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Research Article

A Bibliometric Review of Mathematics Textbooks Research

Rani Sugiarni[1, 2], Tatang Herman[1], Didi Suryadi[1], Sufyani Prabawanto[1], Khairul Hafezad Abdullah[3]

[1]Department of Mathematics Education, Faculty of Mathematics and Science Education, Universitas Pendidikan Indonesia, INDONESIA.
[2]Department of Mathematics Education, Faculty of Teacher Training and Education, Universitas Suryakancana, INDONESIA.
[3]Social Security Management Center of Excellence, School of Business Management, Universiti Utara Malaysia, MALAYSIA.

ABSTRACT

Ongoing advancements are being made in mathematics education to meet the demands of modern pedagogy and student learning. Therefore, it is imperative to understand contemporary research trends in mathematics textbooks to align with contemporary pedagogical standards and accommodate diverse student learning needs. The current bibliometric review aims to analyse the publication trends of studies about mathematics textbooks. This review employed datasets from the Scopus and Web of Science (WoS) databases and analysed them using ScientoPy and VOSviewer. The examination of publication trends revealed a substantial surge in academic engagement in mathematics textbooks, particularly in recent times in both databases. The surge in publications signifies an expanding scholarly focus and commitment to advancing knowledge in mathematics education, with a particular emphasis on mathematics textbooks. An examination of source titles unveiled that Journal of Physics: Conference Series articles impact the discourse within the field. Some prevalent keywords, including "mathematics textbooks", "problem-posing", and "statistics education", have surfaced in contemporary research, attesting to the field's evolving trends. The growing emphasis on "design" and "cognitive demand" indicates an expanding aspiration to foster enhanced conceptual comprehension and cognitive involvement among students. Further investigation into the impact of instructional design and cognitive demand on fostering more profound understanding and active participation in mathematics is warranted, particularly emphasising the practical ramifications for curriculum designers and educators.

Keywords: Mathematics textbooks, Mathematics education, Problem-posing, Cognitive demand, Design.

Correspondence:
Tatang Herman
Department of Mathematics Education, Faculty of Mathematics and Science Education, Universitas Pendidikan Indonesia, INDONESIA.
Email: tatangherman@upi.edu
ORCID: 0000-0002-4349-4042

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INTRODUCTION

Mathematics education is constantly evolving to meet the demands of modern teaching and learning. According to Grenier-Boley and Sabra,[1] mathematics education initiatives focus on developing research findings and cultivating novel ideas regarding mathematics instruction. As underlined by Sánchez,[2] there is a realisation within this discipline of the critical need to adopt a multicultural and intercultural perspective, considering the many cultures and situations in which mathematical knowledge is generated and utilised. Nevertheless, the abstract character of mathematical concepts frequently causes difficulty in studying mathematics. As a result, the substance of mathematics textbooks is critical in overcoming these obstacles. These textbooks include structured explanations, relevant examples, and practical applications that aid in understanding and actively engaging students in the learning process.[3,4]

Work examples and exercises in textbooks can affect and frame students' thinking about mathematics, widening their perspectives on the topic.[5] In addition, textbooks should feature real-world problems that require higher-level cognitive skills, allowing students to apply mathematical learning in complicated settings.[6] Students heavily rely on mathematics textbooks to understand basic knowledge and skills, demonstrating a positive attitude towards textbook use in mathematics learning.[5] Furthermore, students diligently recorded extensive notes that specifically emphasised the significance and fundamental concepts, thus fostering a more profound comprehension and altering their perspectives regarding the textbook.[7] As a result, the content and design of mathematics textbooks are critical in providing students with the tools and resources they need to succeed in mathematics.

Additionally, mathematics textbooks are vital in encouraging students' creativity. They facilitate opportunities for students to cultivate their creative thinking abilities and engage in innovative problem-solving.[8] As an illustration, a considerable proportion of the queries in high school mathematics textbooks were classified as creative or quite creative, according to an analysis of the level of

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creativity in these texts.[8] Creating a mathematics learning media textbook that fosters students' creativity during the learning process was the subject of a separate investigation.[9] Fardah *et al.*[9] employed the ADDIE model in their research to facilitate the design and development of a textbook that addressed pertinent subjects and adhered to a format that fostered innovation. In addition, books for instructors and students were created under the STREAM framework, combining science, technology, reading, engineering, the arts, and mathematics. The primary purpose of these books was to assist students in conceptual understanding, problem-solving, and creative expression.[10] Overall, the studies underscore mathematics textbooks' significance in fostering and cultivating students' creativity within mathematics.

