A Bibliometric Analysis on Mathematics Learning Interest in Primary Education: A Scopus-Based Review (1982–2025)

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Abstract
Research on mathematics learning interest in primary education has grown rapidly over the past two decades, yet no bibliometric study has systematically mapped its intellectual structure and thematic evolution. This study aimed to map the research landscape of mathematics learning interest in primary education by identifying publication trends, research productivity, and dominant research themes. A bibliometric analysis was conducted on 92 articles indexed in Scopus from 1982 to 2025 using Bibliometrix and VOSviewer. Findings reveal an annual growth rate of 6.66% with a significant surge after 2018, with China, the United States, and Turkey dominating research output. Nine thematic clusters were identified, with dominant themes including mathematics achievement and anxiety, motivation and learning interest, and self-concept and self-efficacy. The fragmented co-authorship network indicates limited international collaboration in this field. These findings provide a comprehensive intellectual map for researchers and education practitioners to identify research gaps and build a more structured collaborative agenda for future inquiry.

1. Introduction

Mathematics occupies a central position in primary education, serving as the foundation for logical thinking, problem-solving, and quantitative reasoning that students will need throughout their academic and professional lives. Despite its importance, mathematics consistently ranks among the subjects most widely perceived as difficult and least enjoyed by students. Evidence from large-scale international assessments such as PISA and TIMSS indicates that a substantial proportion of primary school students encounter barriers in mathematics learning, not only in terms of cognitive ability, but also in terms of their emotional and motivational engagement with the subject (OECD, 2023). Students who develop negative feelings toward mathematics from the early years of schooling tend to progressively disengage from mathematics learning activities, creating a cycle of avoidance that accumulates over time and ultimately limits their academic and career opportunities (Dowker, Sarkar, & Looi, 2016). Addressing this challenge requires a deeper understanding of the affective dimensions of mathematics learning, particularly interest, motivation, and attitude, which have been shown to exert significant influence on student engagement and achievement (Hannula et al., 2016).

Mathematics learning interest refers to a relatively stable motivational orientation that influences how students engage with mathematical tasks, how much effort they invest, and how persistently they pursue mathematical understanding (Renninger & Hidi, 2016). Unlike transient curiosity, sustained interest in mathematics serves as a strong predictor of long-term academic engagement and career choices in science, technology, engineering, and mathematics (Eccles & Wigfield, 2020). The development of mathematics learning interest during the primary school years is particularly critical, as this period represents a sensitive window during which students begin to form fundamental attitudes and motivational dispositions toward school subjects (Eccles & Wigfield, 2020). Research has consistently shown that students who develop positive interest in mathematics during the early years of schooling tend to be more capable of pursuing advanced mathematics courses, demonstrate greater academic resilience when facing difficulties, and achieve higher levels of mathematical competence (Gottfried, Marcoulides, Gottfried, & Oliver, 2015). Conversely, the decline in mathematics interest that frequently occurs during the transition from primary to secondary school has been identified as a major barrier to sustained student participation in mathematics education worldwide (Lazarides & Oppermann, 2021).

Given the significant role of mathematics learning interest in shaping students' educational trajectories, researchers across multiple disciplines have devoted considerable attention to understanding the factors that promote or inhibit this interest among primary school students. Studies have examined a wide range of

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variables, from classroom instructional practices, teacher enthusiasm, parental involvement and peer dynamics to the role of technology-enhanced learning environments (Chang, Wu, Weng, & Sung, 2017; Simpkins, Davis-Kean, & Eccles, 2006). The literature on mathematics learning interest in primary education has grown substantially over the past two decades, with publications emerging from diverse geographical and cultural contexts, including China, the United States, Turkey, Indonesia, Finland, and several European countries. This geographical diversity reflects global recognition of mathematics learning interest as a pressing educational concern. At the same time, research findings are dispersed across numerous journals and research traditions, making it increasingly difficult for scholars and practitioners to obtain a coherent picture of the field's development, its key contributors, and its emerging directions.

Although several synthesis efforts have been conducted through systematic reviews and meta-analyses on motivation, attitudes, and gender differences in mathematics (Else-Quest, Hyde, & Linn, 2010; Hannula et al., 2016), these studies have tended to focus on specific constructs or populations rather than providing a comprehensive mapping of the entire research landscape on mathematics learning interest in primary education. To date, no bibliometric study has systematically mapped the intellectual structure, key contributors, collaboration patterns, and thematic evolution of this specific research domain. This gap is increasingly important to address given the rapid growth of publications in this area and the need for researchers and policymakers to navigate an increasingly complex literature.

Bibliometric analysis offers a methodologically appropriate approach to address this gap. As a quantitative method for evaluating scientific output, bibliometric analysis employs statistical techniques to examine patterns of publication, citation, collaboration, and keyword co-occurrence within a defined body of literature (Zupic & Cater, 2014). Through the use of analytical tools such as Bibliometrix and VOSviewer, researchers can identify the most productive authors, journals, institutions, and countries in a given field, trace the historical development of research themes, and visualize the intellectual networks connecting scholars across different research traditions (Aria & Cuccurullo, 2017; Van Eck & Waltman, 2010). Bibliometric analysis has been widely adopted in educational research to map emerging fields and identify research gaps, as evidenced by recent studies on artificial intelligence in mathematics education (Subroto, Malik, Raditya, & Saputra, 2024), technology-enhanced learning (Hu, Islam, Ahmad, & Khambari, 2021), and STEM education (Li, Wang, Xiao, Froyd, & Nite, 2020). These studies demonstrate that bibliometric mapping can generate insights that are difficult to obtain through conventional narrative reviews, particularly when the volume of literature is large and geographically dispersed (Donthu, Kumar, Mukherjee, Pandey, & Lim, 2021).

