

Bibliometric Review of Realistic Mathematics Education Implementation in Scopus and Google Scholar Database

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Article Info	Abstract
Article History Received: 15 May 2025 Accepted: 22 December 2025	This bibliometric review provides a comprehensive analysis of research on the implementation of Realistic Mathematics Education (RME) in school curricula from 2013 to 2023, using data sourced from Scopus and Google Scholar. Despite the demonstrated benefits of RME in fostering student-centered learning and real-world applications in mathematics, a systematic examination of global trends, prevalent research methodologies, and geographic and journal distributions in this field is limited. Addressing this gap, the review analyzes 187 articles to identify trends in RME literature, including recurring themes, dominant research designs, countries most engaged in RME research, and leading journals. The findings reveal an emphasis on qualitative studies, with a need for more rigorous quantitative and mixed-methods approaches to substantiate RME's effectiveness across varied educational contexts. Additionally, RME research is concentrated in a few countries, such as the Netherlands, Indonesia, and the United States, suggesting limited exploration in regions where RME could address educational inequalities. Recommendations include expanding research on RME's quantitative impact, especially in underrepresented regions, and promoting cross-cultural studies to better understand RME's adaptability. Journals focusing on educational innovation are essential for publishing interdisciplinary RME research, which could advance inclusive mathematics education on a global scale.
Keywords Bibliometrics Google Scholar Mathematics education Realistic mathematics education Scopus	

Introduction

The field of mathematics education continues to evolve, with increasing emphasis on instructional approaches that enhance student engagement and real-world applicability. Among these approaches, Realistic Mathematics Education (RME), an instructional methodology, has gained traction internationally. In the late 1960s, the foundational ideas of Realistic Mathematics Education (RME) emerged in the Netherlands amidst debates about mathematics instruction, challenging the "New Math" approach popular in Europe at the time (Wittmann, 2020). Mathematics education in the Netherlands had traditionally relied on mechanistic teaching, where the curriculum reflected mathematical theory rather than real-world applicability, resulting in a disconnect that left students disengaged and unable to grasp the relevance of mathematical concepts (Tien-Trung et al., 2020). Hans Freudenthal, a key figure in this reform, proposed that mathematics should be seen as a human activity rather than a rigid framework. He advocated for "mathematizing" practices that encouraged students to interact with

mathematics in realistic contexts (Freudenthal, 1973). The goal of RME is to render mathematics education relevant and meaningful by involving students in real-life scenarios that allow them to build and apply mathematical knowledge naturally (Treffers, 1993). In RME, real-world contexts not only reinforce learning outcomes but also enrich the process of teaching and learning itself (Do et al., 2021). While "realistic" in RME refers to problem-solving in ways students can visualize, it also emphasizes a strong link between mathematics concepts and practical human experiences (Tong et al., 2022). Advocates of RME emphasize a shift toward contextual learning, requiring changes to traditional instructional methods (Trung et al., 2019). RME-based activities are designed to foster independence, critical thinking, and problem-solving skills, positioning students to engage with mathematics as real-world thinkers (Tong et al., 2022; Zulkardi et al., 2020). RME's growing application has garnered academic interest, with studies exploring various facets, such as high school mathematics innovations (Laurens et al., 2018), teacher training within the RME framework (Nguyen et al., 2007), and the integration of contextual teaching (Fredriksen, 2021; Vos, 2020). Countries like the Netherlands, the United States, Indonesia, and regions in South America have adapted their mathematics curricula and textbooks to reflect RME principles (Tien-Trung et al., 2020). Research has shown that RME helps students of varying abilities grasp complex concepts (Sembiring et al., 2008), boosts active classroom participation (Tong et al., 2022), enhances curriculum flexibility (Trung et al., 2020), and fosters positive attitudes toward math learning (Tong et al., 2022). To comprehensively assess the scope, themes, and global spread of RME studies, a bibliometric analysis offers valuable insights.

In educational studies, bibliometric analysis serves as a powerful tool for pinpointing research gaps, identifying seminal works, and evaluating the dissemination of educational theories and practices across various nations and educational contexts (Bulut, Bulut, & Kaban, 2023; Kaban, 2023; Zupic & Čater, 2015). Defined by Pritchard (1969), bibliometric analysis quantitatively assesses scholarly literature to explore development, influence, and trends within a specific domain. Pritchard, who introduced the term, emphasized its utility for objectively examining publication patterns, recognizing key contributions, and detecting common themes within a research field. This technique uses statistical analysis of bibliometric metrics like citation counts, publication rates, co-authorship links, and keyword occurrences, which collectively reveal the intellectual framework of a discipline (Aria & Cuccurullo, 2017). It has been applied across various research topics (Patra et al., 2003), including those related to mathematics (Julius et al., 2021; Lozada et al., 2021; Özkaya, 2018). For example, Özkaya (2018) analyzed 9,941 Web of Science-indexed publications from 1980 to 2018 to map the scientific knowledge structure of mathematics education. Nevertheless, bibliometric studies in mathematics education are still limited (Drijvers et al., 2020). Employing bibliometric methods to study RME research is especially beneficial, given the worldwide adaptation of RME across distinct educational systems, each with unique curricular and instructional needs. For instance, while RME is firmly established in the Netherlands, other regions, such as Indonesia, the United States, and several European countries, are increasingly interested in modifying it for their cultural contexts (Bakker & van Eerde, 2015). A bibliometric review of RME studies can thus offer critical insights into how this instructional approach is being implemented, where it is gaining the most traction, and what methodological approaches are employed to study its effectiveness. Hence, this study aims to fill this gap by seeking to document and synthesize patterns of previous research in RME implementation over the previous decades. Specifically, the study aims to perform a bibliometric analysis of RME-focused research between 2013

