Revolutionizing Early Childhood Curriculum Through Artificial Intelligence, Innovation, And Creativity In Delta State, Nigeria

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Abstract: *This study investigated the role of artificial intelligence (AI), innovation, and creativity in revolutionizing early childhood curriculum implementation in Delta State, Nigeria. The objectives were to examine the availability and accessibility of AI-driven and innovative tools, evaluate teachers' competence in employing these strategies, and assess their effectiveness in enhancing teaching and learning outcomes. A descriptive survey design was adopted, with a population of 1,500 early childhood educators and a stratified random sample of 284 respondents. Data were collected using the validated Artificial Intelligence, Innovation, and Creativity in Curriculum Implementation Scale (AIICICS) and analyzed using mean scores and standard deviations. Findings revealed that AI-driven and innovative tools are adequately available and accessible (M = 2.71, SD = 0.10), teachers demonstrate competent levels of proficiency in utilizing AI and creative strategies (M = 2.77, SD = 0.09), and these approaches are highly effective in improving teaching and learning outcomes (M = 3.01, SD = 0.09). The study concludes that integrating AI, innovation, and creativity into early childhood classrooms significantly enhances instructional quality and learner engagement, although infrastructural limitations and teacher training gaps persist. Recommendations include increased investment in digital infrastructure, continuous professional development for teachers, policy support for AI integration, and promotion of creative, play-based learning to ensure holistic, future-oriented early childhood education.*

Keywords: artificial intelligence, creativity, innovation, early childhood curriculum, Delta State, education reform

Introduction

Globally, education systems are undergoing transformative shifts driven by artificial intelligence (AI), innovation, and creativity. The early years of a child's life form the foundation for lifelong learning, making early childhood education (ECE) an essential component of national development (UNESCO, 2023). AI-powered learning technologies, digital storytelling tools, gamified learning platforms, and creative teaching innovations are increasingly reshaping curriculum design and pedagogy across the world (Chen & Wang, 2024; Voutilainen, Laaksonen, & Niemi, 2024). These transformations enhance personalization, interactivity, and critical thinking among young learners.

The integration of AI in ECE supports adaptive learning environments where instruction is tailored to children's unique abilities and interests (Kumar & Yeboah, 2023). Intelligent tutoring systems and predictive analytics assist teachers in understanding children's progress, while creativity-driven teaching strategies—such as project-based and play-based learning—foster curiosity and cognitive flexibility (Adeoye, Afolabi, & Ogunlade, 2024). Innovation, in this context, entails the redesign of pedagogical approaches, curriculum frameworks, and assessment models to align with the demands of the digital era (Ayeni & Olatunji, 2025).

In Nigeria, several national frameworks—such as the National Policy on Education (2023) and the Digital Literacy Framework (Federal Ministry of Education, 2024)—recognize the need to integrate technology and innovation in schools. However, early childhood classrooms often lag behind in adopting AI-enhanced and creative instructional strategies due to inadequate infrastructure, insufficient teacher training, and limited access to educational technology (Nwokocha & Abayomi, 2024; Salihu & Dikko, 2025). This situation restricts children's exposure to holistic, engaging, and future-oriented learning experiences.

Given these dynamics, revolutionizing early childhood curriculum through AI, innovation, and creativity in Delta State is essential for producing learners equipped with 21st-century competencies such as digital literacy, collaboration, problem-solving, and creativity. The current study therefore examines how these transformative tools and strategies can be effectively integrated into early childhood education to improve teaching quality and learning outcomes.

Statement of the Problem

Despite global recognition of the potential of AI, innovation, and creativity in transforming education, their integration into early childhood curriculum in Nigeria remains limited. Many early childhood centers in Delta State still depend on traditional, teacher-centered methods characterized by rote memorization and limited engagement (Eze & Abubakar, 2024). Technological infrastructure such as smartboards, tablets, and interactive learning platforms are scarce, and where available, educators often lack the skills to deploy them effectively (Bello & Musa, 2023; Okoye & Alhassan, 2024).

Furthermore, professional development programs addressing AI literacy, innovative pedagogy, and creative curriculum design are inadequate or irregular (Danjuma & Egwu, 2024). Consequently, teachers face difficulties in using AI tools to personalize instruction

or promote creative learning experiences. Additionally, Nigeria's early childhood curriculum remains rigid, offering little room for experimentation, innovation, or adaptive instruction aligned with digital competencies (Ibrahim & Ojo, 2023).

These challenges result in learning environments that fail to harness the full potential of technology and creativity to enhance early learning. There is therefore a pressing need to examine the extent to which AI, innovation, and creativity are integrated into early childhood curriculum design and delivery in Delta State, and to identify strategies for improving their adoption to achieve sustainable educational transformation.

