impact International Journals and Publications

© IIJP 2026 | Volume 2, Issue 3, pp. 1830-1842 | ISSN: 2636-4484

DYNAMIC KNOWLEDGE CHANGE AND EDUCATIONAL TECHNOLOGY INTEGRATION IN MATHEMATICS CURRICULUM IMPLEMENTATION IN NIGER STATE, NIGERIA

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ARTICLE INFO

Article No.: 0552

Accepted Date: 17/08/2026

Published Date: 09/09/2026

Type: Research

ABSTRACT

The study was motivated by the need for curriculum systems that respond to evolving knowledge demands and technological advancement, as well as the persistent gap between curriculum policy and classroom practice. The study examined curriculum implementation as a process of dynamic knowledge change, assessed the extent of educational technology integration, and identified factors influencing effective integration of educational technology in secondary schools. A descriptive survey research design was adopted. The study was conducted in 50 secondary schools (20 public and 30 private) in Kontagora Local Government Area of Niger State, Nigeria, involving 159 teachers and school administrators selected through a multi-stage sampling technique. Data were collected using a structured questionnaire titled *Dynamic Knowledge Change and Educational Technology Integration Questionnaire (DKCETIQ)*, which was validated by experts and yielded a reliability coefficient of 0.709 using Cronbach's Alpha. Data were analyzed using mean and grand mean statistics. Findings revealed that curriculum implementation does not adequately reflect dynamic knowledge change (Grand Mean = 1.83), indicating a predominantly traditional approach to teaching and learning. Educational technology was integrated to a moderate extent (Grand Mean = 2.64), although implementation varied across schools. The findings further indicated limited influence of knowledge change on teaching practices and inadequate recognition of barriers to effective technology integration. The study concludes that meaningful curriculum transformation requires stronger alignment between dynamic knowledge change and educational technology integration. A key limitation is that the study was confined to secondary schools in Kontagora Local Government Area, which may limit the generalizability of the findings to other local government areas in Niger State.

Keywords: dynamic knowledge change, educational technology, curriculum implementation, secondary schools, Niger State.

1. Introduction

The rapid development of scientific knowledge, technological innovation, and digital communication has transformed how knowledge is produced, accessed, and applied. In contemporary education, knowledge is increasingly dynamic, requiring curriculum systems to remain flexible and responsive to changing societal and technological demands (Tebu, *et al,*2025). highlights the implications of these global changes for education and the teaching profession, particularly the need for educational systems to prepare learners for changing social and professional environments. Consequently, effective curriculum implementation requires more than the transmission of established knowledge; it requires continuous adaptation of teaching and learning processes to emerging knowledge and skills Educational technology has become an important component of this transformation. Digital learning platforms, artificial intelligence applications, virtual learning environments, and other technology-supported instructional tools provide opportunities for new approaches to teaching, learning, and knowledge construction. However, the effective integration of technology depends on teachers' readiness, professional development, pedagogical adaptation, institutional support, and the availability of appropriate technological resources. Studies on ICT and educational technology integration have continued to identify challenges associated with infrastructure, teacher capacity, access, and the effective use of technology in educational settings (Msafiri *et al*., 2023; Ranbir, 2024). In Nigeria, the transformation of the educational system through digital technology has similarly generated both opportunities and challenges. Irele (2021) identifies challenges and prospects associated with digital integration in the Nigerian educational system, while (Wakil *et al.* 2024) examine the transformation of teaching and learning through new and emerging information technology trends. Chukwuemeka *et al.,* (2025) further examine the movement from traditional to smart education in Nigeria, highlighting challenges and opportunities for learning. These developments indicate the growing importance of aligning curriculum implementation with technological change and emerging knowledge demands. Despite these developments, the relationship between dynamic knowledge change, curriculum implementation, and educational technology integration remains an important issue for secondary education. Curriculum flexibility and responsiveness to change are increasingly necessary in the digital age (Romadhon & Aslan, 2025). While curriculum innovation remains relevant to educational development in Nigeria (Adeleke *et al*., 2025). However, the extent to which curriculum implementation reflects dynamic knowledge change and the factors influencing effective educational technology integration in secondary schools require further examination. This study therefore examines curriculum implementation as a process of dynamic knowledge change, assesses the extent of educational technology integration, and identifies factors influencing effective integration of educational technology in selected secondary schools in Niger State.