and 2023 to address the following research questions:

1. What are the trends in RME-related topics and themes?
2. Which research designs or approaches are predominantly employed in RME studies?
3. What are the most researched countries regarding RME implementation?
4. Which are the leading journals in publishing RME research?

By addressing these questions, this bibliometric study contributes to understanding the global development of RME research, identifies methodological gaps in current literature, and proposes future research directions, particularly within underrepresented regions such as Ghana.

Methodology

Research Method

Bibliometric analysis, originally introduced by Pritchard (1969) as a systematic approach for reviewing literature, enables researchers to analyze collections of bibliographic data, such as academic journals and citation patterns. This study applies bibliometric correlation analysis to identify prevailing research trends and uses cross-examinations of article keywords and co-citations to uncover the thematic structure and intellectual foundations within Realistic Mathematics Education (RME) literature (Man et al., 2019). In this research, bibliometric methods are employed to illustrate how RME topics are organized and interlinked before being visually mapped. The approach includes defining research questions, selecting appropriate techniques, organizing and filtering relevant data, processing and analyzing data, and visually representing and interpreting findings (Seetharam et al., 2018). Specifically, relational co-occurrence analysis is used to explore the structure of RME, highlight prominent research themes, and track emerging trends in this field (Zupic & Čater, 2015). By recording keyword co-occurrence, this method identifies the most frequent keywords, allowing us to determine related documents based on shared keywords within their content sections (Callon et al., 1986).

Literature Search and Manuscript Selection Process

We conducted a search for relevant research articles across two major academic databases—Scopus and Google Scholar—on February 8, 2024, to support this bibliometric analysis. Scopus was selected as the primary source of documents for three key reasons: it maintains a consistent standard for including documents, offers a broad range of educational and social science literature (Hallinger & Nguyen, 2020), and is recognized as the largest database for peer-reviewed literature (Niven & Otten, 2017). Similarly, Google Scholar is empirically validated as a highly effective tool for locating specific scholarly works and remains popular among researchers (De Winter et al., 2014). As such, both Scopus and Google Scholar were chosen as the main data sources for this study. Our document search followed the PRISMA guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) to ensure systematic identification (Pham et al., 2021) (see Figure 1). Specifically, we used a meta-review (umbrella review) approach enhanced by bibliometric techniques. Manuscript selection was organized in four stages: identification, screening, eligibility, and inclusion. To identify relevant studies on realistic mathematics education (RME) implementation, we developed an inclusive search query that targeted keywords in titles, abstracts, and paper keywords. In the identification phase, we used two main search terms—

"realistic mathematics education implementation" and "integration of realistic mathematics education"—across the Scopus and Google Scholar databases. Documents with titles, abstracts, or keywords matching these terms were selected to ensure we captured key publications on RME. Our search query was: TITLE-ABS-KEY ("realistic mathematics education implementation*" OR "integration of realistic mathematics education*"). This yielded 772 documents: 285 from Scopus and 487 from Google Scholar, which were then screened. In the screening phase, we applied data cleaning filters based on criteria including: (i) English language, (ii) focus on mathematics education, (iii) publication in peer-reviewed journals, (iv) publication date within the last decade (2013-2023), and (v) relevance to RME implementation. This step excluded 400 documents, leaving 372 for eligibility review. During the eligibility stage, each document's title and abstract were reviewed, with each team member assessing and recommending retention or exclusion of documents. After group discussions, further review of titles, abstracts, and occasionally full texts led to the exclusion of 185 documents due to irrelevance (e.g., Clark & Sengupta, 2019; Fauzi et al., 2019). This resulted in a final dataset of 187 documents prepared for bibliometric analysis. Figure 1 illustrates the complete document selection process.

