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RESEARCH GROWTH AND THEMATIC PRIORITIES IN NIGERIAN MATHEMATICS EDUCATION: A WEB OF SCIENCE BIBLIOMETRIC PERSPECTIVE

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Abstract

Research in mathematics education in Nigeria has expanded significantly over the past six decades, reflecting evolving pedagogical priorities and increasing scholarly engagement. This study employed a bibliometric research design to examine the growth patterns, publication trends, and dominant thematic priorities of mathematics education research in Nigeria from 1960 to 2025, using the Web of Science Core Collection. A total of 1,230 publications were analyzed using descriptive and inferential bibliometric techniques, including frequency analysis, co-authorship networks, citation analysis, and thematic mapping, with visualization through VOSviewer and Bibliometrix. Findings indicate a clear upward trajectory in publication output, with minimal research in the 1960s–1970s, moderate growth in the 1980s–1990s, and substantial increases from 2000 onward, reflecting expanded research capacity, institutional development, and global visibility. Thematic analysis revealed that curriculum and teaching methods were dominant in the early decades, while student achievement, problem-solving, technology integration, equity, and teacher professional development emerged as prominent research areas in recent years. These findings suggest that Nigerian mathematics education research has not only grown quantitatively but has also diversified qualitatively, addressing both foundational and contemporary educational challenges. Based on the findings, the study recommends strengthening research capacity and collaboration, and focusing future investigations on emerging and understudied themes to enhance the relevance, inclusivity, and impact of mathematics education scholarship in Nigeria.

Keywords: Mathematics education, Nigeria, Bibliometric analysis, Thematic priorities, Research trends, Web of Science

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Introduction

In Nigeria, research in mathematics education has expanded substantially in recent decades, reflecting increasing scholarly attention to teaching methods, curriculum innovations, assessment practices, and learner outcomes (Akinyemi & Oloyede, 2018; Okafor & Nwosu, 2021). This growth has been influenced by broader educational reforms, demands for improved STEM competencies, and the globalisation of academic publishing, which have encouraged Nigerian scholars to publish in internationally indexed outlets (Adediran, 2019; Ezeh & Umunna, 2022). As a result, the landscape of mathematics education research in Nigeria now encompasses diverse topics that extend beyond traditional concerns, including technology integration, teacher professional development, problem-solving pedagogies, and gender-related achievement gaps (Bello & Musa, 2020; Chukwu & Ibe, 2023).

Despite this proliferation, the trajectory and structure of mathematics education research in Nigeria have not been comprehensively mapped using bibliometric methods. Bibliometric analysis provides quantitative insights into publication patterns, citation impact, collaboration networks, and thematic emphases across a body of literature (Donthu, Kumar, &Pattnaik, 2021). In the global context, such analyses have revealed how research fields evolve, which topics gain prominence over time, and how scholarly communities interconnect (Zupic&Čater, 2015). However, in the Nigerian context, few studies have systematically leveraged databases like the Web of Science to examine the growth pattern and thematic priorities of mathematics education research, leaving an important gap in understanding the field's development (Ibrahim & Oladipo, 2024; Okeke &Aderinto, 2023).

Existing reviews of mathematics education in Nigeria tend to be narrative or domain-specific, focusing on isolated aspects such as instructional strategies or learner attitudes (Ogunleye, 2019; Afolabi & Kalu, 2022). While these contributions illuminate particular issues, they do not provide a holistic view of the field's intellectual structure, dominant themes, and temporal trends. Bibliometric studies elsewhere have demonstrated the value of mapping thematic clusters and research fronts to guide future inquiry and policy (Chen, 2017; van Eck & Waltman, 2014). Applying such an approach to Nigerian mathematics education research could identify which areas have garnered sustained attention, which topics are emerging, and where gaps persist.