Based on this background, this study conducts a bibliometric analysis of research on mathematics learning interest in primary education using data extracted from the Scopus database covering the period from 1982 to 2025. A total of 92 articles were included in the analysis following a systematic selection process guided by the PRISMA framework. The analysis was conducted using Bibliometrix through the Biblioshiny interface and VOSviewer software. This study aims to provide a comprehensive and up-to-date mapping of the intellectual landscape of this research domain by addressing three research questions: (1) How have publication trends and growth patterns in mathematics learning interest research in primary education evolved over time? (2) Which authors, journals, institutions, and countries have been most productive and influential in this field, and what collaboration patterns exist among researchers? (3) What are the dominant research themes and how are they structured within the keyword co-occurrence network of this literature?

2. Method

This study employed a bibliometric approach to map the research landscape of mathematics learning interest in primary education. Bibliometrics is a quantitative method that analyses scientific literature through statistical measurement of publications, citations, and collaboration patterns (Donthu et al., 2021). This approach was selected for its capacity to provide a systematic overview of research developments, identify emerging trends, and map intellectual structures through network analysis (Aria & Cuccurullo, 2017). Document selection followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines adapted for bibliometric studies, as illustrated in Figure 1 (Page et al., 2021).

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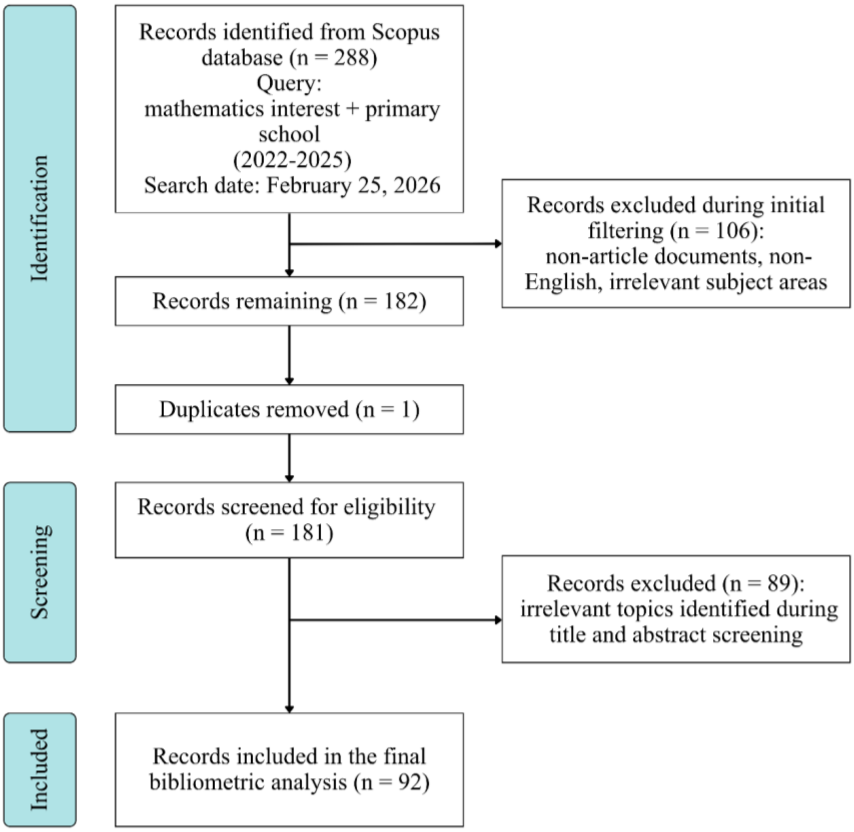

Figure 1. PRISMA Article Selection Flowchart

The analysis was conducted using two complementary software tools to ensure validity and triangulation of results. The primary tool was Bibliometrix and its web interface Biblioshiny, an open-source R-based package developed specifically for comprehensive science mapping. Bibliometrix was used to perform descriptive analysis, Bradford's Law analysis, Lotka's Law analysis, and keyword trend visualisation (Aria & Cuccurullo, 2017). The second tool was VOSviewer, developed by Leiden University for constructing and visualising bibliometric networks, used to generate keyword co-occurrence networks and co-authorship networks (Van Eck & Waltman, 2010). Prior to analysis, author name standardisation was performed manually to address spelling variations and ensure the accuracy of collaboration analysis.