The current bibliometric review communicates our understanding of mathematical textbook research trends and influences within academic circles. One possible explanation is that the value of studying mathematics textbooks stems from their role in assisting students' knowledge development and achievement.[11] In this sense, working examples, exercises, and problem-solving techniques are included in textbooks, which students respect and pay attention.[12] On the other hand, students tend to prioritise practical parts of mathematics, focusing on verbalisation and numerical and computational skills above understanding mathematical concepts and developing connections with past knowledge.[13] Students consider textbooks essential for learning mathematics, and subjects of connection in them can assist them in discovering that mathematics is connected rather than compartmentalised.[14] Students frequently use textbooks for homework and exam preparation, and this process includes social assistance from parents and siblings.[15] At a pivotal point, educators can improve mathematics accomplishment and generate students who can apply mathematical understanding in complicated settings by analysing and improving textbooks.

The bibliometric analysis of mathematical textbooks is subject to constraints or limits. However, a bibliometric analysis was conducted on various textbooks, including e-books. These included studies on e-books in English as a foreign language education,[16] e-book learning research in physics education,[17] and e-books in social sciences.[18] The bibliometric analysis on e-books in English as a foreign language education, physics education, and social sciences exemplify the wide range and variety of studies in this field. An extensive analysis like this allows for identifying patterns, influences, and areas that need improvement, leading to a more thorough comprehension of the effects and development of mathematics textbooks. The purpose of the present bibliometric analysis is to examine the publication patterns of research on mathematics textbooks by addressing the following research questions:

What trends and patterns have been identified in the quantity of publications on mathematics textbooks?

Which source titles have published the most research on mathematical textbooks?

What are the current areas of study or subjects that are becoming prominent in research on mathematics textbooks?

METHODOLOGY

This study utilises bibliometric analysis to evaluate scholarly articles on mathematics textbooks. Bibliometrics is a method of assessing information using quantitative studies of bibliographic mechanisms in scientific publications.[19] Bibliometrics is crucial in evaluating the chronological development of a field and pinpointing research topics that necessitate additional exploration.[20] Bibliometric methods enable academics to study the dynamics of a specific topic by considering a broad range of information and sources. This technique improves existing knowledge and practices.[21] The current study prioritised the use of bibliometrics because of its ability to offer a comprehensive perspective on the topic. Bibliometrics recognises the practical significance of developing research avenues by including historical and present publications.[22]

Datasets collection and analysis

The current bibliometric analysis utilised the Scopus and Web of Science (WoS) databases. The records were acquired on November 1, 2023, and a search approach was employed to examine the research on mathematics textbooks. The present study did not restrict the search to Scopus and WoS papers but instead focused on analysing research publications from 1990 to 2022. This implies that the papers under consideration for analysis span from 1990 to 2022, assuring a thorough investigation of pertinent material within a significant temporal scope.

Scopus and WoS databases are selected based on their comprehensive coverage, rigorous quality control procedures, and dependable citation analysis skills, as Durán-Sánchez [23] emphasised. The databases provide researchers with the ability to retrieve a diverse array of academic literature, enabling thorough analyses and the recognition of impactful publications and authors.[24] Furthermore, the citation analysis options offered facilitate examining citation patterns, assessing impact measures, and identifying crucial articles within the field.[20]

The search parameters employed in this investigation included: ("Mathematics textbook" OR "Mathematical textbooks" OR "Math textbooks" OR "Mathematical analysis textbooks" OR "College-level mathematics textbooks" OR "High school mathematics textbooks" OR "Undergraduate mathematics textbooks" OR "Graduate mathematics textbooks" OR "Primary education mathematics textbooks" OR "Secondary education mathematics textbooks" OR "Mathematical education textbooks" OR "Introductory mathematics textbooks" OR "Mathematical modelling textbooks"). The Title, Abstract, and Keywords were

used in the search operation. This extensive search inquiry covers various publications pertinent to mathematics textbooks. Adding to this, using numerous terms ensures a broader field of scholarly literature investigation on the examined topic.[25]

The search includes publications in numerous languages, allowing for a thorough examination of worldwide academic works. It is noted that, in this study, a specified temporal limit was set by omitting articles published after December 31, 2022. ScientoPy and VOSviewer were used to investigate the datasets obtained in this review. ScientoPy, a well-known Phyton software package, is helpful for bibliometric studies,[26] whereas VOSviewer is a scientific visualisation tool.[27] The primary goal of the analysis was to assess global scientific production and theme progression concerning mathematics textbooks in Scopus and WoS.

