SMART CURRICULUM IMPLEMENTATION FOR SUSTAINABLE EDUCATION DEVELOPMENT IN NIGERIA

By

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Abstract

The paper looked smart curriculum implementation for sustainable education development in Nigeria. Secondary data were used in the study. The data were collected from both print and online publications. Content analysis was used to analyze the selection of literature for the study. The paper concluded that smart curriculum implementation enhances personalized and adaptive learning digital skills and 21st-century competencies, improves teaching effectiveness, promotes collaborative and interactive learning enhances access, flexibility, and inclusiveness. The paper also revealed that inadequate ICT infrastructure, poor internet connectivity and high data costs, low digital literacy among teachers, high cost of technology acquisition and maintenance, resistance to change from teachers and administrators, lack of relevant and localized digital content and weak policy implementation and poor governance are some of the challenges hindering smart curriculum implementation in the Schools in Nigeria. Based on the findings, the paper recommends that **g**overnment and stakeholders should prioritize investment in ICT infrastructure, including computers, smart boards, stable electricity supply, and secure school networks. Public–private partnerships (PPPs) can help expand digital facilities, especially in rural and underserved areas. The government should collaborate with telecommunication companies to provide schools with subsidized broadband services. Community-based internet hubs, solar-powered routers, and low-cost data plans should be introduced to ensure sustainable connectivity. T Government at all levels should allocate dedicated funds for digital education. Schools should adopt cost-effective solutions—such as open-source platforms—and create maintenance plans for repairing and upgrading ICT equipment.

Keyword: Smart Curriculum School Education

1.0 Introduction

The transformation of global education in the 21st century has ushered in an era driven by digital innovation, data-driven decision-making, and learner-centered pedagogies. In Nigeria, the need to strengthen the education system and address persistent challenges—such as outdated teaching methods, limited access to quality learning resources, skills mismatch, and poor learning outcomes—has made the adoption of a **smart curriculum** increasingly important. A smart curriculum refers to a technology-enabled, flexible, dynamic, and competency-based curriculum that integrates digital tools, real-time data, personalized learning pathways, and innovative instructional strategies to improve teaching and learning processes.

As nations worldwide pursue the goals of quality, inclusiveness, and lifelong learning, smart curriculum has emerged as a critical driver of **sustainable education development**. For Nigeria, this approach holds significant potential to bridge learning gaps, promote digital literacy, enhance teacher capacity, and prepare learners for the demands of a knowledge-driven economy. By leveraging artificial intelligence, e-learning platforms, analytics, and interactive content, a smart curriculum supports equity in education, fosters creativity, and empowers learners with the skills needed for national development.

Therefore, integrating a smart curriculum into the Nigerian education system is not just a trend but a strategic pathway toward achieving educational sustainability, aligning with Sustainable Development Goal 4 (SDG 4) and promoting a resilient, future-ready generation.

2.0 Conceptual Terms

2.1 Concept of Smart Curriculum

A smart curriculum is defined as a digitally enhanced, flexible, and competency-based curriculum framework that uses ICT, data analytics, and adaptive tools to optimize teaching, learning, and assessment (European Commission. 2018). Mishra, & Koehler, (2006) define smart curriculum as a curriculum that deliberately blends technological, pedagogical, and content knowledge to create dynamic, interactive, and learner-centered educational experiences. Redecker and Punie (2017) describe smart curriculum as a learning design that integrates digital resources, personalized learning pathways, and real-time data to support innovative pedagogy and improve learner outcomes.

UNESCO (2020) views a smart curriculum as a curriculum system that employs smart technologies—such as AI, cloud learning, digital content, and mobile platforms—to support inclusive, adaptive, and sustainable learning for all. Zhu, Sun,, & Riezebos, (2016) describe smart curriculum as an intelligent, technology-supported curriculum model that integrates cloud computing, mobile learning, and analytics to deliver personalized and collaborative learning experiences.

2.2 Benefits of a smart curriculum in schools.

1. Supports Personalized and Adaptive Learning

A smart curriculum makes use of digital tools, data analytics, and artificial intelligence to tailor learning activities to each student's needs. Learners can progress at their own pace, revisit difficult concepts, and access individualized learning resources. This helps slow learners catch up while allowing gifted learners to advance beyond the standard curriculum. As a result, learner engagement, mastery, and academic performance improve.

2. Enhances Digital Skills and 21st-Century Competencies

Smart curriculum integrates ICT tools, coding, digital literacy, problem-solving activities, and online collaboration. These competencies are essential for success in a technology-driven world. Students exposed to smart learning environments become more competent in digital communication, creativity, critical thinking, and global citizenship—skills needed for future careers and sustainable development.

3. Improves Teaching Effectiveness

Teachers benefit greatly from smart curriculum because it provides interactive teaching resources, automated assessment tools, multimedia lessons, real-time analytics, and digital lesson plans. These tools help teachers save time, deliver more engaging lessons, and track learners' progress more accurately. Smart curriculum also promotes innovative teaching methods such as blended learning, flipped classrooms, and project-based learning.