Data were collected from the Scopus database on 25 February 2026. Scopus was selected as the sole data source due to its broad coverage of more than 25,000 indexed journals, structured metadata supporting bibliometric analysis, an integrated citation tracking system, and full compatibility with both Bibliometrix and VOSviewer. The target population of this study comprised all peer-reviewed articles indexed in Scopus that address mathematics learning interest, motivation, or attitudes among primary school students. A systematic search strategy was applied using purposive keyword-based sampling, which is the standard approach in bibliometric research for defining and retrieving a relevant corpus of literature (Donthu et al., 2021). The following search query was applied to the Title, Abstract, and Keywords fields: TITLE-ABS-KEY (("mathematics interest" OR "math interest" OR "mathematics motivation" OR "learning interest" OR "attitude toward mathematics" OR "mathematics attitude" OR "interest in mathematics") AND ("primary school" OR "elementary school" OR "primary education" OR "grade school" OR "primary student*" OR "elementary student*")). The initial search retrieved 288 documents. After applying subject area filters (Social Sciences, Psychology, and Mathematics), 182 documents remained. Following the removal of one duplicate identified using the Bibliometrix package in R, 181 documents proceeded to manual title and abstract screening. Inclusion criteria required articles to address mathematics interest, motivation, or attitudes among primary school students, to be written in English, and to be indexed in Scopus. Articles were excluded if they focused on other educational levels, were not specific to mathematics, or did not address affective dimensions of learning. This process yielded a final corpus of 92 articles for analysis.

Data analysis was conducted in three sequential stages, each corresponding to one of the study's research questions (Donthu et al., 2021). Stage 1, Descriptive Analysis. Descriptive bibliometric analysis was performed using Bibliometrix to examine publication trends and distribution patterns. This stage included the calculation of annual growth rate, Bradford's Law to identify core journals, Lotka's Law to examine author productivity distribution, and geographic distribution analysis based on author affiliations (Aria & Cuccurullo, 2017). Stage

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2, Network Analysis. A co-authorship network was constructed using VOSviewer with a minimum threshold of one document per author. This stage also included the identification of the most productive authors, journals, institutions, and countries using Biblioshiny. Stage 3, Keyword Analysis. A keyword co-occurrence network was constructed using VOSviewer with a minimum occurrence threshold of 2, yielding 42 keyword items. Keyword trend analysis and treemap visualisation were conducted using the Trending Topics and TreeMap features in Biblioshiny.

3. Results and Discussion

3.1. Results (Mandatory)

3.1.1. Overview of Publications

Table 1 presents the main bibliometric information of the 92 analysed documents. The dataset spans over four decades, from 1982 to 2025. The annual growth rate was 6.66%, with an average of 22.64 citations per document. A total of 286 authors contributed to these documents, with an average of 3.25 co-authors per document. The international co-authorship rate was 15.22%.

Table 1. Main Information of the Analysed Dataset

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	1982–2025
Sources (Journals, Books, etc)	71
Documents	92
Annual Growth Rate %	6.66
Document Average Age	8.16
Average citations per doc	22.64
References	805
DOCUMENT CONTENTS	
Keywords Plus (ID)	119
Author's Keywords (DE)	266
AUTHORS	
Authors	286
Authors of single-authored docs	10
AUTHORS COLLABORATION	
Single-authored docs	10
Co-Authors per Doc	3.25
International co-authorships %	15.22
DOCUMENT TYPES	
Article	92

Figure 2 displays the annual scientific production from 1982 to 2025. Two distinct phases were observed. The first phase (1982–2009) was characterised by slow growth with fewer than five articles per year. The second phase began around 2010 and showed significant growth, with a particularly sharp increase after 2018.

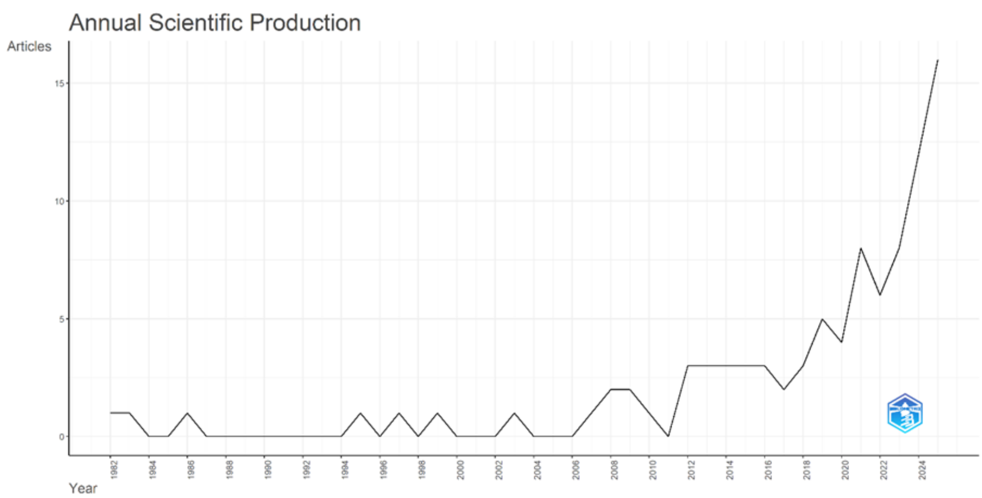

Figure 2. Annual Scientific Production on Mathematics Learning Interest in Primary Education (1982–2025)

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3.1.2. Most Productive Authors

Table 2 presents the top 10 most productive authors. Wang Y ranked first with three publications, while the remaining nine authors each contributed two publications. The majority of the 286 recorded authors appeared only once in the dataset, which is consistent with Lotka's Law distribution, as illustrated in Figure 3.