Preliminary datasets analysis

The preliminary analysis is illustrated based on merging datasets from Scopus and WoS databases. The elimination of duplicates is conducted by utilising ScientoPy software. ScientoPy, a specialised software, merges Scopus and WoS datasets based on a field tags correlation table and identifies and eliminates duplicate documents.[28] The datasets obtained from both databases comprised 1022 publications. The inclusion criteria focused on document types such as articles, reviews, proceedings, book chapters, and conference papers, resulting in 939 publications to be examined, with 667 datasets in Scopus and 272 datasets in WoS. Eliminating duplicates resulted in 788 datasets, with 518 from Scopus and 270 from WoS. The database and registry searches' structure in the current study is portrayed in Figure 1, following the steps proposed by Page *et al.*[29]

RESULT AND DISCUSSION

In this section, the datasets were analysed following the formulated research questions. The deliberation of the findings may serve as a valuable point of reference for numerous parties involved, such as scholars, researchers, and students. Based on this review, evaluating the evolution of mathematics textbook research and future directions and identifying current research deficiencies are expected to enrich mathematics textbooks' diversity and research growth.

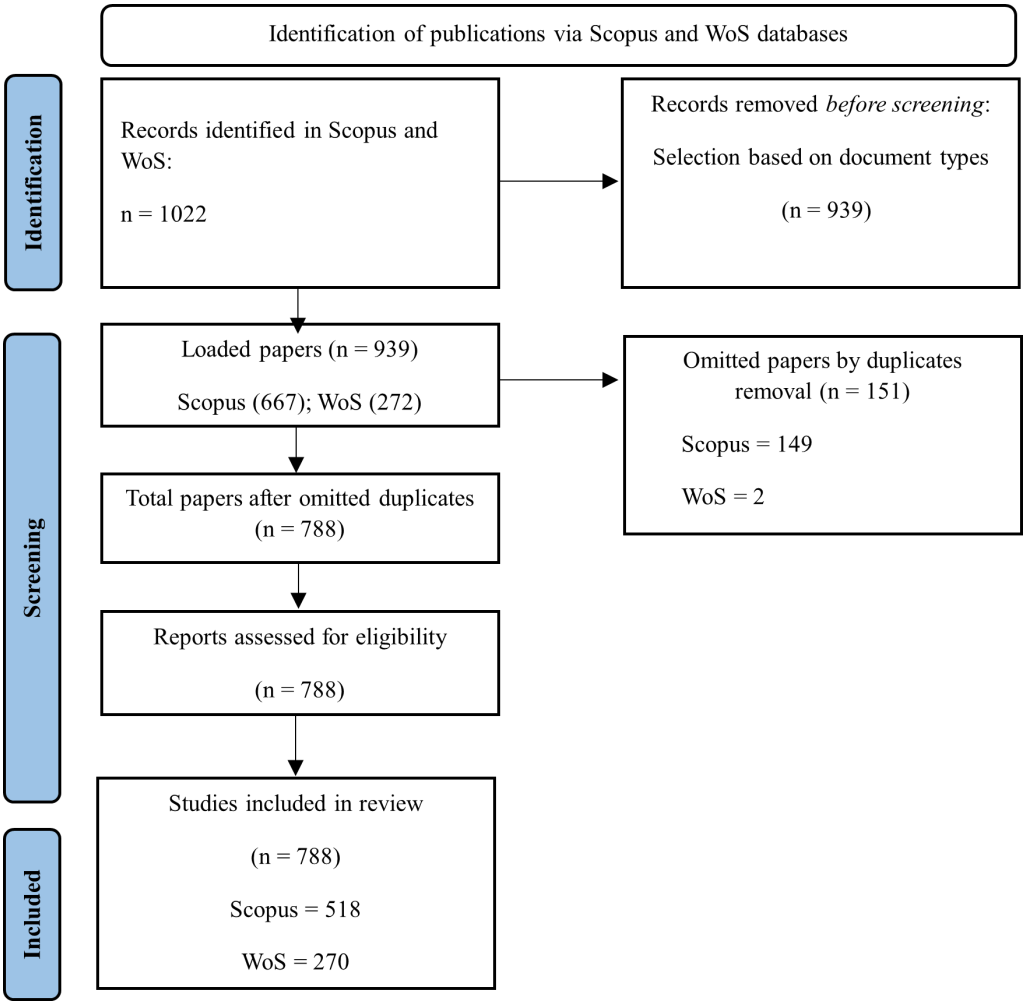

Figure 1: Flow diagram of searches of databases and registers.

The analysis of publications' pattern

The bibliometric evaluation of mathematics textbooks, explicitly focusing on the increase in publications, uncovered intriguing patterns based on the data obtained from Scopus and Web of Science (WoS) databases. Figure 2 summarises the results, illustrating the publication count for each year from 1990 to 2022.

Based on Figure 2, the publication count in Scopus exhibits a fluctuating pattern over the years. From 1996 to 2000, there was a notable increase in publications, peaking at 6 in 1997. The years 2001 to 2011 witnessed relatively steady growth with occasional fluctuations. In 2020, there was a significant surge with 53 publications, followed by a gradual increase until 2022. The trend indicates a positive and continuous growth in the mathematics textbook publications in Scopus.