Literature Review

Romadhon & Aslan (2025) focus on curriculum flexibility in the digital age and efforts to build education that is responsive to change. Adeleke *et al.* (2025) examine curriculum innovation and sustainable development in Nigerian education, while Kingsley (2026) examines social studies curriculum implementation and peace building among students in colleges of education in North-Central Nigeria. These works collectively address curriculum implementation, innovation, flexibility, and responsiveness to changing educational demands. Several studies focus on the integration of educational technology and ICT into teaching and learning. Msafiri *et al*., (2023) provide a systematic literature review of ICT integration in secondary education, addressing what works, what does not, and future directions. Ranbir (2024) examines challenges and opportunities

associated with educational technology integration, while (Irele., 2021) discusses digital integration into the Nigerian educational system, particularly its challenges and prospects. Wakil *et al* (2024) consider the transformation of teaching and learning through new and emerging IT trends in the Nigerian educational system. Chukwuemeka *et al*. (2025) examine the transformation from traditional to smart education in Nigeria, focusing on challenges and opportunities for learning. The changing role of teachers in technology-mediated and contemporary educational environments is addressed in several studies. Souza (2024) considers global perspectives on the right to education and their implications for the teaching profession. Rahimi and Oh (2024) examine the role of educators in the 21st century in relation to globalization, technology, and pandemics. Afeni and Ariyibi (2025) focus specifically on teachers' readiness and professional development for technology integration in the 21st-century Nigerian classroom. (Hennessy,. 2025) examines educational dialogue around shared artefacts in technology-mediated contexts. Kosoko-Oyedeko and Ojewunmi focus on leveraging educational technology for teachers' professional development. The literature also considers changes in pedagogical approaches associated with contemporary education. Bature (2020) examines the shift among mathematics teachers from the traditional teacher-centred classroom toward a more constructivist, student-centred epistemology. (Wu,. 2024) addresses critical-thinking pedagogical design in an era of ChatGPT and other artificial intelligence tools, with attention to shifting from teaching "what" toward teaching "why" and "how." Paramole *et al*., (2025) examine assessment literacy and its enhancement within modern education systems. Mohmmed *et al*. (2020) examine emergency remote teaching during the Coronavirus pandemic at Middle East College Oman Rahimi and Oh,. (2024) also consider the role of educators in the context of pandemics alongside globalization and technology. These studies address educational responses to changing circumstances and technology-mediated teaching and learning. Olatunde and Adediran. (2023) assess the impact of globalization on the development of the education system in Nigeria. Souza (2024) examines global perspectives on the right to education and implications for the teaching profession, while (Rahimi & Oh.,2024) address globalization, technology, and pandemics in relation to the changing role of educators. Matthias *et al*. (2025) examine knowledge and adaptability of the Nigerian construction workforce toward sustainable construction practices. In the context of the literature supplied, this work addresses knowledge and adaptability within changing professional practices.

Purpose of the Study

This study examines curriculum as a process of dynamic knowledge change and its implications for educational technology integration in secondary schools in Niger State. It focuses on the influence of evolving knowledge demands on curriculum implementation, instructional practices, and digital technology use, while identifying contextual factors affecting effective practice. The study provides evidence to inform curriculum development, teacher capacity building, and policy implementation.

Objective of the study.

1. To examine curriculum implementation as a process of dynamic knowledge change in selected secondary schools in Niger State.

2. To assess the extent of integration of educational technology in implementing secondary school curriculum in selected secondary schools in Niger State.

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3. To identify the factors influencing the effective integration of educational technology in response to dynamic curriculum change in selected secondary schools in Niger State.

Research question

Based on the purpose of the study, the following research questions will guide the investigation:

1. How is curriculum implemented as a process of dynamic knowledge change in selected secondary schools in Niger State?
2. What is the extent of integration of educational technology in implementing secondary school curriculum in selected secondary schools in Niger State?
3. What factors influence the effective integration of educational technology in response to dynamic curriculum change in selected secondary schools in Niger State**?**

The following null hypotheses will be tested at the 0.05 level of significance:
H_{01}: There is no significant relationship between dynamic knowledge change and curriculum implementation in selected secondary schools in Niger State.

H_{02}: There is no significant relationship between the integration of educational technology and effective curriculum implementation in selected secondary schools in Niger State.

H_{03}: There is no significant relationship between the identified factors influencing educational technology integration and the effective integration of educational technology in response to dynamic curriculum change in selected secondary schools in Niger State.