Table 2. Top 10 Most Productive Authors

No	Author	Articles	Articles Fractionalized
1	Wang Y	3	0.95
2	Ilomanni P	2	0.53
3	Laine A	2	0.53
4	Lazarides R	2	1.00
5	Li H	2	0.31
6	Oppermann E	2	1.00
7	Qin K	2	0.75
8	Radisic J	2	0.83
9	Si J	2	0.31
10	Tok S	2	0.83

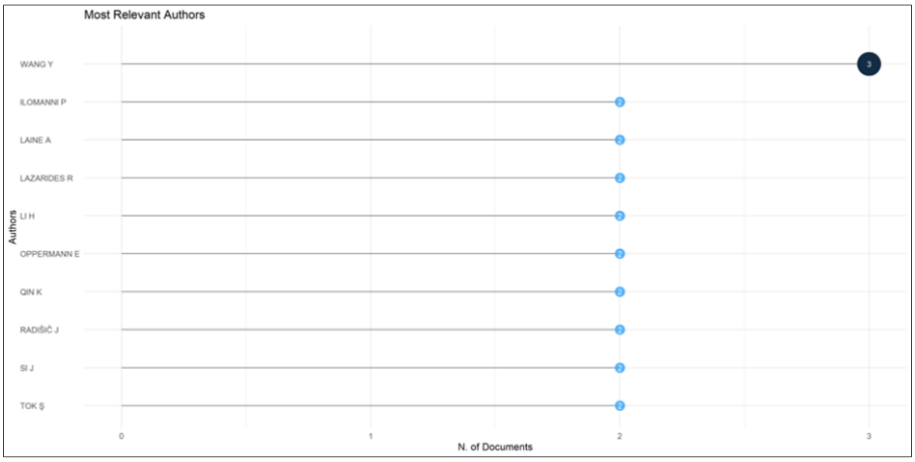

Figure 3. Top 10 Most Productive Authors in Mathematics Learning Interest Research

3.1.3. Most Relevant Journals

Table 3 presents the top 10 journals by publication count. Frontiers in Psychology and Learning and Individual Differences led with four articles each, followed by Education Sciences and LUMAT with three articles each. The publications were distributed across 71 different sources. The Bradford's Law distribution is presented in Figure 4.

Table 3. Top 10 Most Relevant Journals

No	Journal	Articles
1	Frontiers in Psychology	4
2	Learning and Individual Differences	4
3	Education Sciences	3
4	LUMAT	3
5	Computers and Education	2
6	Cypriot Journal of Educational Sciences	2
7	Education and Information Technologies	2
8	Educational Studies in Mathematics	2
9	Eurasia Journal of Mathematics, Science and Technology Education	2
10	European Journal of Psychology of Education	2

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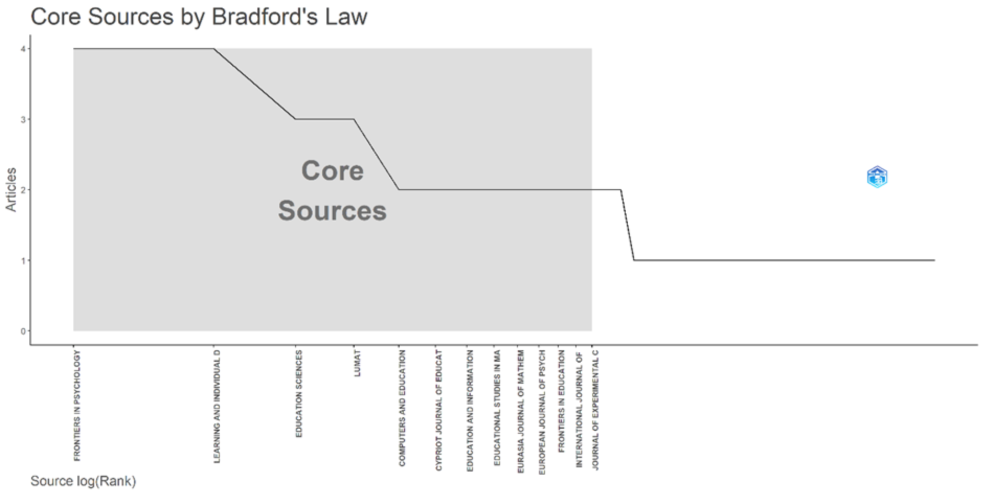

Figure 4. Bradford's Law Distribution of Core Journals

3.1.4. Country and Institutional Analysis

Table 4 presents the top 10 countries by publication output. China led with 31 publications (33.7%), followed by the United States with 25 (27.2%) and Turkey with 23 (25%). Indonesia ranked fourth with 14 publications. Figure 5 shows the country scientific production and collaboration map, indicating that most research was conducted within national boundaries.

Table 4. Top 10 Countries by Publication Output

No	Country	Publications
1	China	31
2	United States	25
3	Turkey	23
4	Indonesia	14
5	Germany	13
6	Finland	10
7	Serbia	10
8	United Kingdom	10
9	Spain	9
10	Australia	5