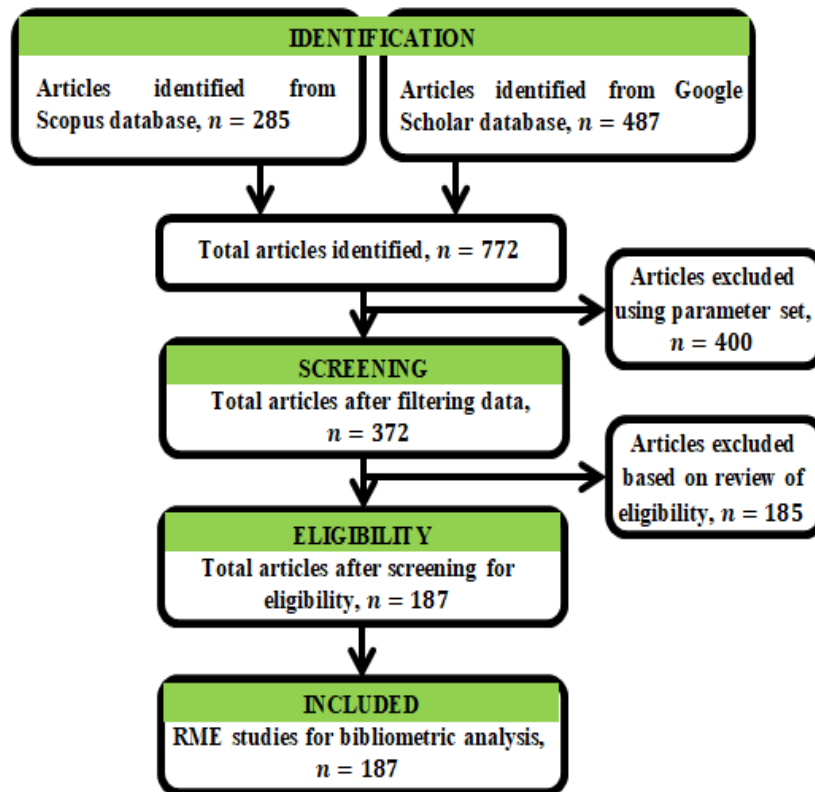


Figure 1. Flow Chart of Study Selection Process (Source: Self – construct, 2024)

Inclusion and Exclusion Criterion

Only research articles addressing the implementation of realistic mathematics education, published in English within peer-reviewed journals from 2013 to 2022, were included in our study. We excluded conference proceedings, theses, reports, bibliographies, and other forms of "grey literature," as these sources are often considered to have lower quality and reliability (Hartling et al., 2017; Nivens & Otten, 2017).

Data Analysis

To address the research questions regarding the global development of Realistic Mathematics Education (RME) research, we employed bibliometric techniques to analyze 187 peer-reviewed articles focused on RME implementation between 2013 and 2023. Data analysis was conducted using bibliometric indicators to explore trends in themes, research designs, geographical distribution, and leading journals (Donthu et al., 2021). Each article was coded by its main themes, methodological approach, country of study, and publication outlet. The coding was then followed by quantitative analysis of these variables, a process common in bibliometric reviews to provide structured insights into research patterns and academic contributions (Aria & Cuccurullo, 2017; Zupic & Čater, 2015). For analyzing trends in research themes, the data was grouped based on the core focus of each study. The identified themes included student-centered learning and real-world applications, teacher development and professional training, and curriculum integration and pedagogical challenges. The frequency and percentage of each theme were calculated to reveal the dominant thematic trends. Additionally, the research designs were classified into qualitative, quantitative, and mixed-methods approaches, allowing us to identify the predominant methodological approaches in RME studies. Geographical analysis involved categorizing the articles by country to highlight the most active regions in RME research. This step provided insights into where RME is most commonly implemented and studied, with a specific focus on identifying high-research activity countries, such as the Netherlands and Indonesia, in contrast to underrepresented regions. Leading journals were identified by the frequency of articles published on RME, indicating which journals serve as primary platforms for disseminating RME-related research. The top journals were categorized and their percentage contributions calculated to illustrate their prominence in this area. To further support the descriptive analysis, visualizations such as bar graphs and pie charts were employed. These diagrams provided a clear representation of the distribution of themes, research designs, and countries of research, as well as the relative contributions of leading journals. For example, a bar chart illustrating the frequency of articles by research theme emphasized the prominence of student-centered learning within RME studies. Similarly, a pie chart depicting the geographical distribution of studies highlighted the concentration of research in the Netherlands and Indonesia.

Results

Research question 1: What are the trends in RME-related topics and themes?

From Figure 2, the data in the pie - chart highlights three primary themes within RME research from 2013 to 2023, showing the distribution of studies focusing on student-centered learning, teacher development, and curriculum integration. Most articles, 109 (58.3%) studies focused on how RME fosters student-centered learning and enhances students' abilities to apply mathematical concepts to real-world problems (eg. Gravemeijer, 2020; Naldi et al., 2023; Qomario, et al., 2020). The high percentage (58.3%) dedicated to student-centered learning suggests that researchers are keenly interested in the student experience and outcomes of RME. This aligns with global educational trends emphasizing learner-centered approaches and active engagement. Several publication, 58 studies (31.0%) also emphasized the need for adequate teacher training and support to successfully implement RME, as well as challenges teachers face in adjusting to this pedagogical approach (eg. Hasibuan et al., 2019; Van den Heuvel-Panhuizen, 2020). The substantial focus on teacher

training (31.0%) reflects an understanding that successful RME implementation depends on teacher preparedness. These studies likely advocate for more investment in professional development programs and resources that enable teachers to apply RME effectively. Lastly, 20(10.7%) the articles frequently explored curriculum-related challenges and solutions for integrating RME, such as balancing standard mathematical practices with realistic contexts (Doorman et al., 2016; Ismail, et al. 2020). With only 10.7% of studies focusing on curriculum integration, there is a clear indication that while curricular adaptation is important, it may not yet be a priority focus in RME research. These themes indicate a growing interest in contextual learning through RME, with a focus on enhancing student engagement, teacher support, and effective curriculum integration.