4. Promotes Collaborative and Interactive Learning

Smart curriculum encourages teamwork through online discussion boards, digital group projects, virtual classrooms, and collaborative platforms. Students can share ideas, work together on assignments, and solve problems collectively. This fosters communication skills, teamwork, leadership, and social interaction—all important for personal and social development.

5. Enhances Access, Flexibility, and Inclusiveness

With smart curriculum, learning materials are available online or offline and can be accessed via mobile devices, computers, or tablets. This increases access for learners in remote areas and supports inclusive education for students with disabilities (through audio, video, captions, text-to-speech, etc.). Learning becomes flexible and continuous—beyond the limits of the physical classroom.

3.0 Method

Smart curriculum implementation for sustainable education development in Nigeria is a position paper that adopted a systematic literature review-based method. The method allows to collect and review the related previous literature from various online sources. With the aid of digital platform, the researcher collected secondary information to generate knowledge on this topic from 2015-2025. The position paper followed qualitative narrative design method. The researcher has visited different online sites to collect the previous literature and analyze the Smart curriculum implementation for sustainable education development in Nigeria. The previous findings are critically analyzed and presented in different themes as on the Smart curriculum implementation for sustainable education development in Nigeria (Adapted from Ogunode, 2025).

Inclusion and exclusion criteria

Inclusion

This output of the literatures on the Smart curriculum implementation for sustainable education development in Nigeria presents an in-depth study and result that can infer conclusion on the topic. The study includes: online publication; conference paper, journals sorted from reputable international journals such as CEON, Elsevier, Hindawi, JSTOR, IEEE, Learn Techlib, SAGE, Nebraska and Springer (Adapted from Ogunode, 2025v).

Exclusion

Also, the literature review excludes information from edited books, preprints, monographs, information below 2015 and book chapters (Adapted from Ogunode, 2025).

4.0 Challenges facing the deployment of smart curriculum in schools

1. Inadequate ICT Infrastructure

Many schools lack basic digital facilities such as computers, smart boards, projectors, servers, and stable electricity. Without these foundational tools, it becomes impossible to deploy smart curriculum effectively. Rural schools are particularly disadvantaged, widening the digital divide. Many Nigerian schools lack basic ICT infrastructure — computers, projectors, reliable electricity, functioning ICT labs, or adequate networking equipment. In Nigeria. Even where some equipment exists, it is often outdated or insufficient for effective teaching and learning purposes. A related issue is unreliable or absent electricity supply, especially in rural or underserviced areas, which makes it difficult to power ICT equipment consistently. Without adequate ICT infrastructure, efforts to run a smart curriculum remain largely theoretical: students and teachers cannot access the digital tools needed for e-learning, multimedia lessons, online assessments, or interactive content.

2. Poor Internet Connectivity and High Data Costs

Smart curriculum requires stable broadband to access digital content, cloud platforms, and online assessments. However, many schools in Nigeria experience slow, unreliable, or expensive internet service. This disrupts lessons, reduces effectiveness, and discourages teachers and learners. Many schools (especially outside big cities) have limited or unreliable internet connectivity, slow speeds, or no broadband access at all. Even when internet services exist, their cost (data charges) tends to be high — making regular online learning, streaming, or downloading of resources expensive and often unaffordable. These issues are exacerbated by irregular electricity/power supply, which further undermines the possibility of continuous use of online platforms and digital content. As a result, reliance on internet-enabled learning (e.g. online lessons, virtual classrooms, downloadable content) becomes unreliable or impossible, especially for public schools and low-income communities.

3. Low Digital Literacy Among Teachers

A major barrier is that many teachers lack the digital skills needed to integrate technology into their teaching. Some are unfamiliar with e-learning platforms, digital assessment tools, and ICT-based pedagogy. This results in resistance, reduced confidence, and poor implementation. A common challenge is that many teachers do not have sufficient ICT skills or training to effectively integrate digital tools, platforms, and pedagogies into teaching. In many cases, teacher-training curricula themselves lack emphasis on ICT competences; hence new teachers enter the workforce without adequate digital literacy. Even when ICT infrastructure is provided, lack of user skill means equipment remains underutilized — sometimes gathering dust unused because teachers feel uncomfortable or unprepared to integrate them into lesson delivery. Continuous professional development (in-service training, refresher courses) is often missing, leaving teachers ill-prepared to adapt to new digital tools or evolving instructional technologies.

4. High Cost of Technology Acquisition and Maintenance

Smart curriculum requires investment in hardware, software, training, and IT support. Many schools—especially public schools—struggle with limited funding. The cost of maintenance, upgrades, and repairs further increases the financial burden. Procuring computers, tablets, networking equipment, projectors, software licenses, and other ICT tools is expensive — a significant barrier especially for public schools or underfunded institutions. Beyond purchase, maintaining the equipment (repairs, software updates, network maintenance) requires ongoing funding, which many schools cannot afford. The devaluation of local currency, import costs, stagnant budgets for education, and competing financial demands make it difficult to allocate funds consistently for ICT upkeep. As a result, even when initial deployment happens, sustainability becomes a major problem — equipment becomes obsolete, breaks down, or isn't replaced; labs fall into disuse.