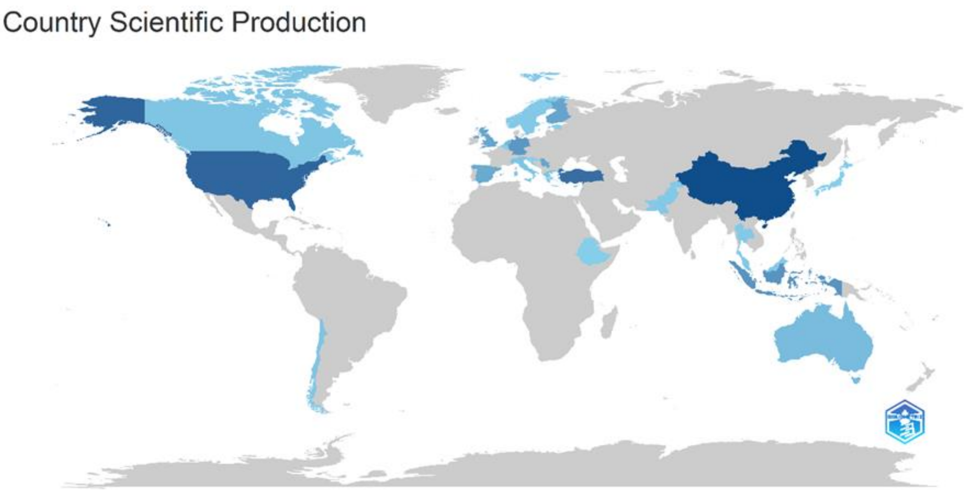

Figure 5. Country Scientific Production and Collaboration Map

Table 5 presents the top 10 most productive institutions. Beijing Normal University and the University of Novi Sad led with four articles each, followed by three institutions with three articles each: The Education University of Hong Kong, Universitas Jambi, and the University of Belgrade.

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Table 5. Top 10 Most Productive Institutions

No	Institution	Articles
1	Beijing Normal University	4
2	University of Novi Sad	4
3	The Education University of Hong Kong	3
4	Universitas Jambi	3
5	University of Belgrade	3
6	Universita degli Studi di Padova	3
7	Eberhard Karls Universitat Tubingen	2
8	Faculty of Education	2
9	Middle East Technical University (METU)	2

3.1.5. Co-authorship Network

Figure 6 presents the co-authorship network generated using VOSviewer. The network comprised 91 authors distributed across 91 clusters with zero inter-cluster links, indicating that collaboration in this field occurred predominantly within small, self-contained research groups.

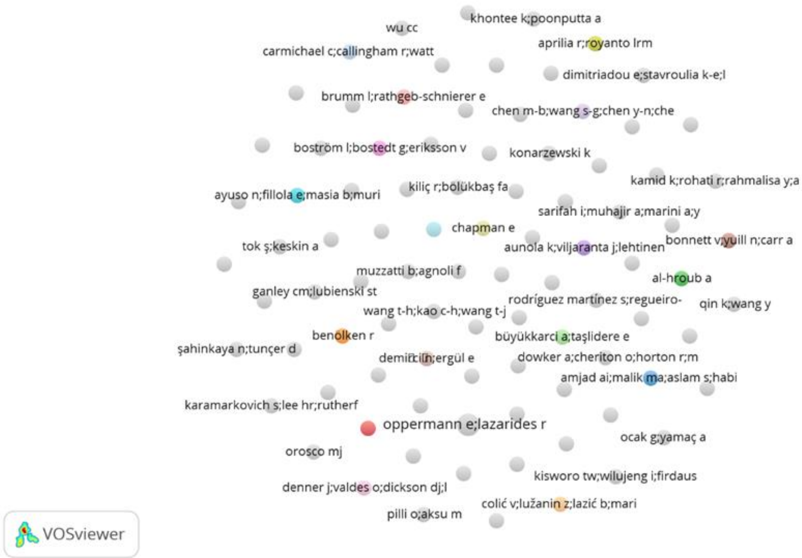

Figure 6. Co-authorship Network of Authors (VOSviewer)

3.1.6. Keyword Co-occurrence and Research Themes

Table 6 presents the top 20 most frequent keywords. The term 'mathematics' dominated with 29 occurrences, followed by 'primary education' (9), 'attitude' (8), 'mathematics achievement' (8), and 'primary school' (8).

Table 6. Top 20 Most Frequent Keywords

No	Keywords	Occurrences
1	Mathematics	29
2	Primary Education	9
3	Attitude	8
4	Mathematics Achievement	8
5	Primary School	8
6	Elementary School	7
7	Mathematics Anxiety	7
8	Motivation	7
9	Achievement	6
10	Child	6
11	Female	6
12	Human	6
13	Interest	6
14	Male	6
15	Students	6
16	Elementary Students	5
17	Gender	5
18	Mathematics Attitudes	5
19	Self-efficacy	4
20	Article	4

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Figure 7 presents the keyword co-occurrence network, revealing 42 items organised into 9 distinct clusters with 112 links and a total link strength of 141.

