping the future of learning at basic level of education. Use of AI is much needed at this time when innovative teaching techniques is the order of the day. The AI-made tasks include reasoning, problem solving, and learning. Perception, understanding natural language, and making decisions have become so easy. AI has made teaching and learning at basic of education stress-free. Artificial intelligence has been in existence for decades. In the 1950s, a computer scientist Claude Shannon built Theseus, a remote-controlled mouse that could find its path out of a maze and remember the path it took. AI capabilities grew slowly at first. But it was improvements in computer speed, cloud computing, and the availability of large sets of data that really helped Artificial Intelligence start to advance rapidly. Now anyone can access ChatGPT, a program capable of holding text-based conversations with users.

AI is a collection of technologies that have the potential to enable machines to perform tasks that typically would require human intelligence, such as learning and problem-solving-skills which may be an access to digital materials. With regard to basic education, AI is being applied to enhance the learning journeys of pupils and students through experiences that are more personalized to their needs and styles. Exciting and concerning, too, are potential uses for AI when considering pros and cons of using Artificial Intelligence at the basic education level. Thanks to AI, it is now possible to create the plans to organize effective and innovative educational activities that would let learners learn in an engaging and practical and theoretical way at their own pace, while contributing to a class of kids where they could put into play their acquired skills. AI use in basic education ushers in a completely new dimension in instructional design and delivery. The place of AI in higher learning cannot be looked at as a purely technological adoption but rather a complementary exercise in innovative re-imagining of the educational landscape with a view to

further enriching learning experiences, enhancements in operational efficiencies, and better endowing students with requisite skills for the business environment.

What is Artificial Intelligence?

Artificial Intelligence is a set of technologies that enable the computer to perform a variety of advanced functions for analyzing and recommending solutions. AI is the ability of a digital computer system to perform tasks that are normally associated with intelligent beings. The term 'artificial' is used because it can supersede human beings. The feedback one gets depends upon the information the user gives to it. With Artificial Intelligence in education continuously evolving, the outlook appears promising yet complex. The face of AI technologies is changing so fast that it has opened up new opportunities to fundamentally alter the way teaching and learning are conducted, improve learning outcomes, and meet some of the more persistent challenges in education. It is, however, with full realization of the potential of AI that exploring its major positive impact on productivity within Basic education level and its role in facilitating understanding of complex subjects such as science subjects becomes easier for learning and development. With the potential to transform the traditional pedagogical approach, integration of AI in education presents innumerable possibilities for educators, students, and institutions alike.

From learning platforms, AI is able to adapt instruction to individual pupils'/students' needs, AI technologies have reshaped an educational landscape where intelligent tutoring systems can provide real-time feedback. Moreover, AI-driven tools accelerate the process of analyzing large volumes of educational data, thus enabling educators to gain useful insights into student performance, learning trends, and instructional effectiveness. Moreover, immersive learning experiences with the use of virtual and augmented reality applications powered by AI go beyond conventional classroom boundaries. While AI has the key to opening more learning opportunities, it also brings in barriers concerning the aspect of accessibility and further encourages cyber-crime. With these considerations, this paper examines opportunities and challenges concerning the integration of AI in education. By considering these aspects, stakeholders can go about responsibly, taking a strategic position that addresses the possible challenges or dilemmas that AI

integration may present, hence offering assurance that AI will enhance equity, accessibility, and effectiveness in education. Integrating AI in education is considered at this point one of the most powerful tools in revolutionizing education. These technologies open several avenues such as innovative learning experiences, improving student performance, automation of administrative tasks, and the building of advanced learning environments.

Benefits of AI in Education

In education, the benefits of AI are numerous. It is currently changing the face of education in the development of better systems that teachers and students alike can use to make their job so much easier. Some areas in which Artificial Intelligence is changing the face of education include:

Assistance: Those educators who tried AI said it could make their jobs easier by brainstorming lesson plans, student projects, and even quiz ideas. With the help of Artificial Intelligence, instructors can have more time to spend with their students.

Speed: When students are "stuck" with an assignment, AI platforms can offer quick and useful support if a teacher or caregiver is unavailable. For instance, a student might ask, "How do I improve my reading or Arithmetic skills?" as a way of being reminded of the steps for solving an equation. The student can even ask, "What's some effective ways to get better at preparing for examination?" and Chat GPT can offer some advice and resources in an instant.