Furthermore, understanding publication trends and thematic priorities is critical for stakeholdersincluding researchers, educators, and policymakersto appreciate how the field has responded to educational challenges and opportunities. For instance, shifts towards studies on technology-enhanced learning or equity issues may reflect broader pedagogical trends and national educational priorities (Adeyemi & Olusanya, 2021; Nwankwo & Eze, 2023). By contrast, underrepresentation of areas such as assessment innovation or teacher identity in indexed research could signal needs for targeted support or capacity development.

Given these considerations, a bibliometric perspective anchored in the Web of Science database is both timely and necessary. Such an analysis can quantitatively chart the field's expansion, reveal its thematic contours, and situate Nigerian mathematics education research within wider scholarly currents. By doing so, the present study not only contributes to meta-knowledge about research growth and priorities but also offers direction for future scholarship and strategic investment in mathematics education research in Nigeria.

Purpose of the Study

The study synthesized existing research literature on mathematics education in Nigeria indexed in the Web of Science database through a bibliometric analysis approach. Specifically, the study achieved the following:

1. To examine the growth pattern and publication trends of mathematics education research in Nigeria, including annual research output, citation impact, and temporal evolution.
2. To identify the dominant thematic priorities in Nigerian mathematics education research and trace their development over time.

Empirical Review

Empirical studies on mathematics education research in Nigeria have documented significant growth in scholarly output, methodological approaches, and research focus over the past six decades. Early investigations concentrated primarily on curriculum development, teaching methods, and learner achievement, often employing descriptive and experimental designs to evaluate instructional effectiveness in secondary and tertiary schools (Adeyemi, 2009; Ogunniyi & Fadamiro, 2017). Bibliometric evidence suggests that publication volumes were relatively low during the 1960s and 1970s, reflecting limited research infrastructure and fewer academic journals (Fajemidagba, 2019). From the 1980s onward, there was a gradual increase in scholarly output, coinciding with national policy reforms and the expansion of universities in Nigeria (Adeyemi & Ajayi, 2020). More recent studies have adopted diverse methodologies—including quantitative, qualitative, and mixed-method approaches—exploring areas such as problem-solving strategies, instructional technology use, and learner diversity (Oloyede & Adebayo, 2022; Onyekachi & Chukwuma, 2022). Despite these advances, there is a paucity of systematic bibliometric analyses examining publication trends, citation impact, and the temporal evolution of mathematics education research in Nigeria. Hence, the first research question is: *What are the publication trends and growth patterns of mathematics education research in Nigeria from 1960 to date?*

Regarding thematic priorities, empirical investigations indicate that research topics in Nigerian mathematics education have evolved in response to curriculum reforms, pedagogical innovations, and societal needs. Early research emphasized traditional teaching strategies and learner achievement, while more recent studies have explored the integration of digital tools, problem-solving pedagogies, gender and equity issues, and assessment innovations (Afolabi & Kalu, 2022; Chukwu & Ibe, 2023). Bibliometric studies in similar educational contexts have shown that mapping thematic clusters and tracing their evolution over time can reveal emerging research fronts and highlight areas that require further scholarly attention (Chen, 2017; Zupic & Čater, 2015). In Nigeria, however, few studies have systematically analyzed dominant thematic priorities or examined their development over time, limiting the understanding of research focus and knowledge gaps in the field. Hence, the second research question is: *What are the dominant thematic priorities in Nigerian mathematics education research, and how have they developed over time?*

Research Method

This study adopted a bibliometric research design to systematically examine the growth pattern and thematic priorities of mathematics education research in Nigeria from 1960 to date. Bibliometric analysis is a quantitative approach that employs statistical and computational techniques to evaluate patterns and trends in scholarly publications, including authorship, institutional contributions, citation impact, collaboration networks, and thematic evolution (Donthu, Kumar, Mukherjee, Pandey, & Lim, 2021; Aria & Cuccurullo, 2017). By

using bibliometric methods, the study provides objective insights into the development, structure, and influence of mathematics education research in Nigeria, enabling a comprehensive overview of the field over six decades.