Methodology

The study adopted a descriptive survey research design. The design was considered appropriate because it enables the collection of data on respondents' perceptions, experiences, and practices concerning dynamic knowledge change and the integration of educational technology in curriculum implementation without manipulating the study environment. It was particularly suitable for describing existing conditions and examining the extent to which curriculum implementation and educational technology integration reflect changing knowledge demands in secondary schools.

The study was conducted in Kontagora Local Government Area of Niger State, Nigeria, within Zone C of the state. Kontagora was selected as the study area because of the relevance of curriculum modernization and educational technology integration to contemporary secondary education, as well as the practical challenges associated with infrastructure, teacher capacity, and access to digital resources. The study covered both public and private secondary schools in the Local Government Area to provide a broader representation of curriculum implementation practices across different school settings.

The population of the study comprised teachers and school administrators in public and private secondary schools in Kontagora Local Government Area. These respondents were considered

appropriate because they are directly involved in curriculum implementation and the use of educational technology in teaching and learning.

A multi-stage sampling technique was employed to select the participants. At the first stage, Kontagora Local Government Area was purposively selected as the study area. At the second stage, 50 secondary schools comprising 20 public and 30 private schools were selected for inclusion in the study. At the third stage, teachers and school administrators were selected from the sampled schools using an appropriate random sampling procedure to provide eligible staff with an opportunity to participate. A total of 159 secondary school staff participated in the study.

Data were collected using a researcher-developed structured questionnaire titled *Dynamic Knowledge Change and Educational Technology Integration Questionnaire (DKCETIQ)*. The instrument was developed based on the objectives of the study, the research questions, and relevant literature on dynamic knowledge change, curriculum implementation, and educational technology integration.

The questionnaire consisted of two sections. Section A elicited demographic information from the respondents, while Section B contained items measuring curriculum implementation in relation to dynamic knowledge change, the extent of educational technology integration, and factors influencing technology-mediated curriculum delivery. The items were structured on a four-point Likert scale ranging from 1 = Strongly Disagree, 2 = Disagree, 3 = Agree, and 4 = Strongly Agree.

To establish the face and content validity of the instrument, the questionnaire was subjected to expert review by specialists in Curriculum Studies, Educational Technology, and Measurement and Evaluation. The experts assessed the items for clarity, relevance, adequacy, and alignment with the objectives of the study. Their observations and recommendations were incorporated into the instrument before its final administration.

The reliability of the DKCETIQ was established through a pilot test conducted among respondents who were not included in the main study but possessed characteristics similar to those of the target population. The data obtained from the pilot administration were subjected to Cronbach's Alpha analysis to determine the internal consistency of the questionnaire items.

The instrument yielded a Cronbach's Alpha coefficient of 0.709, indicating an acceptable level of internal consistency. According to the commonly used guidelines of (Kennedy 2022).

alpha coefficients above 0.70 are considered acceptable, those above 0.80 are regarded as good, and those above 0.90 are considered excellent. The coefficient of 0.709 therefore suggests that the instrument demonstrated adequate internal consistency for the purposes of the study.

The questionnaire was administered personally by the researcher with the assistance of trained research assistants. The research assistants were adequately briefed on the purpose of the study and the procedures for administering and retrieving the questionnaires to ensure consistency in data collection. Respondents were given sufficient time to complete the questionnaire, after which the completed copies were retrieved immediately or within an agreed period.

Data collected from the respondents were analyzed using descriptive statistics. Specifically, mean and grand mean statistics were used to answer the research questions and determine respondents'

perceptions regarding curriculum implementation, dynamic knowledge change, educational technology integration, and factors influencing technology-mediated curriculum delivery. The four-point Likert scale was interpreted based on the established decision criterion used in the study.

4. Result

Assumption Used for Interpretation

As the questionnaire uses a **4-point Likert scale,** the standard decision rule is:

3.50 – 4.00 = Strongly Agree / Very High
2.50 – 3.49 = Agree / High
1.50 – 2.49 = Disagree / Low
1.00 – 1.49 = Strongly Disagree / Very Low

Research Question 1

How is curriculum implemented as a process of dynamic knowledge change in selected secondary schools in Niger State?