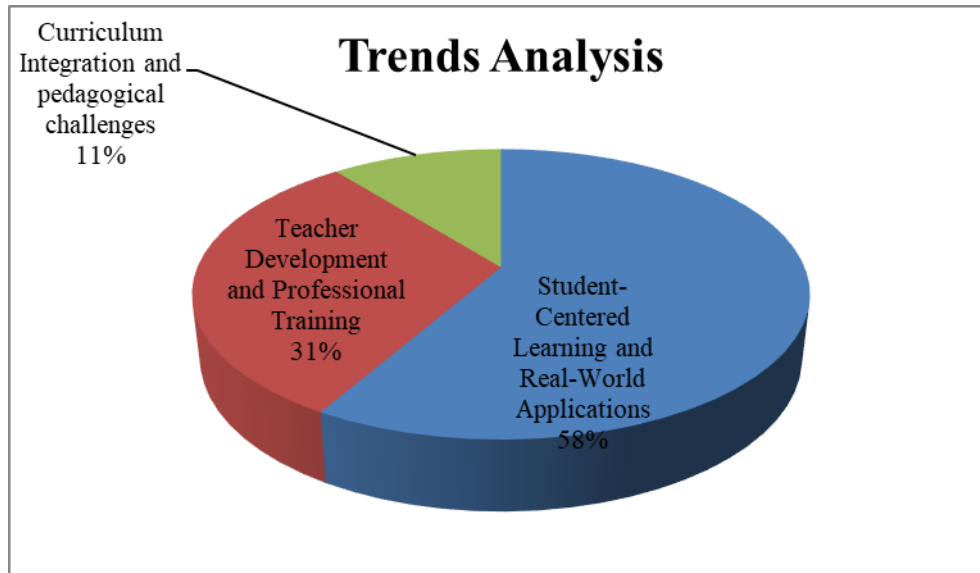


Figure 2. A Pie – Chart showing Trends Analysis (Source: Field survey, 2024)

Research question 2: Which research designs or approaches are predominantly employed in RME studies?

Table 1 provides an overview of the distribution of research designs employed in studies on RME, highlighting three main categories: qualitative, quantitative, and mixed methods approaches.

Table 1. A Table showing Research Design

Category	Sub-category	Count (n = 187)	Percentage (%)	Examples/Notes
Research Design	Qualitative Approaches (Case Studies, Interviews)	107	57.0	Predominantly case studies and classroom observations.
	Quantitative Approaches (Experimental Studies)	58	31.0	Experiments measuring the impact of RME on student achievement.
	Mixed Methods (Combining Qualitative & Quantitative)	22	12.0	Studies combining both qualitative and quantitative data.

Source: Field survey, 2024

From Table 1, the majority of studies utilized qualitative approaches 107(57%), such as case studies, interviews, and classroom observations, which allowed for in-depth exploration of RME implementation processes (Van Steenbrugge et al., 2018). Quantitative designs 58(31%), including experimental and quasi-experimental studies, were also employed to measure RME's impact on student learning outcomes. A smaller portion used mixed methods 22(12%) to combine qualitative insights with quantitative analysis, offering a more comprehensive view of RME's effects (Widjaja et al., 2019). To visualize this analysis, we considered a bar chart to highlight the three categories side by side, making it easy to see the comparative frequency of each research design in a single glance (see Figure 3).