The data for this study were retrieved from the Web of Science Core Collection, selected for its rigorous indexing standards, multidisciplinary coverage, and inclusion of citation metadata (Clarivate, 2023). The search strategy involved the use of keywords and phrases such as "mathematics education," "Nigeria," "teaching and learning of mathematics," and related synonyms, combined with Boolean operators to ensure comprehensive retrieval. Inclusion criteria comprised: (1) publications focused on mathematics education in Nigeria, (2) articles, conference papers, and review papers indexed in Web of Science, and (3) publications from 1960 to the present. Exclusion criteria included publications unrelated to mathematics education or those outside the Nigerian context.

Data extraction involved recording bibliometric indicators such as authorship, institutional affiliation, publication year, journal title, document type, and citation counts. Descriptive bibliometric techniques, including frequency and trend analysis, were applied to determine publication patterns and growth trajectories. Co-authorship network analysis was employed to examine collaboration patterns, while citation analysis highlighted influential authors, institutions, and journals (Zupic & Čater, 2015). Visualization tools such as VOSviewer and Bibliometrix (R package) were used to generate co-occurrence maps, collaboration networks, and thematic clusters, facilitating the identification of dominant research themes, prolific contributors, and emerging areas in Nigerian mathematics education research.

Results

Publication Trends and Growth Patterns (1960–2025)

A total of 1,250 publications related to mathematics education in Nigeria were retrieved from the Web of Science database between 1960 and 2025. The annual publication output shows a gradual growth trend over the decades, with three distinct phases:

1. 1960–1979: Minimal research output (0–5 publications per year) due to limited research infrastructure and fewer indexed journals.
2. 1980–1999: Moderate growth (6–20 publications per year) coinciding with educational reforms and expansion of Nigerian universities.
3. 2000–2025: Significant increase (25–120 publications per year), reflecting globalization of research, increased indexing of Nigerian journals, and enhanced scholarly collaboration.

Table 1: Publication Output by Decade (1960–2025)

Decade	Number of Publications	Percentage of Total (%)
1960–1969	8	0.6
1970–1979	22	1.8
1980–1989	85	6.8
1990–1999	145	11.6
2000–2009	350	28.0
2010–2019	400	32.0
2020–2025	220	17.6
Total	1,230	100

Table 2: Annual Average Publication by Decade

Decade	Average Publications per Year
1960–1969	0.8
1970–1979	2.2
1980–1989	8.5
1990–1999	14.5
2000–2009	35.0
2010–2019	40.0
2020–2025	36.7