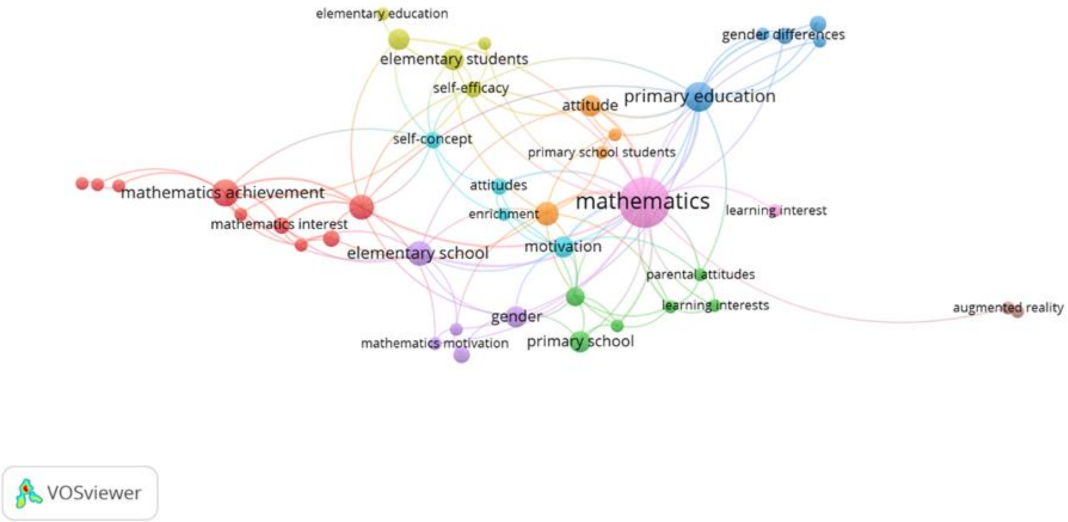

Figure 7. Keyword Co-occurrence Network (VOSviewer)

Table 7 summarises the nine identified clusters with their constituent keywords and proposed thematic labels.

Table 7. Research Clusters Identified through Keyword Co-occurrence Analysis

Cluster	Color	Key Terms	Theme
1	Red	mathematics, mathematics achievement, mathematics anxiety, academic achievement	Mathematics Achievement and Anxiety
2	Green	primary education, primary school students, self-regulated learning	Self-Regulation in Primary Education
3	Blue	attitude, mathematics attitudes, elementary school	Attitudes Toward Mathematics
4	Yellow	motivation, interest, learning interest	Motivation and Learning Interest
5	Purple	gender, gender differences, female, male	Gender Differences in Mathematics
6	Orange	self-concept, self-efficacy, elementary students	Self-Concept and Self-Efficacy
7	Cyan	parental attitudes, learning interests, parental involvement	Parental Influence on Learning
8	Pink	child, human, students, primary school	Student Characteristics in Primary School
9	Brown	augmented reality, technology, digital learning	Technology-Enhanced Mathematics Learning

3.1.7. Research Trend Topics

Figure 8 presents the trend topics analysis showing how research themes evolved over time. Several topics showed growth in recent years, including technology-enhanced learning, game-based mathematics education, and parental involvement.

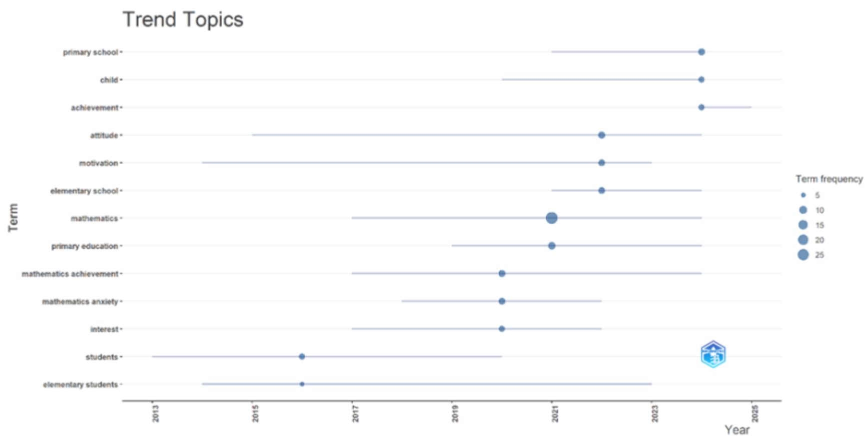

Figure 8. Research Trend Topics over Time

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Figure 9 presents the keyword treemap, confirming that mathematics achievement, motivation, attitudes, and anxiety constitute the core of the research agenda, while augmented reality, game-based learning, and technology integration occupy smaller but growing portions.

Figure 9. Keyword Frequency Treemap

3.2. Discussion

3.2.1. Publication Trends

The annual growth rate of 6.66% with a significant surge after 2018 confirms a sustained and accelerating scholarly interest in mathematics learning interest among primary school students. While this growth rate is lower than the 11.27% reported by Subroto et al. (2024) in artificial intelligence in mathematics education and considerably lower than the 724.62% recorded by Sihombing, Muqodas, & Agustin, (2026) in AI dependency research, the difference is contextually meaningful: the field of mathematics learning interest predates both domains by several decades, and a steady growth rate over a 43-year span reflects a more structurally mature and consolidating research tradition rather than an emergent one. This growth pattern is consistent with broader trends observed in mathematics education research, where affective factors have received increasing attention following repeated evidence from international assessments that cognitive performance alone does not explain learning outcomes (OECD, 2023). The sharp increase in publications after 2018 may be attributed to the growing availability of large-scale longitudinal datasets and the increasing adoption of quantitative methods for examining motivational constructs in educational settings (Lazarides & Oppermann, 2021). The COVID-19 pandemic further intensified this trend, as disruptions to schooling prompted researchers to examine how emergency conditions affected students' motivation and engagement with mathematics (Cahapay, 2020).