The AI for Individualization programs can help individualize learning opportunities for learners. For example, ChatGPT can easily and quickly translate materials to another language, thus making understanding assignments easier for students who speak another language. ChatGPT also can revise materials so they are suitable for varying grade levels and can tailor projects to fit the students' skills and interests.

Personalization: AI can also help in the personalization of learning for the students. By processing the performance data of each student, AI-powered tools analyze not only which students need additional support to improve their learning experiences but also how those specific students need help. Building a feedback system that includes students and teachers in identifying their mistakes and then coming up with ways to improve them.

Furthermore, with the emergence and adoption of AI in education, there has been a way through which students all over the globe have had access to quality education. In fact, today students and teachers alike can have access to real-time information from any part of the world using only a smartphone and an internet connection. Above all, research, which hitherto would take time with rigid readings and flipping through pages, has just gotten easier with the adoption of Artificial Intelligence in education. Another very useful area where Artificial Intelligence has again proved helpful is in facilitating the process of learning. Students can use this mechanism to enhance the learning process in their effort to further understand a subject matter.

More development these days involves AI-powered braille tutor applications that can assist students living with disabilities in learning the process. This is possible because the applications are able to translate physical braille characters into digital text using OCR technology. **AI helps in reducing the workload of teachers:** With the help of AI, workload can be at ease for teachers. Many tasks could be assisted or even taken over by a technological tool without decreasing the quality of teaching.

Balancing the advantages of Artificial Intelligence in basic education with its potential drawbacks or challenges that requires careful planning and consideration, as well as on-going evaluation. AI can empower educators, accelerate learning, and personalize educational experiences, quickly and easily.

Examples of AI powered applications and tools

Copilot: Teachers can automate lesson planning and mapping quick and create a polished presentation with a few thoughtful prompts, Teacher become more efficient and gain time to focus on students' learning.

Hugging: This can be useful for students. It provides human-like conversation and answer question on various topics of interest. Hugging can be used to provide information on issues of concern and help learners complete assignment with mere question and answer session with AI

U-chat: School authority can make use of U-chat to send notification or bulk message to stakeholders on issues of concern in the school

ChatGPT, Microsoft Edge, Perplexity, Research Rabbit, SciSpace and many others that are very useful for learners to enhance their learning skills.

Traditional approaches to education usually do not accommodate learning styles and paces of pupils/students, which are many a time different from one another. On the other hand, AI-powered adaptive learning systems can more often analyze a vast amount of data regarding student performance and preference to craft instruction to each student's unique needs. These systems dynamically adapt the content, pace, and difficulty level of learning materials in response to ongoing feedback, allowing targeted support and challenges to be fully pitched at a level commensurate with the skills level of pupils/students. Personalized learning experiences tend to elicit more engagement, motivation, and accomplishment for learners because they feel more empowered and supported in their own learning journey. Furthermore, personalized learning would help in addressing equity and achievement gaps, providing each learner with high-quality, customized instruction. AI technologies can greatly boost students' engagement and academic success by facilitating more interactive learning experiences. For example, AI virtual tutors and chatbots can hold meaningful conversations with students, answer questions, and provide immediate feedback-mimicking the types of supportive interactions students receive from live instructors. This kind of personalized support enhances students' level of confidence, motivation, and persistence, which in turn improves academic performance. Besides that, the intelligent games for education allow learners an interactive and fun way to practice knowledge and skills contextually. With the incorporation of principles of gamification and adaptive learning, educators are able to craft learning environments that are both enjoyable and very effective in the mastery of complex subject matter and skills. It will also help the teachers by automating tasks for educators and freeing time to invest more time and energy in teaching and mentoring students. The AI-powered systems can automate routine responsibilities comprising grading, lesson planning, and scheduling and free up educators to give more attention to designing engaging learning experiences, giving individualized support to learners, and collaboration with others. By applying AI, educators can also be supported in analyzing student data for strengths, weaknesses,

opportunities available, and areas for improvement. This could, in turn, enable teachers/facilitators to make valid decisions concerning instructional strategies, interventions, and resources for improved teaching and learning outcomes. These immersed technologies have the potential to transport students into virtual worlds, historical settings, or scientific simulations. This could allow them to explore and interact with concepts in ways that would never be possible in a traditional classroom setting.

