

TRANSFORMING CURRICULUM AND INSTRUCTION THROUGH ARTIFICIAL INTELLIGENCE, INNOVATION AND CREATIVE PEDAGOGIES IN NIGERIA

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Abstract

Rapid advances in technology and computing are changing conventional approaches to human challenges or tasks in business, education, finance or healthcare. At the heart of these shifts is the education system which needs to adapt to these changes as well as guide them. The Nigerian education system stands the risk of sliding to the background if concerted efforts are not made at adopting innovations such as the use of artificial intelligence. This paper examines how artificial intelligence (AI), innovation, and creative pedagogies can collaboratively transform curriculum and instruction within Nigeria's education system. It presents a conceptual framework aligning AI-enabled tools with curriculum design, teacher professional development, student-centered pedagogies, assessment innovation, and policy interventions. By situating AI integration within the broader goals of equity, ethical governance, and local relevance, the study argues that purposeful use of AI can improve learning outcomes, personalize instruction, and foster creativity among learners. The paper explores policy considerations, infrastructural challenges, and strategies for implementation across educational levels. It paper concludes by suggesting a roadmap and research agenda for sustainable AI integration in Nigerian education.

Keywords: Artificial intelligence, curriculum design, creative pedagogies, Nigeria, teacher professional development, educational innovation, assessment.

1. Introduction

Education systems worldwide are undergoing a profound shift driven by rapid advances in artificial intelligence (AI), digital technologies, and automation (UNESCO, 2023). Nigeria, despite being Africa's most populous nation, continues to face systemic educational challenges including overcrowded classrooms, inconsistent teacher quality, outdated curricula, and inadequate infrastructure (Angwaomaodoko, 2023)). At the same time, the global demand for 21st-century skills such as creativity, collaboration, critical thinking, and digital literacy are demanding a redesign of both curriculum and instruction.

AI offers significant potential to reimagine these structures by enabling personalized learning, data-driven instruction, and adaptive content generation (Onyebuchi et al., 2024). However, realizing these benefits in Nigeria requires deliberate alignment between technology and pedagogy, supported by ethical governance and inclusive policies. This paper explores how AI, combined with innovation and creative pedagogies, can transform curriculum and instruction in Nigeria not as a technology-

first agenda but as a people-centered reform grounded in equity and contextual relevance.

2. Rationale and Aims

The rationale for this paper is threefold. First, the integration of AI into curriculum and pedagogy has the potential to bridge gaps in instructional quality and accessibility (Daddie et al., 2025). Second, the creative and adaptive affordances of AI can enhance learner engagement through culturally grounded pedagogies. Third, Nigeria's ambition to transition into a knowledge-driven economy requires an educational system that prepares students for the digital future (Emmanuel et al., 2024).

The paper aim to:

Propose a coherent framework linking AI capabilities with curriculum design and pedagogy as well as outline strategies for AI integration in classroom practice, teacher professional development, and assessment systems. It will examine ethical, infrastructural, and policy challenges and present a phased roadmap for scalable implementation.

3. Conceptual Framework

The framework underpinning this study consists of three interrelated layers: Curriculum, Instruction, and Enabling systems (Mallik & Gangopadhyay, 2023). Curriculum Layer (What to Teach): Focuses on competency-based outcomes emphasizing literacy, numeracy, creativity, problem-solving, and socio-emotional learning. Instructional Layer (How to Teach): Prioritizes active, project-based, and blended learning using AI-supported personalization. Enabling Layer (Technology & Systems): Involves AI-powered tools, learning analytics, and data-driven decision-making to support instructional planning and feedback loops. These layers are embedded within participatory governance involving teachers, parents, and policymakers to ensure accountability and cultural relevance.

4. AI Capabilities and Educational Functions

AI has multiple functions relevant to education (Kamalov et al., 2023):

Personalized Learning: Adaptive learning systems diagnose learner profiles and deliver individualized pathways (Du Plooy et al., 2024).

Formative Assessment: AI enables automatic grading, feedback, and identification of misconceptions.

Content Creation: Tools like ChatGPT and Google Gemini can support teachers in generating lesson plans and translating content into local languages.

Teacher Professional Support: AI-driven coaching platforms offer micro-credentials and continuous professional development (Tan et al., 2025).

Administrative Efficiency: Predictive analytics can optimize resource allocation, attendance tracking, and dropout prevention (UNESCO, 2023).

5. Creative Pedagogies: Principles and Practices

Creative pedagogy is grounded in learner agency, imagination, and inquiry (Selkrig & Keamy, 2017). It transcends rote memorization, encouraging students to explore ideas, collaborate, and design innovative solutions. Within AI-supported environments, teachers can use intelligent tools as cognitive scaffolds, allowing learners to co-create content and reflect on their processes (Yan et al., 2024).

Core principles include:

Learner-Centeredness: Students co-design projects aligned with personal interests.

Interdisciplinarity: Integration of STEM, arts, and indigenous knowledge systems.

Authenticity: Learning tasks connected to real-world community challenges.

Iteration: Cycles of experimentation, reflection, and redesign supported by AI simulations.