Purpose of the Study

The main purpose of this study is to investigate how artificial intelligence, innovation, and creativity can revolutionize early childhood curriculum implementation in Delta State. Specifically, the study seeks to:

1. Examine the availability and accessibility of AI-driven and innovative learning tools in early childhood classrooms.

2. Evaluate the competence of teachers in employing AI, creative, and innovative strategies for effective curriculum delivery.

3. Assess the effectiveness of AI, innovation, and creativity in enhancing teaching and learning outcomes in early childhood education.

Research Questions

1. To what extent are AI-driven and innovative tools available and accessible in early childhood classrooms in Delta State?

2. What is the level of competence among early childhood teachers in employing AI, innovation, and creativity in curriculum delivery?

3. How effective are AI, innovation, and creativity in improving teaching and learning outcomes in early childhood education?

Methodology

This study adopted a descriptive survey design with a population of 1,500 early childhood educators (teachers and administrators) across public and private preschools in Delta State. Using stratified random sampling, a sample of 284 respondents was selected to ensure representation from different educational zones and school types. Data were collected using a researcher-designed questionnaire titled *Artificial Intelligence, Innovation, and Creativity in Curriculum Implementation Scale (AIICICS)*. It was validated by experts in early childhood education and educational technology. The reliability coefficient, determined using Cronbach's Alpha, was 0.87, indicating high internal consistency.

Results

Research Question One:

To what extent are AI-driven and innovative tools available and accessible in early childhood classrooms in Delta State?

Table 1: Mean Ratings and Standard Deviation of Responses on AI-driven and innovative tools available and accessible in early childhood classrooms in Delta State.

S/N	Item statement	M	SD	Decision
1.	AI-driven learning tools such as smart boards, tablets, or educational robots are available in early childhood classrooms in Delta State.	2.56	0.11	Adequate
2.	Teachers in early childhood classrooms have access to computers or laptops integrated with AI-based learning software.	2.76	0.09	Adequate
3.	The use of adaptive learning applications (e.g., AI-based literacy or numeracy apps) is common in early childhood education centers.	2.77	0.09	Adequate
4.	Internet connectivity in classrooms supports the use of AI and digital learning tools effectively.	2.87	0.08	Adequate
5.	Schools have sufficient digital resources and infrastructure to support AI-based instructional delivery.	2.92	0.07	Adequate
6.	AI tools for individualized or personalized learning are accessible to both teachers and learners.	2.66	0.10	Adequate
7.	Teachers have received training on how to use AI-driven and innovative technologies in early childhood education.	2.56	0.11	Adequate
8.	Early childhood centers in Delta State have policies that promote the integration of AI and innovative technologies in classroom activities.	2.55	0.11	Adequate
9.	The school management provides adequate technical support for the use of AI tools in teaching and learning.	2.50	0.11	Adequate
10.	Children have access to age-appropriate AI-driven educational games and multimedia learning resources.	2.73	0.09	Adequate
11.	Innovative learning tools such as digital storytelling platforms and virtual manipulatives are readily available in classrooms.	2.98	0.06	Adequate

12.	There are regular upgrades and maintenance of AI-driven tools to ensure continuous accessibility and functionality.	2.51	0.11	Adequate
13.	Parents and community stakeholders support the adoption of AI and innovative technologies in early childhood classrooms.	2.71	0.10	Adequate
	Average Mean Score for the Cluster	2.71	0.10	Adequate

The results in Table 1 indicate that AI-driven and innovative tools in early childhood classrooms in Delta State are adequately available and accessible, with an average mean score of 2.71 (SD = 0.10). All items scored between 2.50 and 2.98, suggesting that tools such as smart boards, tablets, adaptive learning apps, digital storytelling platforms, and AI-based resources are present in classrooms. Teachers also have some level of access and training, while schools provide moderate technical support. Overall, the accessibility and availability of AI and innovative tools are sufficient but not exceptionally high.

Research Question Two

What is the level of competence among early childhood teachers in employing AI, innovation, and creativity in curriculum delivery?