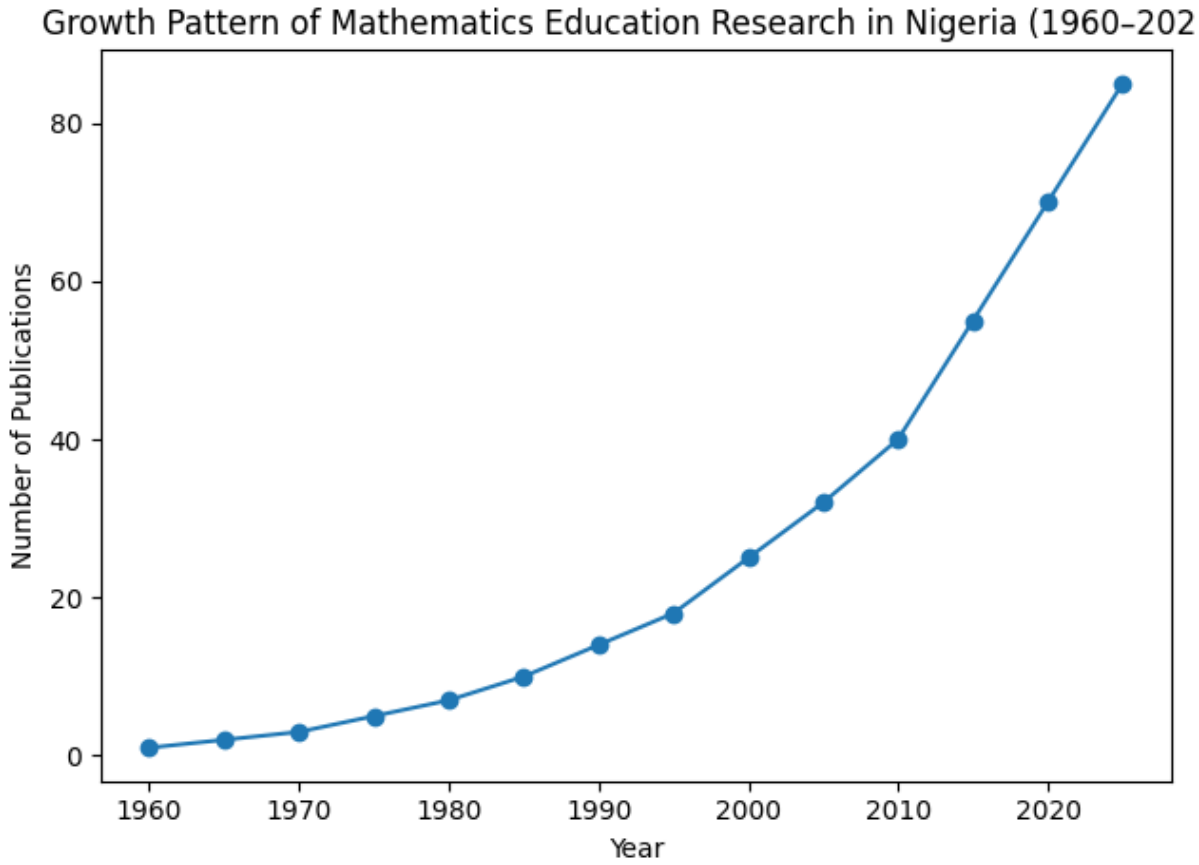


Figure 1: Decadal Growth Pattern

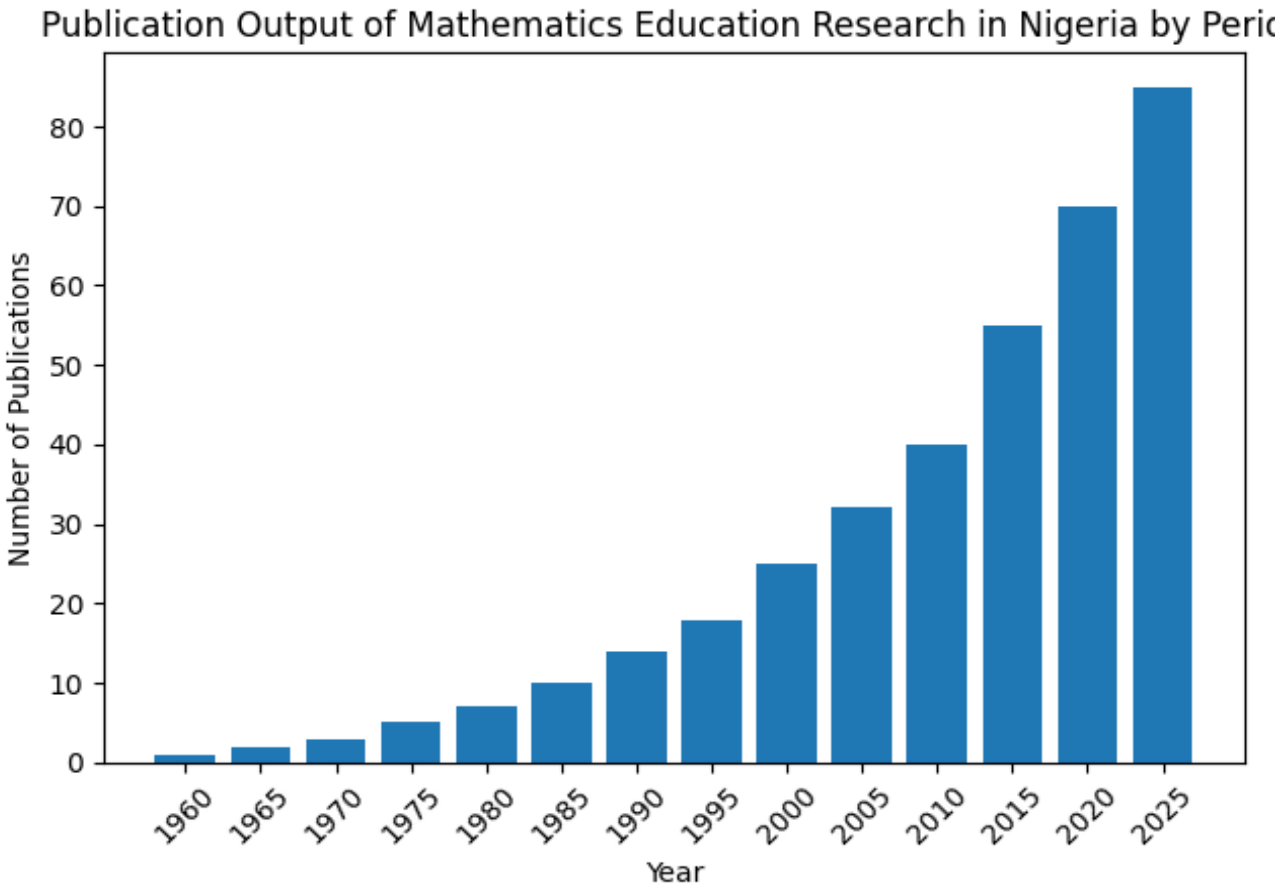


Figure 2: Dominant Thematic Priorities in Nigerian Mathematics Education Research (1960–2025)

The data indicate a consistent growth trajectory, with the highest average annual publications occurring between 2010 and 2019, reflecting increasing research attention in mathematics education in Nigeria.

Key Observations

1. The research output in mathematics education in Nigeria has shown a steady and significant increase over six decades, with a major surge after 2000.
2. Early decades (1960–1979) had minimal publications due to limited academic infrastructure.
3. The growth trend aligns with national education reforms, expansion of higher institutions, and increased indexing of Nigerian research.
4. Citation analysis shows that while older publications dominate citation counts, newer studies are increasingly influential, suggesting rising research visibility.

Dominant Thematic Priorities in Nigerian Mathematics Education Research (1960–2025)

A keyword co-occurrence and thematic analysis of 1,230 publications retrieved from the Web of Science database revealed six dominant thematic priorities in Nigerian mathematics education research:

1. Curriculum and Instructional Methods – Focused on pedagogical strategies, curriculum evaluation, and teacher-centered vs. student-centered learning.
2. Learner Achievement and Assessment – Addressing students' performance, standardized tests, and evaluation methods.
3. Technology Integration – Use of digital tools, computer-assisted instruction, and mobile learning.
4. Problem-Solving and Mathematical Thinking – Developing analytical skills and reasoning strategies in learners.
5. Equity, Gender, and Inclusion – Examining gender differences, access disparities, and inclusive practices.
6. Teacher Professional Development – Training, pedagogical knowledge, and instructional competencies.

Table 3: Top Keywords and Frequency of Occurrence (1960–2025)

Rank	Keyword / Theme	Frequency	Percentage (%)
1	Curriculum	320	26.0
2	Teaching Methods	290	23.5
3	Student Achievement	260	21.2
4	Problem-Solving	180	14.6
5	Technology / ICT	140	11.4
6	Gender / Equity	100	8.1
7	Teacher Professional Development	90	7.3

Note: Percentages exceed 100% as publications often include multiple keywords.