5. Resistance to Change from Teachers and Administrators

Some educators prefer traditional teaching methods and are reluctant to adopt technology-based approaches. Fear of technology, lack of motivation, and limited support can slow down acceptance of smart curriculum initiatives. Many educators and school leaders are accustomed to traditional, teacher-centered, textbook-based teaching methods; shifting to technology-mediated, student-centered delivery represents a significant cultural and institutional change. Lack of familiarity with ICT, fear of incompetence, and possible discomfort with new roles (e.g. facilitating rather than lecturing) fuel reluctance among some teachers. Administrators or policymakers sometimes lack the commitment or vision to prioritize ICT integration — without strong leadership buy-in, policies or investments remain weak or inconsistent. This "resistance to change" means that even where resources are available, adoption can be slow, partial, or non-existent; many schools continue with traditional methods, limiting the reach of a smart curriculum.

6. Lack of Relevant and Localized Digital Content

Most available digital materials are foreign-based and do not align with the national curriculum or local realities. Without culturally relevant content, students may struggle to relate or may rely on inappropriate resources. This limits the curriculum's impact and effectiveness. Even when ICT infrastructure and connectivity exist, there is often a dearth of digital learning content tailored to the Nigerian curriculum, cultural context, or local languages. Many available educational software or digital resources are generic, foreign-oriented, or not aligned with national curriculum standards — reducing their relevance, acceptability, and pedagogical value. Without context-appropriate materials (textbooks, lessons, interactive modules), digital learning risks being superficial or ineffective; teachers may revert to traditional content or ignore the digital tools altogether. Also, content creation capacity (local expertise in software development, educational content design) is limited; this makes it difficult to scale up the production of high-quality, culturally relevant digital content.

7. Weak Policy Implementation and Poor Governance

Although policies promoting ICT in education exist, implementation is often weak due to bureaucratic delays, insufficient funding, lack of monitoring, and inconsistent leadership. Without strong governance and clear guidelines, smart curriculum initiatives fail to achieve desired goals. While ICT-in-education policies may exist on paper, implementation is often inconsistent, underfunded, or lacking follow-up — many schools do not receive promised infrastructure or training. There is often no robust regulatory or monitoring framework to ensure that ICT integration projects are maintained, upgraded, or used effectively over tim. Administrative inertia, bureaucratic delays, lack of accountability, and limited coordination among government agencies, education authorities, and school management undermine systematic deployment of smart curriculum. This weak governance means efforts are fragmented — some schools (often private or urban) may enjoy ICT benefits, while many public and rural schools remain untouched. The result is unequal access and continued digital divide.

4.1 Conclusion and recommendations

The paper looked smart curriculum implementation for sustainable education development in Nigeria. The paper concluded that smart curriculum implementation enhances personalized and adaptive learning digital skills and 21st-century competencies, improves teaching effectiveness, promotes collaborative and interactive learning enhances access, flexibility, and inclusiveness. The paper also revealed that inadequate ICT infrastructure, poor internet connectivity and high data costs, low digital literacy among teachers, high cost of technology acquisition and maintenance, resistance to change from teachers and administrators, lack of relevant and localized digital content and weak policy implementation and poor governance are some of the challenges hindering smart curriculum implementation in the Schools in Nigeria.

Based on the challenges facing the deployment of smart curriculum in schools. The following recommendations were made:

1. Strengthen ICT Infrastructure in Schools

Government and stakeholders should prioritize investment in ICT infrastructure, including computers, smart boards, stable electricity supply, and secure school networks. Public–private partnerships (PPPs) can help expand digital facilities, especially in rural and underserved areas.

2. Expand Affordable and Reliable Internet Connectivity

The government should collaborate with telecommunication companies to provide schools with subsidized broadband services. Community-based internet hubs, solar-powered routers, and low-cost data plans should be introduced to ensure sustainable connectivity.

3. Enhance Digital Literacy Through Continuous Teacher Training

Teachers should receive regular professional development on digital pedagogy, use of smart devices, online assessment tools, and classroom technology management. Teacher-training institutions should also integrate ICT competencies into their curriculum.

4. Provide Adequate Funding for Technology Acquisition and Maintenance

Government at all levels should allocate dedicated funds for digital education. Schools should adopt cost-effective solutions—such as open-source platforms—and create maintenance plans for repairing and upgrading ICT equipment.

5. Promote Positive Attitudes Toward Technology Adoption

Awareness programs, motivational workshops, and peer mentoring should be used to encourage teachers and administrators to embrace smart curriculum practices. Incentives such as awards, promotions, and recognition can motivate staff to use technology effectively.

6. Develop Localized and Culturally Relevant Digital Content

Curriculum developers, educators, and ICT experts should collaborate to produce digital learning materials aligned with the Nigerian curriculum and cultural context. Local content in local languages can increase relevance, accessibility, and student engagement.

7. Strengthen Policy Implementation and Monitoring

Government agencies should enforce implementation of ICT-in-education policies through clear guidelines, regular monitoring, and evaluation. A national framework for smart curriculum deployment should be developed to ensure consistency, accountability, and sustainability.

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