EXPLORING THE IMPACT OF AI ON CURRICULUM DEVELOPMENT AND STUDENT OUTCOMES IN NIGERIAN SECONDARY SCHOOLS

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Abstract

The paper explores how AI is transforming curriculum development and student assessment in secondary education, improving academic programs and learning outcomes. It also addresses challenges faced by schools as they adopt AI technologies. The research found out that, curriculum should be update in the modern scenario many changes are taking every day not only information but building of knowledge is equally important. AI has significantly transformed the process of curriculum development in education. Traditionally, curricula were designed through manual analysis of learning objectives and societal needs, which limited their adaptability. AI's influence on secondary school education is significant, offering personalized learning, improved feedback, and enhanced efficiency in various aspects of teaching and learning. The researchers use secondary method of data collection where different materials were consulted. Recommendations were made used on the conclusion of the paper on how to improve on the AI education system in the country.

Key words: Artificial Intelligent, curriculum development, student, secondary, school, Nigeria.

Introduction

Artificial Intelligence (AI) refers to the ability of machines to impersonate human-like intelligence and perform tasks that typically require human reasoning abilities. These tasks can include learning, problem-solving, decision-making, perception, and language understanding. Basically, AI targets to create computer systems capable of intelligent behavior. The research is going to discuss the importance of AI as it becoming increasingly crucial in Nigerian secondary schools due to its potential to revolutionize education by personalizing learning, enhancing teacher capacity, and improving administrative efficiency. By leveraging AI, Nigeria can better prepare its students for the demands of the 21st-century global economy and address challenges like limited resources and large class sizes. Lawal(2015). The global trends in curriculum development are tilting to the direction of using the curriculum as an instrument for achieving total development of every citizen so as to prepare the nation not only for local and national development but also for international competitiveness. In this regard all these changes should be reflected in the curriculum then and then only application of earning is possible. The paper discusses extensively on what AI is all about, its impact on curriculum development and secondary student outcome.

The Place of AI in the Nigerian Secondary School Curriculum

Artificial Intelligence (AI) is increasingly becoming an essential component of education systems worldwide due to its ability to enhance teaching, learning, and problem-solving. In Nigeria, the inclusion of AI in the secondary school curriculum is emerging as a response to global technological changes. AI provides opportunities for students to develop digital literacy, computational thinking, and problem-solving skills necessary for innovation in the 21st century.The Nigerian secondary school curriculum currently integrates AI-related concepts within subjects such as Computer Studies, Information Technology, Data Science, and STEM activities. Although these contents are limited, they introduce students to basic programming, automation, and intelligent systems that support foundational understanding. AI-based instructional tools such as adaptive learning platforms, automated assessments,

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and virtual labs also serve as supplementary resources to improve personalized learning and enhance academic performance. FME (2020).

Integrating AI in the curriculum promotes career readiness and equips learners with relevant skills for future industries including robotics, data science, healthcare technology, and financial technology. However, challenges such as inadequate infrastructure, poor internet access, limited teacher training, and policy gaps slow its effective adoption. Strengthening teacher capacity, curriculum redesign, and investment in educational technology are essential for successful integration. Adedokun-Shittu,& Shittu, (2023).

Historical Overview of Artificial Intelligence

Artificial Intelligence (AI) has roots traceable to ancient philosophical discussions about artificial beings capable of reasoning. However, practical development began with the emergence of modern computing in the 20th century. The formal establishment of AI as a research field occurred in 1956 during the Dartmouth Conference, led by John McCarthy, Marvin Minsky, Herbert Simon, and Allen Newell. Early programs such as the Logic Theorist (1956) demonstrated that machines could solve problems traditionally handled by humans. From 1956 to the late 1960s, AI research experienced rapid growth, producing significant progress in symbolic reasoning and natural language processing. However, limited computing power and high expectations led to reduced funding in the 1970s, commonly known as the first "AI winter." Russell & Norvig,(2016).