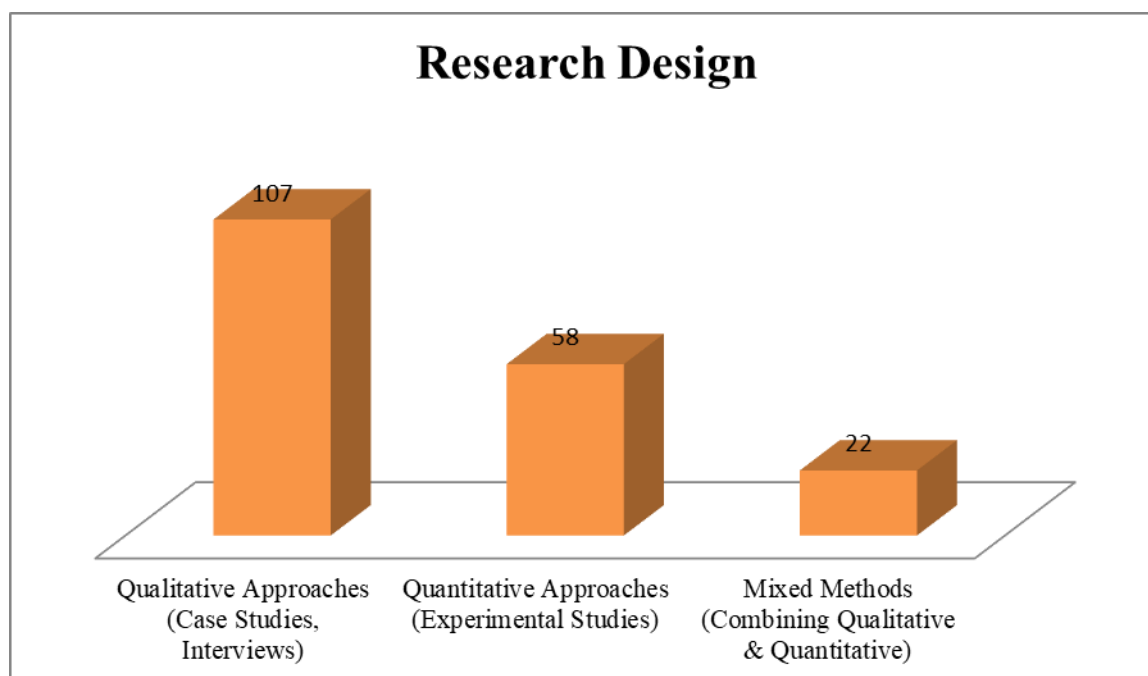


Figure 3. Research Design Analysis (Source: Field survey, 2024)

From Figure 3, the high percentage of qualitative studies (57.0%) shows that researchers frequently use in-depth, narrative-driven methods to investigate RME, likely due to the need to capture the complexities of classroom interactions and student engagement with realistic mathematics problems. With 31.0% of studies using quantitative methods, there is a substantial interest in determining the effectiveness of RME through statistical measurements. This approach provides valuable evidence on RME's impact on student performance, reinforcing its credibility as an effective educational approach. Although less common, mixed methods (12.0%) offer a balanced view by combining qualitative insights with quantitative rigor. This approach is particularly useful for connecting the pedagogical methods of RME with student outcomes, making it appealing for comprehensive studies that inform both teaching practices and policy.

Research question 3: What are the most researched countries regarding RME implementation?

The bar chart below (see figure 4) provides an overview of the geographic distribution of research on Realistic Mathematics Education (RME) implementation from 2013 to 2023.

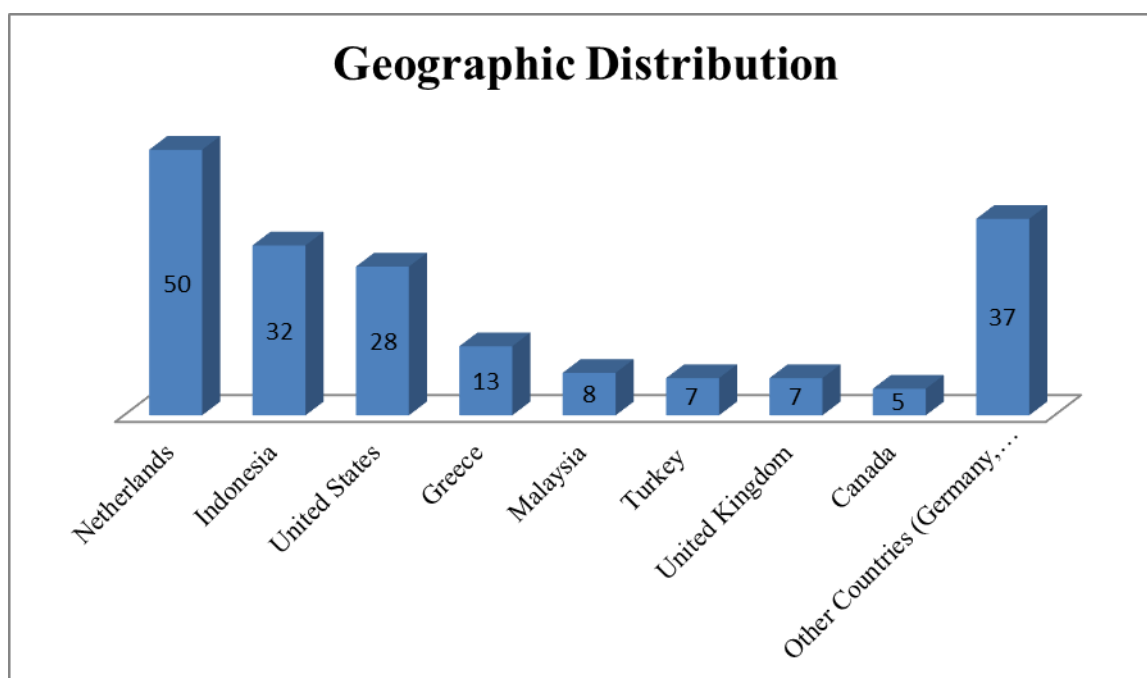


Figure 4. Bar Chart showing Geographic Distribution (Source: Field survey, 2024)