AI in education can create very strong opportunities on many fronts: for the enhancement of learning experiences, the improvement of student performance, streamlining administrative burdens, and the creation of immersive learning environments. These AI technologies would ensure that facilitators effectively personalize instructions, meaningfully engage students, efficiently optimize administrative processes, and create innovative learning experiences that better prepare students to succeed in an increasingly digital, interconnected world. Yet to be taken into consideration is that the realization of such opportunities would depend on how education, at the hands of educators, policymakers, and technology developers themselves, is planned, invested in, and collaborated on for AI to assume the role of being used responsibly and ethically in order to help meet the diverse needs and aspirations of all learners.

Leveraging the opportunities of AI in basic education

Applications of AI in primary school and junior secondary include writing of lesson plan/note, lesson delivery in the class or on-line, assessment, for example, Test feedback, and support of slow learners through the design of contents to suit the speed at which they can learn easily and, therefore, be friendly and flexible.

AI can also be used for making lesson contents which can include textbooks, personalized learning materials, and interactive courses according to student area of specialization and interest. AI tools allow for the creation of educational material with processing capability to make the material consistent, concise, and grammatically correct. Students also use it to write their various assignments.

In the content delivery, AI makes it more effective and flexible by substituting classroom instruction and supporting students to learn from anywhere in the world at any time. In the nearest future, AI may replace facilitators/teachers in some subjects, especially in art and commercial subjects that does not require going to the laboratory for experiments. It equally presents some educational programs for students, scaffolding learners learn the basic skills of interest. Therefore, AI and teachers can work together to develop the best delivery methods for students with maximum positive outcomes. Some of the benefits in delivering learning content through AI include personalized, customized learning, and universal access for all students from diverse linguistic backgrounds, or with certain disabilities related to visual or hearing impairments. According to Dawes (2023), AI can also be applied in the analysis of advanced insights about how students are receiving educational delivery and consequently making progress, with the result that this would enable a far more personalized learning experience. It could thus be argued that this form of AI-based educational delivery is more learner-oriented than the traditional method of educational delivery. It also benefits learners and tutors alike. From the point of assessment, AI enables the automated assessment of learners. For instance, homework and test grading usually consumes much time that would otherwise be spent on professional development, interacting with students, and preparing classes. Because AI is already taking the place of human grading, it can grade close to fill-in-the-blank and all kinds of multiple-choice testing. Nevertheless, essay-grading software is still in its early stages yet, and it is bound to get even better over the coming years.

One of the benefits of AI in assessment is reducing human subjectivity and saving time. Besides, application of AI in educational assessment increases consistency, personalization, and scalability. According to Hooda et al., 2022, feedback on students' assessment or work using AI is already applied today. For example, some schools began adopting the AI systems for tracking and monitoring of the student's progress in order to notify their teacher in case of issues with students turning in poor performances. Some of the tutoring programs are based on Artificial Intelligence

that could give help to students with such activities as writing, basic Mathematics, and others in order to assist them in performing better at school. Generative AI tools, like ChatGPT or Microsoft Bing, can provide customized, fast feedback on student work. The use of AI is, therefore, extended to include giving feedback to students, which is personalized and invites students to make a shift in perspective. However, the authors say that AI-based feedback is limited in the sense that it cannot replace human-embedded knowledge that a teacher has about his or her students.

The advantages of AI in general, such as efficiency and customization, apply equally to AI in education. One important benefit that AI brings to education pertains to making learning more flexible and convenient since learners are afforded the opportunity to learn in their own time and space using infrastructure related to AI. Along with flexibility, AI can also increase access to education, as an increasing number of learners can approach quality educational resources regardless of their economic background and location. This advantage makes the provision for universal access to education much easier. AI can also enable tutors to let their students' AI competencies, attitudes, and readiness to communicate with other learners, solve problems that are more authentic, and develop ideas and solutions innovatively and collaboratively. Thus, the incorporation of AI in basic education is leading to an overall improvement in the performance of students in Primary Leaving Certificate Examinations and in Junior WAEC. The advantages of AI include greater support for pupils in primary school and in secondary school as well. Automation of assessment of students is changing the role of the teacher to that of a facilitator only. The teachers can use AI lessons as a supplementary tool to help the weak students and to give practical experiences in the form of human interaction to students. AI systems can also offer the students a non-judgmental learning environment and recommend solutions to enhance students' performance especially in mathematics and other science subject. AI will also minimize the cost borne by schools because it removes unnecessary work and automates processes, hence reducing resource requirements for the schools. Therefore, the use of AI in education provides flexibility, more learning, opportunity to shift to more important tasks, and increased efficiency to students learning processes and teacher/facilitators lesson delivery.