The 1980s saw renewed interest in AI with the development of expert systems designed to mimic human decision-making. These systems achieved commercial success but also faced limitations, causing another decline in AI funding toward the late 1980s. In the 1990s and early 2000s, improved computational power and new machine-learning techniques revitalized AI research. A major milestone came in 1997 when IBM's Deep Blue defeated world chess champion Garry Kasparov. In the 2010s, deep learning and big data drove the next wave of AI innovation, leading to landmark achievements such as IBM's Watson winning the quiz show Jeopardy! (2011) and Google's AlphaGo defeating a Go world

champion in 2016. Today, AI systems are widely applied across fields including healthcare, finance, transportation, and education. The evolution of AI from symbolic reasoning to powerful data-driven models highlights its significance as one of the most influential technologies of the 21st century. Copeland, (2023).

STATEMENT OF THE PROBLEM

Despite the global integration of Artificial Intelligence (AI) in education, its application in Nigerian secondary schools remains minimal and poorly structured. The existing curriculum does not adequately incorporate AI-based skills and competencies needed for learners to compete in the modern technological environment. As a result, a gap continues to widen between global technological advancement and classroom instructional practices in Nigeria.

Furthermore, there is limited awareness of how AI can improve teaching, learning, and student performance. Challenges such as inadequate infrastructure, low digital literacy, and insufficient teacher capacity hinder effective AI adoption. Consequently, the influence of AI on curriculum development and student outcomes remains unclear. Therefore, there is a need to examine how AI is being integrated into the Nigerian secondary school curriculum and how it affects students' academic achievement, skill development, and preparedness for future careers.

Impact of Artificial Intelligence (AI) on Curriculum Development

Artificial Intelligence (AI) has significantly transformed the process of curriculum development in education. Traditionally, curricula were designed through manual analysis of learning objectives and societal needs, which limited their adaptability. AI now allows for data-driven and dynamic curriculum design that is more responsive to individual learners and changing global trends. AI enables personalized learning by analyzing students' performance and tailoring curricula to meet their specific strengths and weaknesses. Adaptive learning platforms recommend appropriate topics and resources, ensuring learner's progress at their own pace. This personalization increases student engagement and

improves learning outcomes. AI supports data-driven decision-making in curriculum planning. Through learning analytics, educators can track student performance and identify gaps in the curriculum. Predictive models can forecast future skill requirements in the labor market, allowing curricula to be updated proactively to remain relevant. AI tools enhance efficiency in curriculum design. Educators can use AI to generate lesson plans, quizzes, and multimedia resources aligned with learning objectives. This reduces teacher workload and accelerates the curriculum development cycle. Tulsiani(2024)

Furthermore, AI facilitates the integration of emerging skills such as critical thinking, digital literacy, and AI ethics into curricula, preparing students for future job markets. It also improves accessibility by providing translation, speech recognition, and assistive tools for students with diverse learning needs. Moreover, the application of AI in curriculum development also poses challenges. Issues such as algorithmic bias, teacher dependency on AI, and data privacy must be addressed to ensure fairness and ethical use. Conclusively, AI has shifted curriculum development toward a more flexible, personalized, and future-oriented model. With proper ethical frameworks and teacher involvement, AI can create curricula that are both inclusive and responsive to evolving societal needs.

Significant of AI to the Nigerian Secondary School Student.

AI's influence on secondary school education is significant, offering personalized learning, improved feedback, and enhanced efficiency in various aspects of teaching and learning. AI tools can modify content to individual student needs, provide instant feedback, and automate administrative tasks, freeing up teachers for more personalized interaction. For students, AI can personalize learning, offer 24/7 support, and improve engagement. For teachers, AI can assist with tasks like grading and lesson planning, allowing them to focus on student needs. Ajelabi (2024).

AI Tools in Action: Schoola / Curri AI

Platforms like Schoola (Curri AI / Curri SRC) are gaining traction:

1. Teachers generate lesson plans, notes, and assessments aligned with Nigerian curricula within minutes instead of hours, significantly easing workload and boosting classroom engagement.