AI augments these pedagogies by enhancing access to data, modeling creative processes, and providing immediate formative feedback while maintaining human teachers as ethical guides.

6. Curriculum Design Guidelines for AI Integration

To align AI with curriculum objectives, five design guidelines are proposed (NEA, 2025)

Competency-Based Outcomes: Define explicit learning standards across cognitive, digital, and emotional domains.

Modular Structure: Use short, adaptive units that AI systems can recombine for personalization.

Cultural Relevance: Integrate local languages, indigenous knowledge, and Nigerian socio-economic realities.

Ethical Literacy: Teach learners about AI ethics, data privacy, and algorithmic bias.

Assessment Alignment: Design assessments that evaluate higher-order thinking and creativity.

These guidelines reinforce the need for AI to serve educational goals rather than dictate them.

7. Teacher Professional Development and Role Transformation

Teachers are central to AI adoption. Yet, most Nigerian teachers lack structured exposure to AI tools or digital pedagogy (Adole, 2025). A successful framework should:

Provide structure and professional development; Teachers should receive continuous training on AI tools, digital pedagogy and technology enhanced methods.

Provide access to tools and aid digital infrastructure such as computers, reliable internet and approved educational AI platform for classroom use.

Recognize teachers as co-designers who evaluate and adapt AI tools for local context.

Establish ethical and responsible AI use. Teachers should be guided on issues such as data privacy, academic integrity and responsible use of AI (UNESCO, 2023)

Establish ethical literacy training to address data protection and responsible use (UNESCO, 2023).

By reorienting teachers as facilitators and lifelong learners, AI can complement—not replace—their professional agency.

8. Assessment Innovation

Traditional examinations in Nigeria often emphasize recall over reasoning. AI can support a transformation toward continuous, competency-based assessment.

Formative Dashboards: Provide real-time feedback to teachers and students.

Performance Assessments: Project-based outputs and digital portfolios assessed with hybrid (human + AI) rubrics.

Adaptive Summative Testing: Dynamic assessments that tailor difficulty based on prior responses, improving validity (Yan et al., 2023).

Such innovations can reduce exam anxiety and improve diagnostic feedback loops.

9. Equity, Inclusion, and Ethical Considerations

Ethical deployment of AI in education requires attention to fairness, transparency, and data privacy (Floridi & Cowls, 2019). Key challenges include:

Digital Divide: Unequal access to connectivity, electricity, and devices in rural regions.

Bias in Algorithms: Imported AI models often misrepresent African data contexts (Oluka, 2024).

Data Privacy: Schools must enforce strict data consent and anonymization standards.

Community Agency: Avoid vendor lock-in by prioritizing open-source and locally trained models.

Addressing these dimensions ensures that AI integration supports inclusion rather than deepening inequality.

10. Policy, Governance, and Infrastructure Requirements

Nigeria's National Policy on ICT in Education (2019) and recent AI strategy drafts emphasize innovation but remain weak in curriculum alignment and teacher training (Emmanuel et al., 2024). Sustainable AI integration requires policy coherence between Federal and States Governments alignment on competency-based standards and open educational resources. Infrastructure investment on the other hand are vital as reliable power supply, broadband connectivity, and affordable devices are key. Funding and partnerships as well as multi-sectoral collaboration between government, donors, and the private sector and local capacity building hinged on establishing national centers for educational AI research.

Without these enablers, AI adoption will remain fragmented.

11. Implementation Roadmap

A phased implementation model is proposed:

Phase 1 – Foundation (0–12 months): Pilot AI-assisted learning platforms in selected urban and rural schools. Conduct baseline teacher training and curriculum audits.

Phase 2 – Scale and Localize (12–36 months): Expand pilots, integrate local language modules, and deploy offline-first AI systems for low-connectivity schools.

Phase 3 – Institutionalize (36–60 months): Embed AI ethics and literacy into teacher education programs and national curricula. Establish regional AI-in-education research hubs for continuous monitoring and evaluation.

12. Monitoring, Evaluation, and Research Agenda

Monitoring should focus on learning outcomes, engagement, and cost-effectiveness. Key indicators include literacy and numeracy gains, teacher adoption rates, and reductions in dropout patterns. Continuous data-driven evaluation will inform scalability and adaptation.

13. Recommendations

Future research should examine the effectiveness of AI-assisted learning in large classrooms, the creation of culturally sensitive AI contents, assessment of long term impacts of AI literacy on employability, and a focus on comparative analyses of impacts across different Nigerian States.

15. Challenges and Mitigation Strategies

Common challenges include infrastructure deficits, resistance to change, and limited policy continuity. Mitigation strategies involve developing low-tech AI options as well as strengthening data protection frameworks, incentivizing teacher participation through recognition and certification, the establishment of research-policy-practice partnerships to sustain innovation.

16. Conclusion

AI and creative pedagogies together hold transformative potential for Nigerian education. Yet, technology alone cannot solve systemic problems. What is required is a human-centered reform where AI serves as a tool for inclusion, creativity, and critical inquiry. Through coherent policies, teacher empowerment, and continuous evaluation, Nigeria can harness AI to reimagine learning for the 21st century.

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