Importance of AI at Basic Education level.

Personalized learning: Learners can use AI software to learn at their own pace. Examples of such tools are Duolingo Application. AI helps with speech recognition and translation. It facilitates communication in multi-lingual classrooms. It helps children to learn languages at their own pace with set goals and feedback mechanism. This is very useful for learners learning foreign languages such as French language, German Language and so on. There are schools that make use of this application in place of teachers in case of shortage of facilitator.

Intelligent tutoring system: This is a learning system which is used for massive of learning even in different location, this was used during Covid-19 when student could not converge in a classroom for traditional way of learning.

Automated grading and feedback: This is used for marking/grading assignments, quizzes and examination responses, especially computer based test. It sometimes provides a detailed feedback to individuals helping them to understand their mistakes and identify areas of improvement if need be. Examples of such tools are Auto-mark, timely-grade, and turnitin.

Content creation: AI helps to create educative contents. It generates personalized learning material and recommends resources based on learners' interest and proficiency level. This application is very useful according to learner's area of specialization. It also creates interactive learning experience e.g ChatGPT and Jasper.

Predictive analytics: This helps with students' performance grading system, attendance and engagement metric, predict academic outcomes of learners and can also help to identify risks.

However, some challenges beset inclusion of AI in basic education. The risks of bias, misinformation, student isolation and other challenge are further explained below.

Challenges of AI at Basic Education level.

In Nigeria, the implementation of Artificial Intelligence (AI) presents a host of opportunities and advantages for both educators and students. However, along with these benefits come challenges that must be tackled to ensure successful integration. The primary hurdles related

to incorporating AI in education include accessibility issues, concerns about data privacy and security, and the risk of an excessive reliance on AI for task completion.

One of the key obstacles in integrating AI into education is guaranteeing *equal access to AI*-driven tools and resources for all students, regardless of their socio-economic status or any disabilities they may have. Disparities in technology access and internet connectivity can amplify existing educational inequalities. Students from marginalized or dis-advantaged communities may lack the necessary hardware, software, or internet access essential for utilizing AI-enhanced educational platforms and materials

Moreover, *students with disabilities may face obstacles in accessing* AI technologies that are not tailored to their specific needs, widening the digital gap. Another pertinent concern is the issue of *inclusion and ease of access*. Unequal access to technology puts certain individuals at a disadvantage. For instance, students in some part of Nigeria, may lack access to smartphones or the internet, placing them in a disadvantaged position compared to their peers who have such resources.

The *significant costs associated with AI facilities* can also pose a challenge, as the socio-economic status and geographical location of students can influence their access to AI-based education. The financial implications of implementing AI, including initial software and cloud support expenses, as well as ongoing training costs for educators, can be considerable.

Furthermore, there is a risk that an excessive reliance on AI could hinder students' development of critical thinking and cognitive skills, *limiting their independence and creativity* (Dongping et al, 2022). *Depending too heavily on AI* for assignments may restrict students from fully exploring their potential and honing their abilities through traditional learning processes that encourage multi-tasking and problem solving.

Another one significant hurdle in integrating AI involves *ethical considerations and the need for transparency in data collection and utilization*. AI implementation raises concerns about personal data concentration, data privacy, ownership, confidentiality, and ethical standards, signaling the necessity for further improvement in these areas.

Additionally, a notable challenge lies in the *lack of readiness among students, educators* and educational institutions in general (Awofiranye, 2024; Chiu et al., 2023; Pedro et al., 2019). Students are now very lazy to read, research and make significant use of the opportunities that AI brought; they do copy and paste. And lecturers from their end sometimes do not do a thorough check on their students' work. Lecturers too have an opportunity to go through their students work with needed application. (use of turn-it-in).

Moreover, the rising concern of AI potentially supplanting human jobs poses a significant apprehension among teachers who *fear being replaced by AI technologies*. Teachers have insecurity that AI might take over their jobs soon especially art and commercial subjects, this therefore reduce their morale to give in their best in their job delivery.

There is also the issue of *cheating in examination* (Oyesanya, 2014) opined that students can leverage tools like ChatGPT to complete assignments and even in examination, leading to concerns about *academic dishonesty*. However, there are AI programs available to detect such activities and aid teachers in identifying instances of plagiarism accurately.

Furthermore, the risk *of isolation emerges when students engage more with software programs than with human instructors*, potentially fostering a sense of disconnection and decreasing motivation, thereby impacting drop-out rates.