3.2.2. Productivity and Collaboration

The dominance of China, the United States, and Turkey in research output reflects the concentration of mathematics education research in countries with large educational systems and well-established empirical research traditions. China's leading position can be attributed to substantial national investment in STEM education policy and the scale of its primary school population, which provides extensive research opportunities (Xu & Zhong, 2022). This finding is consistent with Subroto et al. (2024), who similarly identified the United States and China as the two most productive countries in artificial intelligence in mathematics education research. Indonesia's notable contribution of 14 publications signals the growing research capacity in Southeast Asia, driven in part by persistent concerns about mathematics performance as reflected in international assessments (OECD, 2023). This aligns with the observation by Sihombing et al. (2026) that Southeast Asian countries are increasingly prominent contributors in educational research, representing not only quantitative productivity but also distinct sociocultural contexts that enrich the diversity of the evidence base.

The identification of Wang Y as the most productive author, with a focus on the relationship between mathematics interest, self-efficacy, and achievement in the Chinese educational context, reflects the integration of motivational and cognitive frameworks that has characterised recent advances in the field (Wang, Guo, &

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Degol, 2021). The contributions of Lazarides and Oppermann, both with fractionalized article scores of 1.00, are particularly notable as their work on classroom motivational environments and mathematics interest trajectories has been highly influential in shaping longitudinal research designs in this domain (Lazarides & Oppermann, 2021).

The fragmented co-authorship network, comprising 91 clusters with zero inter-cluster links, indicates that international collaboration in this field remains limited. This pattern is directly comparable to findings from Sihombing et al. (2026), who identified a similarly fragmented three-cluster co-authorship structure in AI dependency research, and to Subroto et al. (2024), whose bibliometric analysis of AI in mathematics education also revealed limited cross-institutional collaboration. Notably, the international co-authorship rate of 15.22% in the present study is lower than the 17.17% reported by Subroto et al. (2024) and the 19.32% reported by Sihombing et al. (2026), suggesting that mathematics learning interest research is comparatively more nationally contained than these adjacent fields. This geographic concentration of research in a small number of countries suggests that the field would benefit substantially from coordinated cross-national research initiatives that could generate more culturally diverse and generalisable findings (Donthu et al., 2021).

3.2.3. Research Themes

The nine thematic clusters identified through keyword co-occurrence analysis reveal a well-structured but still evolving intellectual landscape. Cluster 1 (Mathematics Achievement and Anxiety) represents the most densely connected and historically rooted research strand, reflecting decades of evidence linking mathematics anxiety to reduced learning interest and poorer academic outcomes among primary school students (Dowker et al., 2016). The persistent centrality of this cluster, reflected in the high link strength of its constituent terms within the 112-link co-occurrence network with total link strength of 141, confirms that the relationship between affective states and cognitive performance remains a fundamental concern in the field, a finding consistent with the centrality of achievement-related keywords identified in comparable bibliometric studies in mathematics education (Subroto et al., 2024). Cluster 4 (Motivation and Learning Interest), which directly addresses the core construct of this review, demonstrates strong connections to both expectancy-value theory and self-determination theory, confirming that these frameworks continue to provide the dominant theoretical grounding for research on mathematics motivation in primary education (Eccles & Wigfield, 2020).

Cluster 6 (Self-Concept and Self-Efficacy) occupies a theoretically significant position, as research consistently demonstrates that students' beliefs about their mathematical abilities serve as a critical mediator between environmental factors and motivational outcomes (Bandura, 1997). Notably, the co-occurrence of self-efficacy with gender and demographic variables in the present network mirrors the pattern observed by Sihombing et al. (2026), who identified self-efficacy as a key variable within the human factors cluster of their keyword network, suggesting that this construct holds cross-domain relevance for understanding differential vulnerability in educational motivation research. The emergence of Cluster 9 (Technology-Enhanced Mathematics Learning) is confirmed as a genuinely early-stage theme by two converging lines of evidence: in the keyword co-occurrence network, 'augmented reality' occupies the most peripheral position in the entire map, connected to the main network through only a single weak link; and in the trend topics analysis, technology-related keywords such as 'augmented reality' and 'digital learning' are absent from the terms with sufficient frequency to appear in the trend visualisation, with their appearance confined predominantly to publications from 2020 onwards. This peripheral network positioning and recent temporal distribution confirm that Cluster 9 represents a genuinely emerging rather than established research strand, characterised by low current integration into the field's intellectual core but measurable growth potential. Similarly, Cluster 7 (Parental Influence on Learning) signals a growing recognition that family-level ecological factors play an important role in shaping children's mathematics interest from the earliest years of formal schooling (Simpkins et al., 2006).

The trend topics analysis confirms that technology-enhanced learning and parental involvement represent the most recently active areas within this literature based on their temporal distribution, with both themes appearing predominantly in publications from 2020 onwards. This temporal pattern indicates a directional shift toward ecological and systems-based perspectives that extend beyond the classroom to examine broader social contexts shaping mathematics learning interest (Eccles & Wigfield, 2020). The keyword treemap reinforces the centrality of achievement, motivation, attitudes, and anxiety as the enduring pillars of the field, while simultaneously highlighting the growing space occupied by emerging themes related to digital learning and gender equity.

3.3. Implications

The nine thematic clusters identified in this study provide a comprehensive map of the theoretical landscape of mathematics learning interest research in primary education. The persistent centrality of expectancy-value theory and self-determination theory across multiple clusters confirms their continued relevance as foundational frameworks for understanding mathematics motivation (Eccles & Wigfield, 2020). At the same time, the emergence of technology-enhanced learning and parental involvement as rapidly growing

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themes suggests that existing theoretical frameworks need to be extended to accommodate ecological and contextual variables that operate beyond the individual student. Future theoretical development in this field would benefit from integrating motivational theories with ecological systems perspectives to better account for the multi-level influences on students' mathematics interest.