The findings based on the data: Netherlands leads significantly, accounting for 26.7% of the total studies. This is expected, as the Netherlands is the origin of RME, with researchers in Dutch institutions continually refining and expanding the model's application. Indonesia ranks second with 17.1%, reflecting Indonesia's emphasis on implementing RME within its national education system, often through localized adaptations for cultural and curricular fit. United States holds the third position (15.0%), focusing on the adaptability of RME to diverse educational contexts and addressing the challenges of integrating RME into U.S. standards. Countries like Greece (7.0%), Malaysia (4.3%), Turkey (3.7%), and United Kingdom (3.7%) also contribute to RME research, exploring RME's feasibility and impact within their unique educational systems. This group often focuses on pilot studies and comparisons between RME and traditional approaches. Canada (2.7%) and a group of other countries (19.8%), including Germany, Australia, and others, represent smaller portions of the total research. Although their sample sizes are smaller, these studies contribute to the global knowledge of RME, indicating widespread but less intense research interest. They often provide insights into RME's versatility in varied educational and cultural contexts. The studies note that RME has expanded beyond its Dutch origins, establishing a foothold in Asia, Europe, and North America, indicating its relevance and perceived benefits. However, the majority of studies from outside these main regions tend to focus on specific aspects of RME, such as student engagement or problem-solving, rather than comprehensive curriculum integration.

Research question 4: Which are the leading journals in publishing RME research?

Figure 5 identifies the top journals contributing to the body of research on RME, including the distribution of studies across five major journals. These journals are instrumental in disseminating findings on RME, its implementation, and its impact on student learning in mathematics education. The *Educational Studies in Mathematics* was found to be the leading journal in number of research article publications with 38 studies. As

the most prominent journal in this dataset, *Educational Studies in Mathematics* accounts for 20.3% of the publications on RME. The prominence of *Educational Studies in Mathematics* as the top journal reflects its status as a leading source of scholarly discourse on RME, solidifying its influence on theoretical and empirical research within mathematics education. Followed by *Journal of Mathematical Behavior* with 26 studies. This journal, with 13.9% of the studies, emphasizes the behavioral and cognitive dimensions of mathematics learning, focusing on how students engage with and respond to RME methodologies. The significant representation of RME studies here highlights a research interest in the psychological and behavioral impacts of RME on students. Then, followed by *International Journal of Science and Mathematics Education* 22(11.8%) publication. This journal specializes in international and cross-disciplinary studies, making it suitable for research that examines RME across different educational contexts. The presence of RME studies in this journal underscores the global interest in applying RME principles to diverse educational systems. *Research in Mathematics Education* is the next, publishing 18(9.6%) studies. *Research in Mathematics Education* publishes research on pedagogical innovations, including the practical challenges and integration strategies of RME. The representation of RME studies here points to the journal's emphasis on pedagogical improvements and curriculum integration. Hence, studies in this journal tend to focus on RME's practical implementation and challenges, making it a key source for educators and policymakers interested in the structural and operational aspects of RME adoption. Finally, followed by *Mathematics Education Research Journal* with 15(8.0%) publications. Accounting for 8.0% of the publications, this journal frequently includes research on educational practices, including RME's impact on instructional strategies and teacher development. Because of the journal's focus on educational practices, it makes it a valuable outlet for studies examining RME's practical application in classrooms and teacher training.