The trend of the WoS database differs from that of Scopus. In the early 1990s, publications in WoS were scarce but slightly increased in the late 1990s. However, a substantial rise was observed in 2009, with 13 publications. From 2001 to 2009, there were fluctuations, but the overall trend was upward. The peak of 29 publications was reached in 2018, followed by varying numbers until 2022. Despite the fluctuations, there is clear evidence of growth in mathematics textbook publications, especially in the later years.

The patterns identified in the bibliometric assessment of mathematics textbooks, as disclosed by the Scopus and WoS databases, indicate a substantial and favourable influence on the corpus of knowledge in mathematics education. The substantial surge in scholarly articles observed after 2000, as indicated by Scopus and WoS, signifies an expanding scholarly focus and inclination towards investigating mathematics textbooks. The increased number of publications in 2020 and 2018 in Scopus and WoS underscores the heightened scholarly activity in recent years. This may be attributed to the developing of new educational paradigms, technological progress, or pedagogical innovations.[30] This growth is indicative of a sustained commitment to advancing the field of mathematics education through research on textbooks.

Furthermore, the fluctuations noted in both databases may be attributed to ever-changing elements such as changes in pedagogical strategies, evolving educational policies, or modifications in the curriculum's focus. Thompson and Cook[31] assert that education is currently experiencing a topological revolution wherein innovative topological principles and relationships impact the formation and deformation of the components and surfaces that comprise the topologies of education. Policy reform, curriculum, assessment, testing, teacher registration and accreditation, classrooms, timetables, subjects, histories, data, teachers, and students are among these components and surfaces.[31] The contrasting trajectories exemplified in Scopus and WoS highlight the importance of integrating numerous sources into bibliometric evaluations, thus augmenting the overall understanding of the field's development. Therefore, researchers and educators can further develop effective mathematics education practices by actively investigating novel approaches, instructional strategies, and content delivery methods. Also, the variations observed over time may indicate a capacity to adjust and react to the ever-evolving educational environment, mirroring the discipline's dynamic nature.

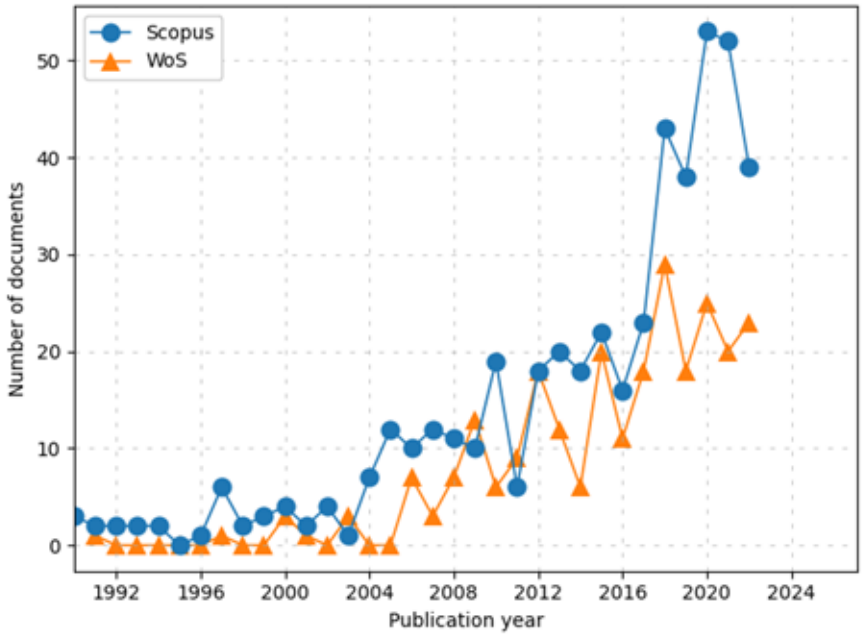

Figure 2: The pattern of publications.

The analysis of source titles

The results from Figure 3, focusing on the most productive source titles in publishing research on mathematics textbooks, reveal valuable insights into the key journals contributing significantly to the field. The top three sources, namely the Journal of Physics: Conference Series, International Journal of Mathematical Education in Science and Technology, and Educational Studies in Mathematics, hold particular importance in shaping the discourse within mathematics education research.

The Journal of Physics: Conference Series holds a significant position, indicating a noteworthy intersection in mathematics education research and physics. Research on cutting-edge, multidisciplinary methods of teaching mathematics may be drawn to this source, with the possibility of physics-related pedagogies or applications. Publication of conference proceedings in this publication could also highlight the applied and practical aspects of teaching mathematics. Educational Studies in Mathematics is a reputable and well-established publication and the second most productive source. Its concentration on educational studies suggests that theoretical and empirical research are given significant attention, giving academics a platform to investigate a variety of facets of mathematics education. The journal probably significantly impacts disseminating research that advances mathematics education's theoretical underpinnings and pedagogical practices. With its emphasis on the global scope of mathematics education research, the International Journal of Mathematical Education in Science and Technology occupies a prominent place. Its ranking among the top three sources indicates that it covers various subjects, including science, technology, and mathematics instruction. Research addressing the opportunities and difficulties of combining various disciplines in educational contexts may find a valuable home in this journal.