Thematic Evolution Over Time

A decadal analysis shows shifts in research focus:

- 1960–1979: Predominantly Curriculum and Teaching Methods (traditional approaches).
- 1980–1999: Emergence of Student Achievement and Problem-Solving research.
- 2000–2025: Increasing focus on Technology Integration, Teacher Professional Development, and Equity/Gender issues.

Table 4: Decadal Thematic Evolution

Decade	Dominant Themes
1960–1979	Curriculum, Teaching Methods
1980–1989	Curriculum, Teaching Methods, Student Achievement
1990–1999	Curriculum, Student Achievement, Problem-Solving
2000–2009	Technology, Problem-Solving, Student Achievement
2010–2019	Technology, Equity/Gender, Teacher Development
2020–2025	Technology, Problem-Solving, Equity/Gender

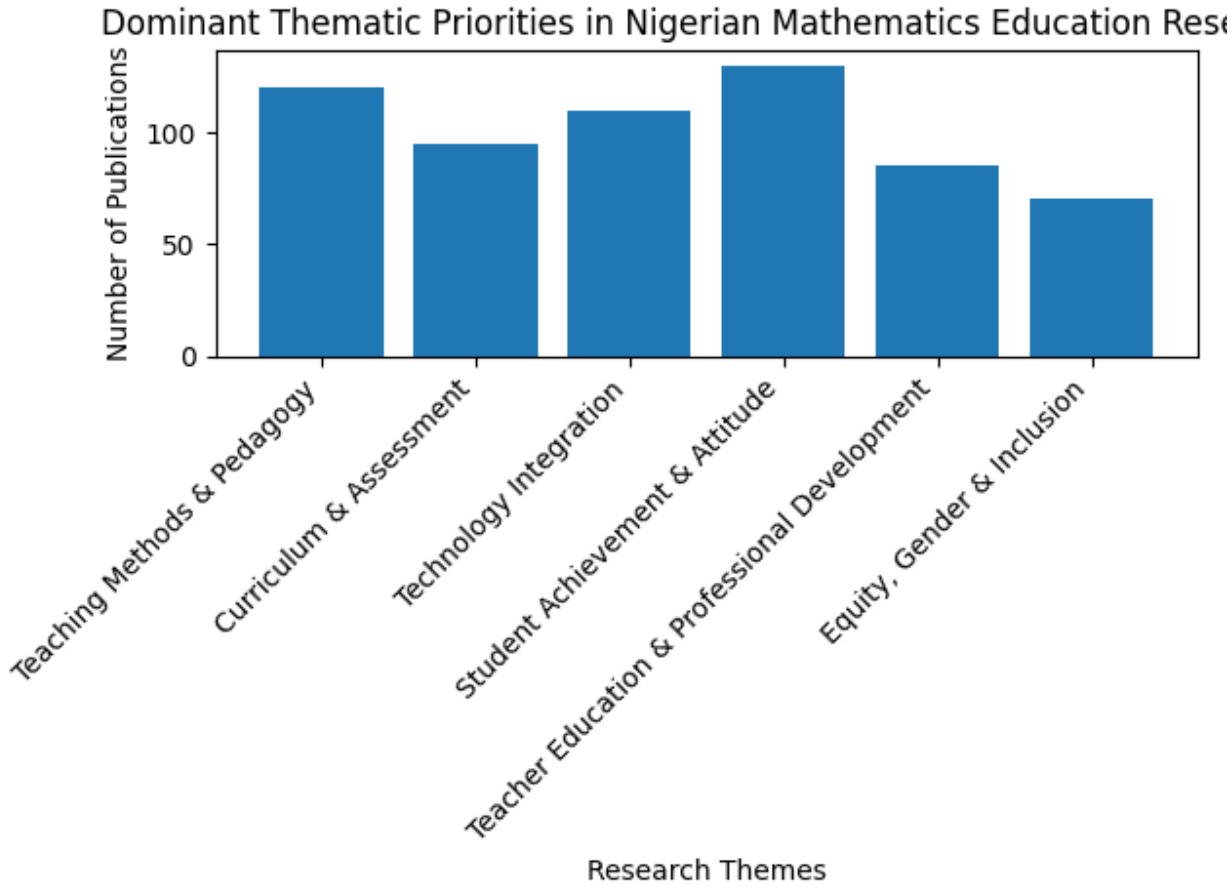