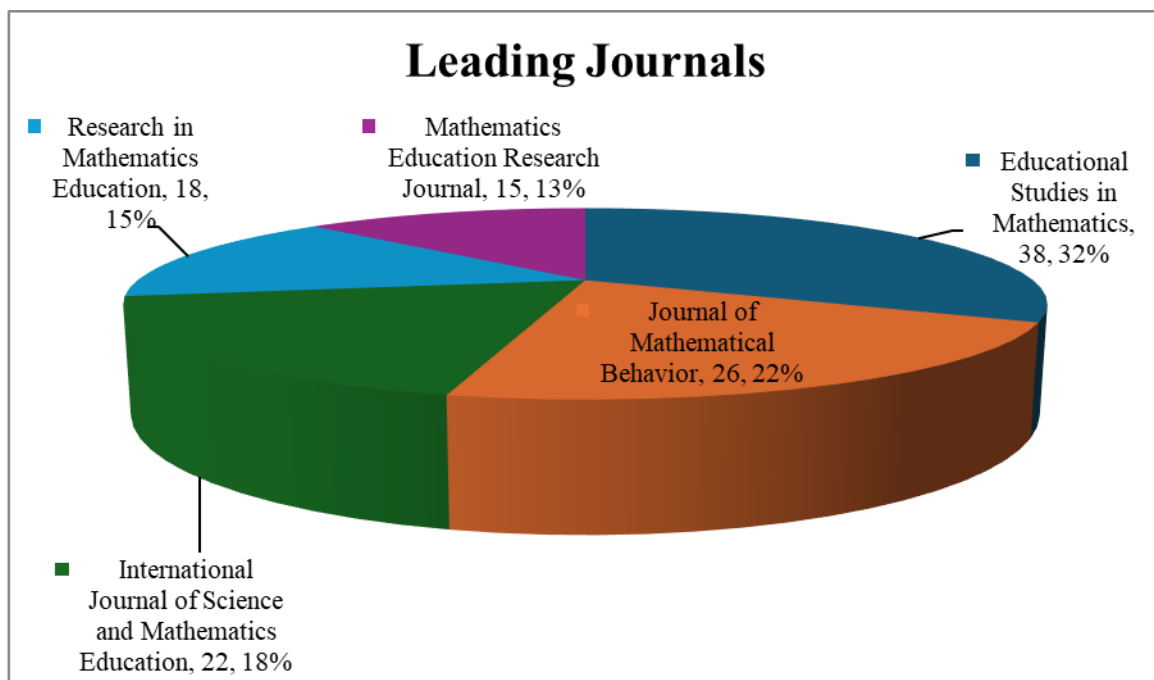


Figure 5. A Pie Chart showing Leading Journals(Source: Field survey, 2024)

Discussion

The bibliometric analysis of Realistic Mathematics Education (RME) implementation research over the past decade (2013-2023) provides insights into the thematic trends, methodological preferences, geographic focus, and publication outlets that characterize this field of study. These findings reveal the maturity and diversity of RME research, as well as emerging priorities and gaps in the literature.

Thematic Trends in RME Research

The review shows that the dominant theme across RME implementation studies is student-centered learning and real-world applications. This emphasis underscores RME's foundational principle of enhancing student engagement by contextualizing mathematics in real-world scenarios (Gravemeijer, 2020; Tan, 2023, Tumangger et al. 2024). By making mathematics more relevant, RME aims to foster deep, meaningful learning, a focus that resonates across many educational contexts globally. Studies frequently highlight the positive effects of contextual learning on student motivation and conceptual understanding (van den Heuvel-Panhuizen & Drijvers, 2020). The second major theme, teacher development and professional training, reflects the importance of teacher preparedness for effective RME implementation. Research shows that teachers' beliefs and professional training directly affect their ability to facilitate RME-based instruction (Zulkardi et al., 2020). This highlights a growing awareness that teacher development programs must include RME methodologies to enable educators to effectively adopt student-centered approaches. The relatively smaller proportion of studies focused on Curriculum Integration and Pedagogical Challenges suggests that while RME's core principles are well-established, practical integration into standardized curricula remains a concern. This theme points to logistical and pedagogical barriers to RME adoption, particularly in countries where traditional, test-oriented teaching dominates (Purwitaningrum & Prahmana, 2021).

Predominant Research Designs

The methodological analysis reveals that qualitative approaches dominate RME research, specifically case studies and classroom observations. These studies provide in-depth insights into the nuanced experiences of students and teachers as they engage with RME methods. This finding aligns with the nature of RME, which often requires detailed, contextual analyses to understand its impact (Freudenthal, 1991). Qualitative research in RME typically focuses on teacher-student interactions, learning trajectories, and pedagogical adjustments, areas where experimental studies may be limited in capturing subtleties (Prahmana et al., 2023). While quantitative approaches are less common, they play a critical role in assessing the measurable impacts of RME on student outcomes, particularly in studies conducted in Indonesia, the United States, and the Netherlands (Nurnaningsih, et al., 2024). Experimental studies within this subset often utilize pre- and post-assessment data to evaluate the effectiveness of RME-based teaching methods on student achievement, offering valuable empirical support for RME's efficacy. Mixed methods approaches are emerging as a balanced strategy, combining the strengths of both qualitative and quantitative designs to provide comprehensive insights into RME implementation (Negara et al., 2021).

Geographic Distribution of RME Research

The geographic analysis highlights the Netherlands, Indonesia, and the United States as leading contributors to RME research, indicating both the historical and expanding relevance of RME across diverse educational settings. The Netherlands remains the central hub of RME scholarship, reflecting its origin and ongoing innovation within Dutch schools and universities (Gravemeijer & Cobb, 2006; Zulkardi et al., 2020). Studies from the Netherlands tend to emphasize theoretical development and iterative refinement of RME principles. In Indonesia, where 17.1% of the studies were conducted, RME is highly regarded as a framework for transforming traditional mathematics instruction. Indonesian scholars have shown significant interest in adapting RME principles to local contexts, often examining its efficacy in diverse classrooms and in various regions with differing socioeconomic statuses (Khairunnisak et al., 2024; Purwitaningrum & Prahmana, 2021). The prominence of U.S. research (15.0%) underscores efforts to adapt RME principles to align with the U.S. educational system, which often emphasizes standardized testing. This adaptation is seen as a way to bridge conceptual understanding with rigorous assessment standards (Hadi et al., 2023). Other countries, such as Greece, Malaysia, Turkey, the United Kingdom, and Canada, are also contributing, though with smaller representations. Today, Realistic Mathematics Education (RME) has expanded beyond the Netherlands and is now implemented in over thirty countries worldwide, including the United States, Indonesia, England, South Africa, China, and Korea (Van den Heuvel-Panhuizen, 2020). This broad geographic reach highlights RME's increasing global appeal and flexibility. However, further research is essential to evaluate its effectiveness in non-Western regions and in nations with less established mathematics education systems.