These top three sources significantly shape the discourse and body of knowledge in mathematics education. They provide venues for researchers to disseminate their discoveries, hypotheses, and inventions to a broader audience. The multiplicity of studies on mathematics textbooks is highlighted by the range of these sources, which include theoretical investigations, multidisciplinary approaches, and international viewpoints. By using these resources, researchers in the area can remain current on the newest advancements, approaches, and industry best practices, ultimately improving mathematics education on both a theoretical and practical level. These sources also act as influential channels that determine the course of future research in mathematics education and set the standard for high-quality research.

The analysis of current areas

In this study, the current research areas are focused on exploring the significance of trending keywords over the past three decades. This evaluation aims to understand the key themes or topics that have gained prominence in the academic literature concerning mathematics textbook research. Figure 4 depicts the top ten keywords used by previous researchers with the percentage of documents that employed those keywords between 2018 and 2022. By assessing the frequency of the keywords, researchers can gain valuable insights into the evolving trends and areas of interest.[26] Such research endeavours contribute to the broader

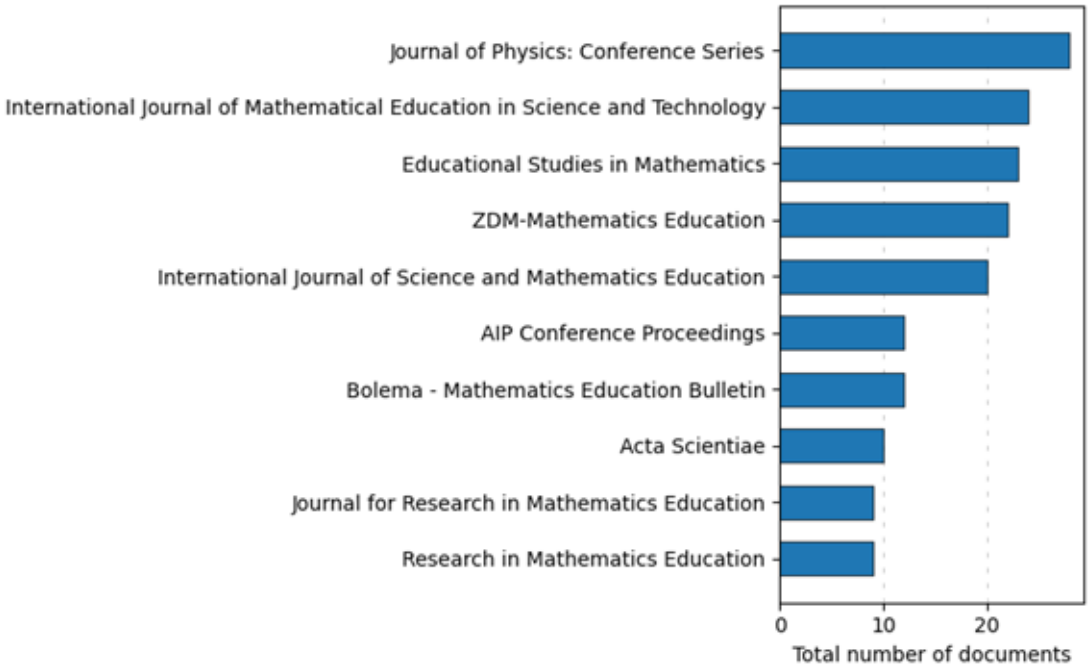

Figure 3: The source titles.

understanding of the current scholarly landscape and help shape future directions of investigation and inquiry.[25]

The analysis of the top ten keywords in Figure 4 reveals noteworthy trends in the study of mathematics textbooks. Foremost among them is the prominence of "Mathematics Textbooks", which emerged as the most frequently cited keyword with 123 occurrences. This underscores a substantial focus on examining and exploring mathematics textbooks' content, structure, and pedagogy within academic discourse. Studies have compared mathematics textbooks from different countries, such as Singapore and Japan, regarding their physical characteristics, structure, and topics or content.[32] Researchers have also conducted systematic literature reviews to synthesise empirical studies on mathematics textbook research, focusing on improving mathematical achievement and producing mathematically skilled students.[4] Furthermore, there is a need to diversify the representation of science and mathematics in textbooks, as they often exhibit male Eurocentric perspectives, and there is a limited number of textbook analyses exploring the historical contributions of non-western regions.[33] Over half of these occurrences, precisely 54%, are concentrated in the last two years (2018 to 2022), signifying a contemporary and sustained interest in this area.