For educational practitioners, the findings of this study offer several actionable directions. The dominance of mathematics anxiety and achievement as core research themes underscores the importance of implementing evidence-based interventions that address the emotional dimensions of mathematics learning from the earliest years of primary school. Teachers and school counsellors should be equipped with strategies for identifying early signs of mathematics anxiety and for creating classroom environments that foster positive motivational orientations. The growing body of research on technology-enhanced learning suggests that thoughtfully designed digital tools and game-based learning platforms hold genuine promise for sustaining and enhancing mathematics learning interest among primary school students (Hwang & Wu, 2012; Lamb, Annetta, Firestone, & Etopio, 2018). The identification of parental involvement as an emerging research theme further highlights the importance of school-family partnerships in supporting children's mathematical development.

At the policy level, the geographic concentration of research output in China, the United States, and Turkey, alongside the notably limited international collaboration network, signals the need for coordinated international research programmes that can generate more representative and generalisable evidence bases. Policymakers in countries with lower research output, particularly in Southeast Asia and Africa, should invest in building national research capacity in mathematics education while simultaneously fostering cross-national partnerships. The consistent evidence linking students' affective engagement with mathematics to long-term academic and career outcomes also has implications for curriculum policy, assessment design, and teacher professional development, all of which should be oriented toward nurturing positive mathematics identities from the primary school years.

3.4. Limitations

This study is subject to several limitations that should be considered when interpreting its findings. First, the analysis relied exclusively on the Scopus database, which, despite its broad coverage, does not index all relevant journals in mathematics education. Research published in regional or national journals not indexed in Scopus, particularly from underrepresented regions such as Sub-Saharan Africa, Latin America, and parts of Asia, may not be captured in the dataset. Future bibliometric studies would benefit from incorporating multiple databases, including Web of Science and ERIC, to ensure more comprehensive coverage of the literature.

Second, the restriction to English-language publications introduces a language bias that may exclude valuable research conducted and published in other languages. This is particularly relevant given that several countries with active research traditions in mathematics education, including China and several European nations, also produce substantial research in their national languages. Third, the bibliometric approach adopted in this study is inherently quantitative in nature and captures patterns of keyword co-occurrence and publication activity rather than the content or quality of individual studies. As such, the thematic clusters identified through VOSviewer represent structural patterns in the literature rather than substantive syntheses of empirical findings. Qualitative or mixed-methods approaches would be needed to complement these findings with deeper interpretive analysis. Finally, the relatively small corpus of 92 articles, while a product of rigorous systematic selection, limits the robustness of some network analyses, particularly the co-authorship network, and should be considered when generalising the collaboration patterns identified in this study.

4. Conclusion

This study successfully mapped the intellectual landscape of mathematics learning interest research in primary education through a bibliometric analysis of 92 Scopus-indexed articles spanning 1982 to 2025, extending prior bibliometric work in mathematics education that has predominantly focused on topics such as artificial intelligence and technology-enhanced learning (Hu et al., 2021; Subroto et al., 2024) by providing the first systematic mapping specifically targeting the affective dimensions of primary school mathematics learning. The findings revealed a consistent publication growth with acceleration post-2018, a dominance of research output from China, the United States, and Turkey, and a thematic structure comprising nine clusters in which mathematics achievement and anxiety emerged as the most central theme while technology-enhanced learning and parental involvement were identified as rapidly developing areas. The fragmented co-authorship network, with zero inter-cluster links, indicates that the field has yet to achieve collaborative maturity, presenting substantial opportunities for cross-national research partnerships capable of generating more globally representative evidence. Based on the thematic patterns identified, future studies are recommended to test the hypothesis that the synergistic integration of technology and parental involvement may moderate the development of mathematics learning interest among primary school students, particularly in cultural contexts currently underrepresented in the literature, through longitudinal and cross-cultural research designs and multi-database searches to ensure more comprehensive literature coverage.

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Author Contributions

Aprina S. P. Hutagalung: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Visualization, Writing – original draft, Writing – review and editing. Lutfi Nur: Conceptualization, Methodology, Supervision, Validation, Writing – review and editing, Project administration. Ghullam Hamdu: Conceptualization, Methodology, Supervision, Validation, Writing – review and editing, Project administration. All authors have read and approved the final manuscript.

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Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/ or publication of this article.

Data Availability

The bibliographic dataset analysed in this study was retrieved from the Scopus database (www.scopus.com) using the search query described in the Methods section, conducted on 25 February 2026. The final corpus of 92 articles used for bibliometric analysis, along with the R script used for data cleaning and the processed dataset in RDS format, are available from the corresponding author upon reasonable request. Keyword co-occurrence network files and co-authorship network files generated using VOSviewer are also available upon request. No human participant data were involved in this study; therefore, no anonymisation procedures were required.

Declaration on AI Use

AI-assisted tools were employed during the preparation of this manuscript exclusively for purposes of language enhancement, writing clarity, and structural refinement, under continuous human supervision. The authors retain full ownership of all research ideas, data collection procedures, analytical processes, and conclusions presented in this work. The intellectual integrity and academic accountability of this manuscript rest entirely with the authors.

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