2. In some schools, AI platforms handle grading and progress tracking, speeding up feedback cycles, reducing administrative burdens, and exposing students to CBT-style exams.

These innovations improve teacher efficiency, enhance content relevance, and elevate student involvement and digital literacy.

1. Curriculum Development & Institutional Initiatives

Government-led AI Pedagogy Programs

Nigeria commenced a five-week AI pedagogy training for 6,000 senior secondary school teachers nationwide. This was supported by Google Research and Data Science Nigeria, aiming to empower educators with tools for personalized learning and modern instruction aligned with newly established Minimum Standards for Senior Secondary Education.

Curriculum Reform and AI Integration Policy

Analysts and education professionals argue that the current Nigerian curriculum must be revised to include AI and digital literacy. Changes are required to prepare students for technology-driven careers and to keep pace with global educational standards. Rivers State research underscores the need for systemic investment in curriculum innovation, infrastructure, and teacher training to adopt AI-driven educational models.

Teachers' Awareness & AI Tool Use

A study in Anambra State surveyed 600 public secondary-school teachers. The findings showed:

- Low awareness and utilization of AI tools—most teachers were unfamiliar with globally recognized AI education platforms.

- Those who did use AI primarily employed them as reference content or to enhance lesson delivery.

- Key challenges: unreliable electricity and insufficient education funding.

- Recommended strategies: increased funding and improved infrastructure to enable effective AI adoption. Evanick(2024).

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Student Outcomes & Learning Achievements

A-Mixed-Methods Study on AI Curriculum

Researchers applied a mixed-methods approach (327 students) where AI lessons had been delivered in Nigerian secondary schools over two years. Results showed:

- AI knowledge application strongly predicted students' problem-solving ($\beta \approx 0.033$) and critical thinking skills ($\beta \approx 0.141$).

- Overall student response to curriculum implementation was positive, though disparities in device access led to varied experiences.

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b. Large-Scale Tutoring Pilot (GPT-4 / AI tutors)

Independent pilots funded by entities like the World Bank and organized by education researchers reported: Over a six-week after-school AI tutoring intervention, students using GPT-4–based tutoring in English outperformed peers by about **0.**3 standard deviations, which equates to nearly two years' worth of typical learning in just six weeks. These gains extended beyond English into AI literacy and digital skills. The program outperformed ~80% of global education interventions studied in developing-country contexts. Infrastructure gaps: Many schools lack reliable power, internet, and access to devices limiting the reach of AI education. Teacher preparedness: AI literacy training is critical—teachers require ongoing capacity building beyond initial training. Ethical and privacy concerns: Data protection and responsible use policies must be established to minimize misuse and academic dishonesty. Dependency risk: If students rely too heavily on AI for answers, their ability to think independently and innovate may suffer without integrated guidance. Melo (2024)

Ways through which AI improves academic programs and learning outcomes of Senior Secondary School Students in Nigeria

Artificial Intelligence (AI) enhances academic programs in Nigerian senior secondary schools by promoting personalized learning through adaptive systems that support students' strengths and weaknesses. AI tutoring tools provide instant feedback that improves understanding, especially in subjects such as Mathematics and Science. Teachers also benefit from AI-based automated grading and lesson-planning support, allowing more time for quality instruction. Aremu, &
Adeyemi,(2022). In addition, AI improves access to digital learning materials for students in remote areas, helping them develop problem-solving and critical-thinking skills. Consequently, AI contributes to improved student engagement, achievement, and academic performance. UNESCO. (2023).

Limitations & Ethical Considerations

1. Infrastructure gaps: Many schools lack reliable power, internet, and access to devices— limiting the reach of AI education.

2. Teacher preparedness: AI literacy training is critical—teachers require ongoing capacity building beyond initial training.

3. Ethical and privacy concerns: Data protection and responsible use policies must be established to minimize misuse and academic dishonest.

4. Dependency risk: If students rely too heavily on AI for answers, their ability to think independently and innovate may suffer without integrated guidance.