Following closely, "Mathematics Education" stands out as the second most prevalent keyword, appearing 61 times. The significance of this term is reinforced by its 33% occurrence in the last two years, demonstrating continued relevance in recent scholarly discussions. The keyword that reflects a broader perspective balancing instructional methods and the broader educational context in mathematics study could be related to "pedagogical notions". In this connection, "Pedagogical notions" encompass teaching strategies and the environment in which mathematics is taught and learned.[34] This strategic approach is crucial as it enhances the coherence of research studies and improves their publication prospects by providing a well-constructed theoretical framework that integrates various research elements.

The generic keyword "Mathematics," with 36 occurrences, holds the third position. Despite its general nature, 53% in the last two years suggests a contemporary exploration of diverse mathematical concepts and theories in academic research. A specific focus on foundational education is evident, with "Primary School" ranking fourth, appearing 23 times. This keyword attests to an increasing interest in understanding and improving the teaching and learning of mathematics at an early age. Notably, 57% of these occurrences are concentrated in the most recent two-year period, indicating a heightened emphasis on primary education in the current scholarly landscape. Mathematics education in early childhood is a topic of increasing interest in academic research, focusing on understanding and improving the teaching and learning of mathematics at a young age. This is evident from including mathematics education courses in teacher education for early childhood.[35] The importance of mathematics in elementary school education is recognised as it provides foundational concepts for students to master other subjects and promotes their intelligence.[36] There is also a growing emphasis on mathematical literacy in primary schools, with different definitions and approaches to instruction and assessment.[37] Preschool teachers

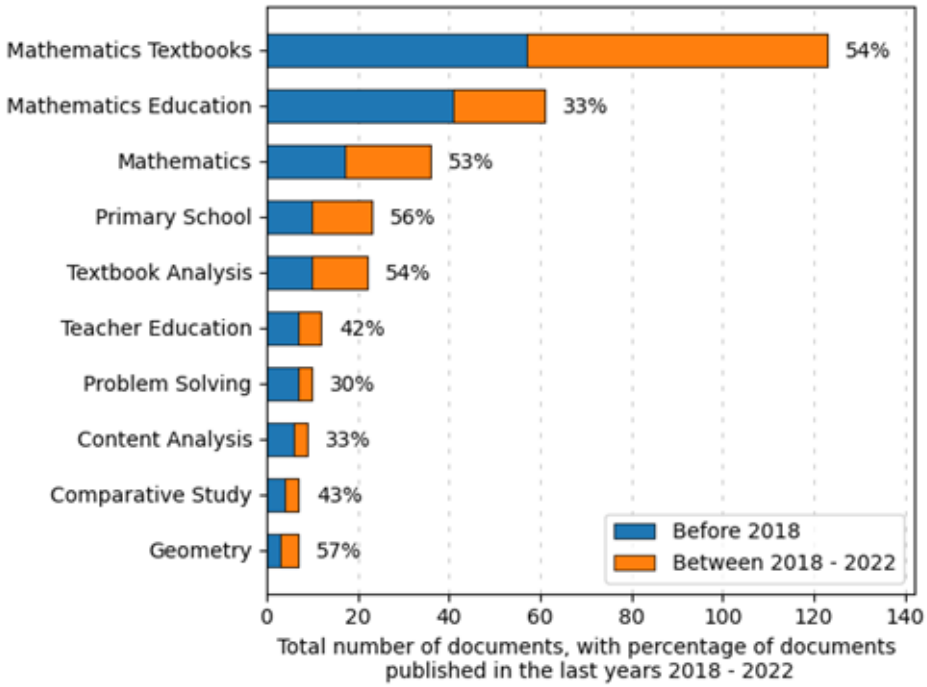

Figure 4: The current research areas.

know the importance of mathematics education and believe that a solid mathematical foundation in early childhood enhances students' engagement in future mathematics courses. However, they require pedagogical knowledge and a relevant curriculum to teach mathematics to young children effectively.[38]

"Textbook Analysis" ranks fifth with 22 occurrences in the fifth rank. This keyword underscores the significance of systematically evaluating and enhancing the quality of mathematics textbooks. The 55% occurrence in the last two years underscores a contemporary emphasis on critically examining and improving the educational tools crucial to mathematics instruction. Textbook analysis in mathematics education is crucial because it helps improve textbooks' quality and enhance students' learning experiences. Through analysis, researchers can identify the strengths and weaknesses of textbooks, such as the types of tasks and the inclusion of mathematical literacy demands.[3,15] This analysis can lead to the development of high-quality textbooks that effectively support students' conceptual understanding of mathematical concepts.[39]

Additionally, textbook analysis allows for comparing textbooks from different countries, highlighting the differences in the presentation and organisation of mathematical concepts.[4] By understanding these differences, curriculum materials can be developed to meet the specific needs of students in different educational contexts.[12] Furthermore, textbook analysis helps to identify the focus areas of research in mathematics education, such as numbers and operations, geometry, and algebra.[40] Textbook analysis is crucial in shaping mathematics education and ensuring students access practical learning resources.