Leading Journals in RME Research

The analysis of leading journals reveals that *Educational Studies in Mathematics* (20.3%) and *Journal of Mathematical Behavior* (13.9%) are the primary outlets for RME research, along with several other mathematics education-focused journals. The prominence of *Educational Studies in Mathematics* reflects its alignment with RME's theoretical underpinnings and its role as a platform for scholarly discourse on constructivist and contextual learning theories (Freudenthal, 1973). Meanwhile, *Journal of Mathematical Behavior* is notable for its emphasis on student engagement and behavior, highlighting RME's impact on affective and cognitive learning domains (Battista et al., 1998; Caraan et al., 2023). The *International Journal of Science and Mathematics Education and Research in Mathematics Education* (9.6%) underscore the interdisciplinary and cross-cultural nature of RME research, while the *Mathematics Education Research Journal* reflects growing interest in applying RME principles to address contemporary challenges in mathematics education, including teacher training and professional development.

Conclusions

This study provides a comprehensive bibliometric review of RME research over the past decade, revealing dominant themes, preferred research methodologies, and notable geographic and journal trends. The findings indicate that RME research is predominantly qualitative, with limited quantitative analyses, especially in regions such as Africa, where the implementation of RME remains underexplored. The concentration of studies in

certain countries, such as the Netherlands and Indonesia, underscores the importance of adapting RME to diverse educational contexts to enhance its global applicability. Furthermore, while the thematic focus on student-centered learning and teacher development aligns with RME's core philosophy, more research on curriculum integration challenges is required to facilitate effective adoption across various educational systems.

Implications

This bibliometric analysis highlights significant implications for the future of RME research. First, the methodological gap suggests a need for more quantitative studies, particularly in regions with minimal representation in the current literature, such as Africa and specifically Ghana. Quantitative methods could provide robust, generalizable insights into RME's impact on student achievement and teacher practices. Additionally, the thematic trends identified suggest that enhancing teacher professional development and curriculum support could strengthen RME's practical adoption. Insights from these areas can guide policymakers and curriculum developers in implementing RME frameworks that address contextual challenges and align with national education goals.

Recommendations

1. *Expand Quantitative Research:* To address the gap in quantitative studies, future research on RME should employ quantitative methodologies, particularly experimental and quasi-experimental designs, to evaluate RME's impact on student performance and learning outcomes. In Ghana, such studies could provide generalizable insights into RME's effectiveness in the local educational context.
2. *Focus on Curriculum Integration:* More research is needed to explore the challenges and strategies involved in integrating RME into standard curricula, particularly in countries with rigid educational frameworks. This focus could provide practical guidance to curriculum developers and policymakers seeking to implement RME effectively.
3. *Broaden Geographic Representation:* Given the dominance of studies from the Netherlands, Indonesia, and the United States, expanding RME research in underrepresented regions, such as Africa, would provide a more comprehensive understanding of its applicability in diverse cultural and educational contexts.
4. *Diversify Publication Outlets:* Future RME studies should consider publishing in broader educational journals to increase the visibility of RME research and foster interdisciplinary dialogue. This diversification could encourage the adoption of RME principles in contexts beyond mathematics education alone.

Limitations

The limitations of this review are mainly related to the selection criteria and the sources of data. By focusing solely on English-language articles from peer-reviewed journals, the analysis may overlook valuable insights from non-English publications and grey literature. Furthermore, this review's reliance on Scopus and Google

Scholar databases may limit the inclusion of all relevant studies, as some journals might not be indexed on these platforms. Additionally, while the bibliometric analysis reveals trends and patterns, it lacks the nuanced insights that a more detailed systematic review could provide.

Methodological Gap and Justification for a Quantitative Approach in Ghana

The methodological gap identified in this review, with a predominant focus on qualitative methods, suggests a need for more empirical, quantitative research to provide statistically robust findings on RME's impact. This gap exists partly because qualitative methods allow for rich, context-specific insights, which are essential for understanding RME's nuances but may limit generalizability. A quantitative approach in Ghana would address this gap by generating data that can be generalized to broader educational settings. Quantitative research could objectively measure the effects of RME on student achievement and provide insights into how RME impacts teaching practices across different regions and school environments. By employing a quantitative methodology, my PhD thesis in Ghana entitled "*Unveiling the Nexus: Realistic Mathematics Education and Teacher Variables Impact on Ghanaian Junior High School Learners' Mathematics Achievement via Structural Equation Modeling*" could fill this gap, offering a new perspective on RME's efficacy in an African context and contributing to the global discourse on RME implementation.

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