Table 1: Curriculum Implementation as Dynamic Knowledge Change

S/N	Item	Mean	Decision
1	Curriculum as Dynamic Knowledge Change Item 1	1.93	Disagreed
2	Curriculum as Dynamic Knowledge Change Item 2	1.75	Disagreed
3	Curriculum as Dynamic Knowledge Change Item 3	1.79	Disagreed
4	Curriculum as Dynamic Knowledge Change Item 4	1.71	Disagreed
5	Curriculum as Dynamic Knowledge Change Item 5	1.79	Disagreed
6	Curriculum as Dynamic Knowledge Change Item 6	2.00	Disagreed
Grand Mean		**1.83**	**Disagreed**

Interpretation

The result in Table 1 indicates that all six items measuring curriculum implementation as a process of dynamic knowledge change recorded mean scores below the criterion mean of 2.50. The grand mean of **1.83** shows that respondents generally disagreed that curriculum implementation in

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selected secondary schools in Niger State reflects dynamic knowledge change. This suggests that curriculum implementation remains largely traditional and static, with limited adaptation to emerging knowledge trends, digital competencies, and evolving societal needs.

Research Question 2

What is the extent of integration of educational technology in implementing secondary school curriculum in selected secondary schools in Niger State?

Table 2: Extent of Integration of Educational Technology

S/N	Item	Mean	Decision
1	Integration of Educational Technology Item 1	2.93	Agreed
2	Integration of Educational Technology Item 2	3.18	Agreed
3	Integration of Educational Technology Item 3	1.93	Disagreed
4	Integration of Educational Technology Item 4	2.89	Agreed
5	Integration of Educational Technology Item 5	2.82	Agreed
6	Integration of Educational Technology Item 6	2.07	Disagreed
Grand Mean		**2.64**	**Agreed**

Table 2 shows that the grand mean of 2.64 exceeds the criterion mean of 2.50, indicating that educational technology is integrated into secondary school curriculum implementation to a moderate extent in selected secondary schools in Niger State. While respondents agreed on several indicators of technology integration, disagreement on some items suggests that integration remains inconsistent across schools and teaching contexts.

Research Question 3

What factors influence the effective integration of educational technology in response to dynamic curriculum change in selected secondary schools in Niger State?

Table 3: Factors Influencing Effective Integration of Educational Technology

A. Influence of Knowledge Change on Teaching Practice

S/N	Item	Mean	Decision

1	Influence on Teaching Practice Item 1	1.57	Disagreed
2	Influence on Teaching Practice Item 2	1.68	Disagreed
3	Influence on Teaching Practice Item 3	2.00	Disagreed
4	Influence on Teaching Practice Item 4	1.79	Disagreed
Grand Mean		**1.76**	**Disagreed**

B. Challenges to Technology Integration

S/N	Item	Mean	Decision
1	Challenge Item 1	1.54	Disagreed
2	Challenge Item 2	1.61	Disagreed
3	Challenge Item 3	1.46	Strongly Disagreed
4	Challenge Item 4	1.86	Disagreed
5	Challenge Item 5	1.57	Disagreed
Grand Mean		**1.61**	**Disagreed**

Table 3 reveals that respondents generally disagreed that knowledge change significantly influences teaching practice in the selected secondary schools, as indicated by the grand mean of **1.76**. Similarly, the grand mean of **1.61** for challenges to technology integration suggests that respondents did not strongly perceive the listed factors as major barriers to educational technology integration. However, the generally low scores may indicate weak awareness or limited recognition of the systemic factors affecting technology integration.

Discussion

The findings of this study provide empirical insight into the relationship between dynamic knowledge change and the integration of educational technology in secondary school curriculum implementation in Niger State.

The first finding revealed that curriculum implementation in selected secondary schools in Niger State does not significantly reflect curriculum as a process of dynamic knowledge change, as evidenced by the grand mean of 1.83, which falls below the criterion mean of 2.50. This suggests that curriculum delivery in the sampled schools remains largely traditional, static, and

insufficiently responsive to evolving knowledge demands, technological advancement, and contemporary educational trends. This finding aligns with the position of (Nkok & Nkok 2025).who argued that many educational systems still operate within rigid curriculum frameworks despite the increasing need for adaptive and dynamic curriculum models. The finding also supports (Adam & Nwigwe, 2026).

Who maintained that dynamic curriculum implementation requires continuous updating of instructional content, teaching methods, and learning objectives to reflect current societal and technological realities.