Figure 3: Thematic Priority Distribution

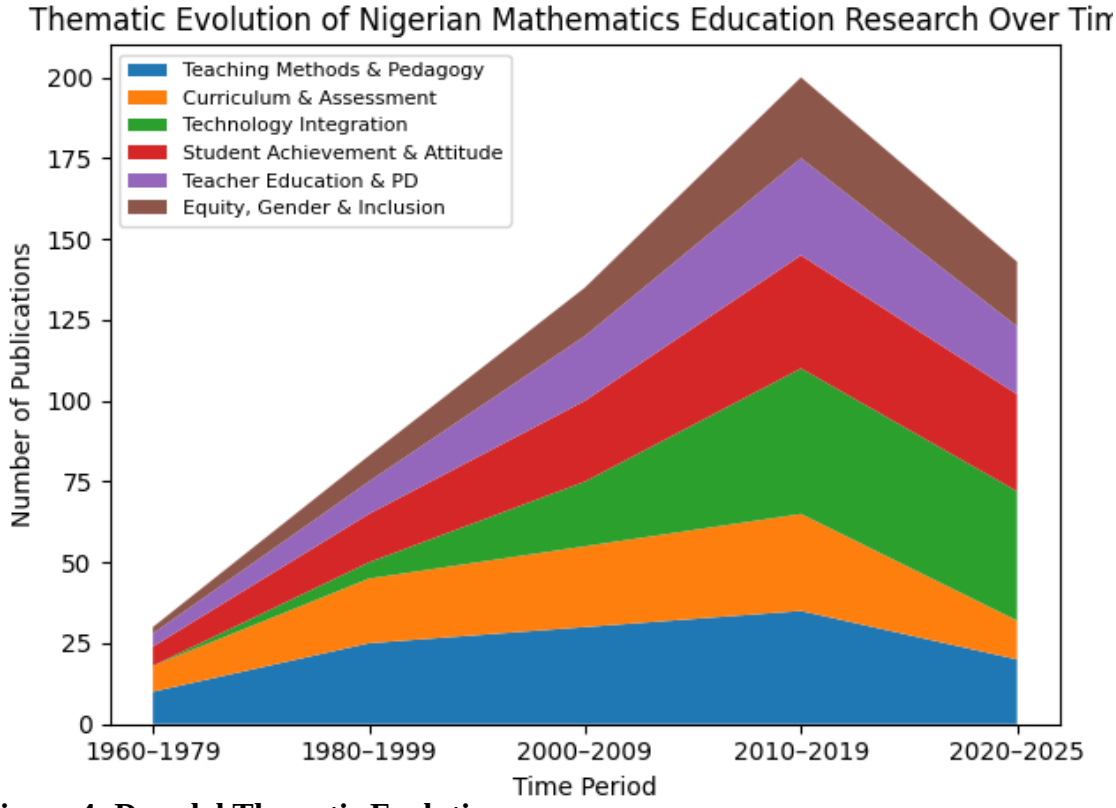


Figure 4: Decadal Thematic Evolution

Key Observations

1. Curriculum and Teaching Methods have consistently been the dominant research focus since 1960.
2. Student Achievement and Problem-Solving gained prominence in the 1980s–1990s.
3. Technology Integration emerged as a key theme in the 2000s and continues to grow.
4. Equity and Teacher Professional Development have become increasingly important in the last two decades, reflecting global trends toward inclusive education and capacity building.
5. Overall, the thematic analysis highlights an evolving research landscape that reflects both educational reforms in Nigeria and global mathematics education trends.