Future Prospects of Nigeria Secondary School Students in the AI Era

The Artificial Intelligence (AI) era presents vast opportunities for Nigerian secondary school students, particularly in transforming learning processes and future career pathways. With the integration of AI-driven technologies—such as intelligent tutoring systems, virtual laboratories, and adaptive learning platforms—students can gain personalized instruction suited to their individual learning needs. This enhances critical thinking, problem-solving, and technological skills that are essential in the global knowledge economy. Olamide, (2022).

AI skills provide students with access to emerging career opportunities in data science, robotics, machine learning, cyber security, and software engineering. Early exposure to these skills helps students compete globally and participate in digital innovation. Additionally, AI enhances creativity through digital tools for design, research, and collaboration, fostering entrepreneurship and empowering students to develop locally relevant solutions. Ahmed, (2023).

Negative Effect of AI on Nigeria Secondary School Students' Achievement

Artificial Intelligence (AI) is increasingly influencing teaching and learning in Nigerian secondary schools. However, despite its benefits, AI use has several negative effects on students' academic achievement. One major issue is over-dependence on AI tools, which discourages students from developing critical thinking and problem-solving abilities. When students rely on AI to complete assignments or generate ideas, their creativity and analytical skills decline, reducing genuine learning. AI also contributes to academic dishonesty, as students may use AI systems to produce answers without understanding the subject content. This leads to poor examination performance and weak knowledge retention. Additionally, increasing use of AI can reduce teacher–student interaction, which limits personalized guidance and affects motivation and overall academic growth. Adeoye, & Afolabi, (2022

Another disadvantage is related to digital inequality. Many students—especially those in rural areas—lack access to AI technologies, widening the learning gap between students who can afford digital tools and those who cannot. Furthermore, easy access to digital devices may expose students to distractions, resulting in poor study habits and reduced learning time, which negatively impacts academic performance. UNESCO. (2022).

Challenges of AI in Nigerian secondary schools

Applying Artificial Intelligence (AI) in Nigerian secondary schools faces major challenges. These include inadequate infrastructure, limited access to technology and internet, insufficient teacher training, ethical concerns about data privacy and bias, and high costs associated with AI tools. Moreover, there's a need for curriculum updates to include AI-related subjects and address potential job displacement concerns (Melo, 2024)

Conclusion

AI has transformed curriculum development by making it **personalized, data-driven, and adaptive**. It allows teachers to adapt learning paths to individual students, update content in real time, and integrate future skills like AI literacy and critical thinking. AI tools mechanize lesson planning and resource creation, saving time for teachers. Also, AI promotes **inclusive education** through translation and assistive technologies. Though, challenges include **bias in algorithms, data privacy risks, and reduced teacher independence**. With proper ethical use, AI can create curricula that are flexible, inclusive, and aligned with developing global needs. AI is already making a measurable impact on curriculum development and student outcomes in Nigerian secondary schools but that impact remains extremely restricted and inconsistent. Early pilots show remarkable gains in literacy, critical thinking, and digital fluency, yet infrastructure, teacher readiness, and policy gaps limit wider adoption.

A tactical blend of teacher training, curriculum reform, equitable infrastructure investments, and strong ethical misunderstanding is essential to scale and sustain these benefits. Nigeria has begun the journey; continued focus and coordination can help realize AI's full educational capacity.

Recommendations

1- Federal Government should scale AI pedagogy training to more teachers across all states, ensuring follow-up support and mentoring.

2- Government can develop a national curriculum framework explicitly integrating AI education, digital literacy, and computational thinking at various grade levels.

3- Government should invest in infrastructure: reliable electricity, internet access, and procurement of affordable educational devices, especially in public and rural schools.

4-Government encourage pilot programs evaluate what works (e.g. School tools, after-school tutoring) and scale based on data-driven results.

5-Ministry of education should establish ethical guidelines and data protection laws covering student privacy, transparency, and AI usage norms.

6-Stakeholders should raise partnerships among government, universities, edtech startups, and NGOs to co-design culturally relevant AI curriculum and learning tools.

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