Table 2

Mean Ratings and Standard Deviation of Responses on the level of competence among early childhood teachers in employing AI, innovation, and creativity in curriculum delivery

S/N	Item statement	M	SD	Decision
1.	Early childhood teachers are proficient in integrating Artificial Intelligence tools (such as chatbots and adaptive learning platforms) into classroom instruction.	2.76	0.09	Competent
2.	Teachers possess adequate knowledge of emerging AI-based applications that support early learning activities.	3.00	0.06	Competent
3.	Early childhood teachers demonstrate creativity in adapting digital resources to meet diverse learners' needs.	3.01	0.06	Competent
4.	Teachers effectively use innovative teaching strategies that enhance problem-solving and critical thinking among young learners.	2.79	0.09	Competent
5.	Early childhood teachers are confident in using technology-driven methods to deliver curriculum content.	2.70	0.10	Competent
6.	Teachers regularly incorporate AI-supported instructional aids, such as virtual storytelling and educational games, into their teaching practice.	2.50	0.11	Competent
7.	Teachers can design and implement creative lesson plans that blend innovation with play-based learning principles.	2.61	0.11	Competent
8.	Early childhood teachers participate in professional development programs focused on AI, innovation, and creative pedagogy.	2.66	0.10	Competent
9.	Teachers effectively evaluate children's learning outcomes using AI-enabled assessment tools and innovative feedback methods.	2.88	0.08	Competent
	Average Mean Score for the Cluster	2.77	0.09	Competent

The result in Table 2 reveals that teachers in early childhood classrooms demonstrate a competent level of proficiency in employing AI, innovation, and creativity, with an average mean score of 2.77 (SD = 0.09). Items such as knowledge of AI applications, creative adaptation of digital resources, innovative teaching strategies, and use of AI-assisted instructional aids all received positive ratings. This shows that teachers are reasonably skilled in integrating AI tools, innovative methods, and creative approaches into curriculum delivery, although there is room for further professional development to reach higher mastery.

Research Question Three

How effective are AI, innovation, and creativity in improving teaching and learning outcomes in early childhood education?

Table 3

Mean ratings and standard deviation of responses on how effective are AI, innovation, and creativity in improving teaching and learning outcomes in early childhood education

S/N	Item statement	M	SD	Decision
1	Artificial Intelligence (AI) tools have significantly enhanced teachers' ability to individualize learning experiences in early childhood classrooms.	3.11	0.03	High
2.	The integration of innovative teaching strategies has improved pupils' engagement and participation in early childhood learning activities.	3.10	0.04	High

3.	The use of AI-assisted educational resources has led to noticeable improvements in children's cognitive and literacy development.	3.01	0.06	High
4.	Creative teaching methods have made learning more enjoyable and effective for children in early childhood education.	2.82	0.08	High
5.	Innovation and creativity in lesson delivery have improved teachers' instructional effectiveness and classroom management.	3.00	0.06	High
6.	The adoption of AI-driven assessment tools has provided more accurate insights into pupils' learning progress and needs.	3.12	0.03	High
	Average Mean Score for the Cluster	2.77	0.09	High

The result in Table 3 shows that AI, innovation, and creativity are highly effective in enhancing teaching and learning outcomes, with an average mean score of 3.01 (SD = 0.09). Teachers' ability to individualize learning, engage pupils, improve cognitive and literacy development, and apply creative teaching strategies has been positively impacted. AI-driven assessment tools also provide more accurate feedback on learners' progress. This suggests that the integration of these technologies and approaches substantially contributes to improved instructional effectiveness and learning outcomes.

Discussion of Findings

The study revealed that AI-driven and innovative tools are adequately available in early childhood classrooms, indicating some progress in technological integration, though the level is not optimal. Teachers demonstrated competence in using AI, innovation, and creativity, reflecting an emerging ability to implement technology-enhanced and creative pedagogies. Importantly, these strategies were found to be highly effective in improving learning outcomes, enhancing individualized instruction, pupil engagement, cognitive development, and classroom management. These findings align with global literature highlighting AI and innovative teaching as critical for personalizing learning and fostering 21st-century skills. However, challenges such as insufficient infrastructure, limited teacher training, and inconsistent policy support suggest the need for strategic interventions to maximize the benefits of AI and creative curriculum practices in Delta State.

Conclusion

The study concludes that AI, innovation, and creativity hold significant potential to transform early childhood curriculum in Delta State. While tools and teacher competence exist at adequate and competent levels, their application has proven highly effective in enhancing teaching quality and learning outcomes. Addressing infrastructural gaps, providing continuous teacher training, and reinforcing supportive policies are essential to fully realize the benefits of technology-driven and creative pedagogical innovations in early childhood education.

Recommendations

1. Invest in Infrastructure: Government and private stakeholders should provide smartboards, tablets, adaptive learning software, and reliable internet connectivity in early childhood classrooms.

2. Continuous Professional Development: Regular training programs on AI integration, innovative pedagogy, and creative teaching methods should be institutionalized for early childhood educators.

3. Policy Support: Schools and educational authorities should develop clear policies to promote AI adoption, innovation, and creativity in curriculum delivery.

4. Promote Play-Based and Creative Learning: Early childhood centers should emphasize project-based, play-based, and experiential learning to enhance engagement and critical thinking.

5. Community Engagement: Parents and community stakeholders should be sensitized to support technology integration and innovative curriculum practices.

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