The second finding showed that educational technology is integrated into curriculum implementation to a moderate extent in selected secondary schools in Niger State, with a grand mean of 2.64. This indicates that while educational technology is being utilized in some aspects of teaching and learning, its integration is neither comprehensive nor consistent across schools. This finding corroborates (Ebony et al., 2026). who reported that educational technology integration in many developing educational contexts remains partial and uneven, often characterized by occasional rather than systematic use. The moderate level of integration observed may reflect growing awareness of digital instructional tools among teachers while simultaneously indicating persistent limitations in infrastructure, access, and pedagogical application.

The third finding revealed that respondents generally disagreed that knowledge change significantly influences teaching practice and did not strongly perceive the identified factors as major barriers to technology integration, as indicated by grand means of 1.76 and 1.61 respectively. Although this finding suggests low perceived influence of dynamic knowledge change on pedagogical practice and minimal recognition of barriers to technology integration, it may also reflect limited awareness among respondents regarding the broader systemic and pedagogical implications of dynamic curriculum reform. This finding contrasts with Frontiers (Editorial, 2025) & (Msafiri *et al.,* 2023), who identified teacher competence, infrastructure deficits, inadequate training, and weak policy implementation as significant barriers to educational technology integration in developing contexts. The discrepancy may indicate either contextual variation or respondents' limited sensitivity to institutional constraints affecting technology-mediated curriculum implementation.

Overall, the findings suggest that while some efforts toward educational technology integration exist within the selected secondary schools, curriculum implementation remains insufficiently aligned with the principles of dynamic knowledge change. The persistence of traditional instructional approaches and moderate technological adoption indicates that substantial work remains to achieve responsive, technology-enhanced curriculum delivery in Niger State secondary schools.

Conclusion

The study concludes that the major challenge facing curriculum implementation in the selected secondary schools in Niger State is not simply the availability or use of educational technology, but the limited transformation of curriculum practice in response to changing knowledge demands. The evidence indicates a gap between the expectation of a responsive, knowledge-driven curriculum and the realities of classroom implementation. Although educational technology has

gained a moderate presence in instructional practice, its contribution to curriculum transformation remains constrained by the limited integration of emerging knowledge, contemporary pedagogical approaches, and technology-supported teaching practices.

The findings further suggest that sustainable curriculum transformation requires more than the introduction of digital tools. It depends on the capacity of teachers and schools to continuously adapt curriculum content, instructional practices, and learning processes to changing educational and technological contexts. Consequently, curriculum modernization in Niger State should be approached as a continuous institutional process involving curriculum renewal, teacher development, technological support, and effective implementation mechanisms. The central implication is that meaningful educational technology integration will be achieved only when technology is embedded within a broader culture of continuous curriculum adaptation and professional practice.

Finally Future researcher should investigate the relationship between dynamic knowledge change, educational technology integration, and students' learning outcomes using mixed-method or longitudinal designs and objective measures such as classroom observations and academic performance for future Studies.

Recommendation

I. Integrated Curriculum Reform and Policy Enforcement
Educational authorities and curriculum planners should undertake periodic curriculum review and modernization to align with emerging knowledge trends, digital competencies, and 21st-century learning demands. This effort must be supported by strong policy implementation and continuous monitoring frameworks to ensure that curriculum innovations are effectively translated into classroom practice.

ii. Government and school administrators should institutionalize continuous professional development programmes, including workshops and in-service training, aimed at equipping teachers with both pedagogical and technological competencies. Emphasis should be placed on fostering learner-centred, technology-integrated instructional approaches that promote critical thinking, collaboration, and inquiry-based learning.

iii. Provision and Utilization of Educational Technology Infrastructure
Relevant stakeholders should prioritize the provision of adequate educational technology infrastructure—such as reliable internet access, digital devices, and smart classroom tools—while also promoting awareness and effective utilization among teachers and school leaders to support dynamic curriculum implementation.

iv. The Ministry of Education and school management boards should establish regular monitoring and evaluation frameworks to assess the extent to which curriculum implementation reflects dynamic knowledge change and technology-supported pedagogical practices. Periodic classroom observations, curriculum audits, and performance reviews should be conducted to ensure compliance with curriculum innovation objectives and to provide evidence-based feedback for continuous improvement.

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v. School administrators and educational agencies should encourage teachers to participate in professional learning communities, academic conferences, curriculum review workshops, and digital learning networks. Such initiatives will enhance teachers' awareness of emerging knowledge trends, strengthen their capacity to adapt instructional practices to contemporary realities, and improve their responsiveness to curriculum change.

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