While AI offers numerous advantages, its full integration into basic education may pose *accessibility challenges for some students, particularly in less developed regions where access to necessary technologies like smartphones and internet connectivity is limited*. Socio-economic status and geographical location can thus impede the widespread adoption of AI in education.

Another significant obstacle is the high cost associated with implementing AI technologies in education, which encompasses expenses related to device maintenance and training educators to navigate these systems effectively. *This financial burden could strain educational budgets*, potentially leaving some countries trailing behind in technological advancements.

Moreover, Velmurugan & Ramesh, (2020) noticed the incorporation of *AI may inadvertently fuel technology addiction among students and teachers*, as educational activities

increasingly rely on digital devices, potentially leading to excessive screen time and dependence on technology.

Cyber crime: The internet revolution in Nigeria has brought enormous changes to social and academic ways of life. Agba (2023) attests to the fact that, cyber-crime has come as a surprise and a strange phenomenon that for now lives with us in Nigeria. With each passing day, we witness more and more alarming cases of cyber-crimes in Nigeria, with each new case more shocking than the preceding one. Unfortunately, the country's image has also suffered as a result of the unscripted activities of some Nigerians using the internet as a channel for the perpetration of criminal spamming activities. In Nigeria today, there are students who engage in this form of anti-social behaviour for the purpose of living a life of splendour. This tends to affect their educational pursuit and learning outcomes.

The internet has brought numerous terrible effect on the educational system in Nigeria. Common forms of cybercrime include *phishing, bullying, victimization and intimidating other learners, hacking, spreading hate and inciting terrorism, distributing child pornography, and grooming.*

Summarily, despite the evident benefits of AI, challenges persist in its usage at Basic education level. It is crucial for stakeholders in the education sector to remain adaptable and receptive to change as technology continues to evolve and shape the educational landscape.

Possible means of addressing Potential challenges (Recommendations)

There are various challenges in integrating of AI at basic education level. This necessitates some solutions to make AI comfortable for use.

To overcome accessibility challenges, stakeholders such as educators, policymakers, and technology developers need to prioritize the development of inclusive AI solutions that cater to the needs of all learners. This involves aspects like affordability, ease of use, compatibility with assistive technologies, and the provision of training and support to enable effective utilization of AI tools by educators and students.

The best way to ensure the ethical use of AI in basic school is for government to enact comprehensive school policies. Give staff and learners a list of approved AI tools and provide guidelines for appropriate use. If necessary, arrange training sessions to ensure teachers understand how to use these tools, and why the rules are in place. Revise these policies constantly as AI is still in a state of flux and you never know when a new ethical challenge will arise.

Developing soft skills, such as communication, empathy, and teamwork, heavily relies on human-to-human interactions. As such, AI should be seen as a complement to traditional educational methods, not a replacement instead of over-reliance on AI which could diminish the value of human interaction in education.

Police and other security agencies should be made to undertake courses on cyber-crime detection using technology to detect crime, bullying and other inappropriate behaviour in school and institutions, as is currently practiced in Senegal and other African countries.

There is need for educational institutions to invest in infrastructure, resources, and professional development to support the effective integration of AI technologies in classrooms.

Policymakers should enact regulations that safeguard students' privacy, promote digital inclusion, and ensure equitable access to AI-powered educational opportunities. Technology developers must prioritize the design and development of AI solutions that are inclusive, transparent, and accountable, with robust safeguards against bias and discrimination.

Ultimately, by working together with ethical foresight and a commitment to equity and inclusion, stakeholders can harness the transformative potential of AI to create more engaging, personalized, and effective learning experiences for all learners.

Conclusion

In this paper, we have ventured into the different paths that AI brings into education, including personal educational dimensions, better interaction of students and provision of basic equipment around administrative scheduling. Even so, we have mentioned the importance and usefulness of AI, its application and opportunities and challenges which are negative aspects of AI technology that can be seen in some areas of the education, for example, security, privacy,

accessibility, cost and classroom teacher's resistance. AI must first of all not discriminate. Comprehensive use of AI is possible with responsible deployment in such applications as to not discriminate but rather to provide the needs and goals of diverse students. Radical inclusion might be the response to overcome the difficulties in data privacy and security, while the process may also be the source of potential innovation. AI usage in the primary schools will therefore enhance incorporation of technology in their curriculum where learners will envision themselves taking a lead in the technological world and thus become productive members of the global society in this digital era.

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