By utilising VOSviewer mapping, the current study discerned several prominent keywords that have gained prominence since 2017 (see Figure 5). Among these keywords, "mathematics textbooks", "comparative analysis", "problem-posing", "statistics education", "textbooks", "secondary education", "design", "substraction", and "cognitive demand" emerged as the most protruded. These prominent keywords reflect current trends and priorities within mathematics education research and have implications for informing educational policies, curriculum development, and instructional practices to improve mathematics teaching and learning outcomes.

Firstly, the prominence of "mathematics textbooks" and "textbooks" suggests a continued interest in investigating the role and effectiveness of instructional materials in facilitating mathematics learning. This is significant as textbooks often serve as primary resources in classrooms and can significantly influence teaching practices and student learning outcomes. Research has shown that students heavily rely on textbooks, using kernels, examples, and exercises to understand basic knowledge and skills.[4] However, textbooks alone cannot change teaching practices or student learning. Teachers and students need to be involved in co-designing curriculum trajectories and materials to support the implementation of reform efforts.[5] Students value textbooks that support engagement through self-regulated learning, but there is a need to fill the knowledge gap in learner-textbook relationships.[6]

The emphasis on "comparative analysis" also highlights a growing trend towards comparing different approaches, methodologies, or educational systems in mathematics education. This reflects a broader movement towards evidence-based practices and the importance of understanding which instructional strategies are most effective in promoting student achievement and engagement. Studies have examined the use of Content and

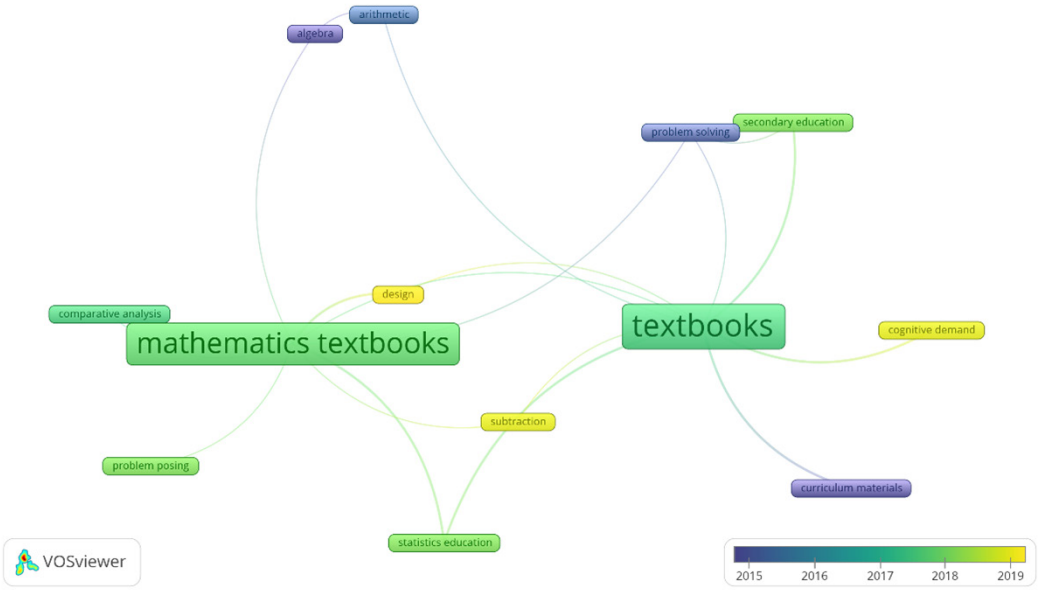

Figure 5: The pattern of publications.

Language Integrated Learning (CLIL), Content-Based Instruction (CBI), and English Medium Instruction (EMI) in teaching mathematics.[41] The emphasis on comparative analysis highlights the importance of understanding which instructional strategies are most effective in mathematics education.

The inclusion of "problem-posing" underscores a shift towards promoting higher-order thinking skills and problem-solving abilities among students, moving beyond traditional rote learning methods. The inclusion of problem-posing in mathematics and science education aims to promote higher-order thinking skills and problem-solving abilities among students.[42] Problem-posing allows students to connect their knowledge with real-world concepts, enhancing their conceptual understanding and motivation to learn.[43] Moreover, the attention to "statistics education" indicates a recognition of the increasing importance of statistical literacy in today's data-driven society, emphasising the need to enhance students' understanding of statistical concepts and methods. Statistics education recognises the importance of statistical literacy in today's data-driven society and emphasises the need to enhance students' understanding of statistical concepts and methods.[44] By engaging in cycles of statistical inquiry, students learn to pose statistical questions, collect and analyse data, and interpret results.