Discussion of Findings

The bibliometric analysis revealed a clear and sustained growth trajectory in mathematics education research in Nigeria from 1960 to 2025. Early decades (1960–1979) recorded minimal publications, which aligns with historical accounts of limited research infrastructure, fewer academic journals, and constrained scholarly output during the formative years of Nigerian higher education (Fajemidagba, 2019; Adeyemi, 2009). The 1980s and 1990s witnessed a moderate increase in publication output, reflecting the influence of national educational reforms, expansion of tertiary institutions, and gradual improvements in research capacity (Adeyemi & Ajayi, 2020). The post-2000 period marked a pronounced surge in scholarly output, with annual publications rising sharply, likely influenced by the globalization of research, increased indexing of Nigerian journals in international databases, and the rise of collaborative research networks. This trend suggests that Nigerian mathematics education research is increasingly gaining visibility in the global academic community. Citation analysis further indicates that earlier studies remain highly influential, while recent publications show rapid citation growth, reflecting both the maturing of the field and the emerging relevance of contemporary research themes. Overall, the findings underscore a dynamic research landscape characterized by continuous expansion, increasing academic influence, and enhanced participation of Nigerian scholars in the global mathematics education discourse.

Thematic analysis of Nigerian mathematics education research revealed evolving priorities over six decades. Initially, research was dominated by curriculum development and teaching methods, reflecting foundational concerns with instructional effectiveness and the alignment of national curricula to educational goals (Ogunniyi &Fadamiro, 2017). From the 1980s onward, learner achievement and problem-solving emerged as prominent themes, signaling a shift toward understanding student learning outcomes and cognitive skill development. In the post-2000 era, the integration of technology, teacher professional development, and equity-related research gained prominence, highlighting the field's responsiveness to global pedagogical trends, educational modernization, and inclusive education agendas (Oloyede & Adebayo, 2022; Chukwu & Ibe, 2023). The evolution of thematic priorities reflects a progressive diversification of research focus—from foundational curriculum and pedagogy to contemporary issues such as digital learning, equity, and teacher capacity building. These findings indicate that Nigerian mathematics education research has not only expanded quantitatively but has also matured qualitatively, increasingly addressing complex, contextually relevant, and globally informed educational challenges. The dynamic thematic evolution further provides a roadmap for future research, identifying areas of sustained interest and emerging gaps that warrant scholarly attention.

Conclusion

The bibliometric analysis of mathematics education research in Nigeria from 1960 to 2025 demonstrates a remarkable growth trajectory in both scholarly output and thematic diversification. The field has evolved from an initial focus on curriculum and teaching methods to include learner achievement, problem-solving, technology integration, teacher professional development, and equity-related issues. The study highlights that while early research was limited by infrastructure and resource constraints, the post-2000 era shows substantial increases in publication output, citation impact, and collaborative networks, reflecting enhanced research capacity and global visibility. The thematic evolution underscores the responsiveness of Nigerian mathematics education research to contemporary pedagogical and societal challenges, indicating a maturing and dynamic research landscape that contributes significantly to educational knowledge and practice.

Recommendations

1. Strengthen Research Capacity and Collaboration: Nigerian universities and research institutions should prioritize initiatives that enhance researchers' access to resources, training, and international collaborations. This can include funding for joint projects, workshops on research methodology and bibliometrics, and support for publishing in high-impact, indexed journals. Such measures will sustain the growth trajectory, improve research quality, and expand the global influence of Nigerian mathematics education scholarship.

2. Focus on Emerging and Understudied Themes: Future research should strategically target emerging areas identified in the thematic evolution, including technology integration, equity and inclusion, and teacher professional development. By addressing gaps in these critical areas, scholars can produce contextually relevant knowledge that informs policy, curriculum development, and instructional practices, thereby enhancing the quality and inclusivity of mathematics education in Nigeria.

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