The keywords "secondary education" and "substraction" specifically focus on addressing the unique challenges and instructional needs at the secondary school level, particularly in arithmetic operations. The unique challenges and instructional needs at the secondary school level, particularly in arithmetic operations, are addressed in the context of secondary education. Acquiring mathematical knowledge is inherently intertwined with the fundamental arithmetic operations of addition, subtraction, multiplication, and division. Among these operations, multiplication is frequently cited as a source of dissatisfaction among junior high school students or their equivalents.[45]

Finally, the emphasis on "design" and "cognitive demand" reflects a growing interest in designing effective learning environments and tasks that promote cognitive engagement and deep understanding of mathematical concepts. Researchers have found that consistently selecting and implementing cognitively demanding tasks is crucial for students' conceptual understanding of mathematics.[46] This focus acknowledges the importance of instructional design in promoting meaningful learning experiences beyond surface-level memorisation or procedural knowledge. By intentionally selecting and implementing cognitively demanding tasks, educators can challenge students to construct their understanding of mathematical concepts actively, leading to more robust learning outcomes.

Limitation

A constraint of this study is its dependence on datasets sourced from the Scopus and Web of Science (WoS) databases. Although these databases are highly acknowledged for their extensive coverage and meticulous quality control systems, it is possible that they may not include all pertinent publications on mathematics textbooks. Furthermore, the conclusions regarding datasets were exclusively derived from the utilisation of keyword searches, as specified in the methodology. This technique may have disregarded pertinent papers that did not utilise the precise keywords employed in the search strategy. In addition, the analysis of the datasets was limited to data until December 31, 2022, thus excluding recent publications that could have offered valuable insights into the present status of research in mathematics education.

CONCLUSION

In conclusion, this study used bibliometric analysis to identify patterns and trends concerning mathematics textbooks research. The investigation of publishing patterns found a significant increase in scholarly activity related to mathematics textbooks, notably in recent years, as evidenced by the Scopus and Web of Science databases. This increase in publications demonstrates a growing scholarly interest and dedication to expanding knowledge in mathematics education. Furthermore, the study of source titles revealed the critical role that publications like the Journal of Physics: Conference Series, Educational Studies in Mathematics, and the International Journal of Mathematical Education in Science and Technology play in influencing the field's discourse. These journals enable scholars to share their discoveries and contribute to the larger body of knowledge in mathematics education.

Furthermore, a study of current research fields revealed several popular terms, such as "mathematics textbooks", "problem-posing", and "statistics education," reflecting changing trends and goals in the field. The emphasis on instructional design and cognitive demand reflects an increasing desire to promote greater conceptual understanding and cognitive engagement among students. This study sheds light on the current status of mathematics education research and identifies areas for further investigation and advancement.

The present study offers multiple noteworthy contributions to the knowledge and practices in mathematics education concerning analysing research trends in mathematics textbooks. Through analysing publication patterns and trends, we offer researchers, educators, and policymakers a thorough comprehension of the changing landscape of mathematics education that can guide the creation of educational programmes, teaching methods, and policies that aim to improve the results of mathematical education. Furthermore, examining source titles allows us to identify prominent journals that substantially impact the subject. This helps researchers choose the most suitable platforms for sharing their work and promotes collaboration among academic community members. Also, our examination of the present study

domains illuminates growing patterns and focal points, such as problem formulation and statistics instruction, thereby directing forthcoming research paths and endeavours aimed at tackling urgent obstacles and progressing understanding in mathematics education.

Moving forward, several promising avenues for future research in mathematics education emerge from our findings. Firstly, there is a need for further investigation into the effectiveness of mathematics textbooks and instructional materials in facilitating student learning and achievement across diverse educational contexts. Researchers can explore innovative approaches to textbook design, content delivery, and pedagogical strategies to optimise their impact on student outcomes. Secondly, future studies should continue to examine the intersection of mathematics education with other disciplines, such as physics, to identify interdisciplinary approaches and instructional methodologies that enhance learning experiences. Additionally, research is needed to enhance students' problem-solving skills, statistical literacy, and conceptual understanding, particularly in secondary education. Finally, research should continue exploring the role of instructional design and cognitive demand in promoting deeper learning and engagement in mathematics, focusing on practical implications for educators and curriculum developers. By addressing these research gaps and priorities, scholars can contribute to improving and innovating mathematics education practices worldwide.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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