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Innovative Pedagogy in Elementary School Mathematics Education: A Systematic Literature Review and Bibliometric Analysis

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Abstract
Innovative pedagogy has been at the heart of efforts to strengthen mathematics learning in early grades, but the field is still scattered among a wide range of technologies and rapidly evolving learning approaches. This study maps the scientific landscape of innovative pedagogy in elementary school mathematics education through systematic literature review combined with bibliometric analysis. By following the PRISMA 2020 protocol, a search of the Scopus database yielded 1,002 records, which were then filtered based on the criteria of subject area, focus, and document type so that a final corpus of 19 indexed and peer-reviewed articles published between 2021 and 2026 was obtained. The corpus was analyzed descriptively to see publication trends, geographic distribution, and source journals, and visualized through co-occurrence, co-authorship, and co-citation maps using VOSviewer. The findings show a sharp acceleration in recent times, with 58% of studies published in 2025–2026 and a noticeable shift towards artificial intelligence, large language model tutoring, augmented reality, and learning analytics. The thematic synthesis identifies four main strands: technology-assisted learning, teacher competence and readiness, inclusive and equitable practices, and assessment and feedback design. The bibliometric map shows a geographically fragmented field with very minimal cross-border collaboration and no representation from Indonesia. This study contributes an integrated and up-to-date picture of how innovation is reshaping primary school mathematics pedagogy and advocates contextually sensitive research to reach underrepresented backgrounds. Situating this map within the context of Islamic education, the pronounced absence of Indonesia—home to one of the world's largest networks of Islamic primary schools (Madrasah Ibtidaiyah)—is highlighted as a strategic opportunity for future research that adapts innovative mathematics pedagogy to madrasah settings and Islamic educational values.

Keywords: bibliometric analysis, technology integration, systematic literature review, innovative pedagogy, elementary school mathematics education

A. INTRODUCTION

Mathematics at the primary school level lays the conceptual foundation on which to build on later learning, and the quality of teaching in the early years also shapes how confident children will be in reasoning with numbers, spaces, and structures. Over the past decade, the question of how to teach this material well has shifted from just curriculum coverage to attention to pedagogy that is responsive, engaging, and increasingly mediated by technology. Innovative pedagogy, understood here as the practice of learning that moves away from routine transmission in order to deepen reasoning and participation, is thus attracting increasing attention from researchers at the elementary school level.

This concern is especially pertinent to Islamic education. Indonesia hosts one of the largest faith-based basic education systems in the world, in which Madrasah Ibtidaiyah (Islamic primary

schools) educate millions of pupils alongside the public school system. Islamic educational tradition places a strong emphasis on the pursuit of knowledge (ṭalab al-'ilm) and on nurturing sound reasoning, so improving the quality of early mathematics teaching aligns naturally with the aims of the madrasah. As digital devices, artificial intelligence, and augmented reality increasingly reshape mathematics classrooms, Islamic schools face the additional task of adopting these tools in ways that are consistent with the madrasah curriculum and with Islamic values. Mapping innovative pedagogy in elementary mathematics, therefore, is not only a general educational priority but also a matter of direct relevance to the modernization of Islamic primary education.

A number of factors have strengthened this interest. The deployment of digital devices into the classroom opens up new ways to represent mathematical ideas, ranging from learning analytics platforms that personalize exercises (Rodríguez-Martínez et al., 2023) to augmented reality environments that make geometric relationships more visible (Na et al., 2025). More recently, generative artificial intelligence and large language model tutoring systems are beginning to enter elementary school mathematics learning, promising adaptive support for story problem solving while raising new concerns about pedagogical transparency (Liu et al., 2025; Looi et al., 2026). In line with these technological developments, a parallel strand of literature has examined the competencies teachers need to carry out innovation, including inclusive teaching skills (Abdulah & Mahmud, 2025) and readiness to integrate digital technology into daily learning (Li et al., 2025a). Islamic primary schools are increasingly part of this movement, with a growing body of practice exploring how madrasah teachers can integrate digital and intelligent tools while preserving the curricular and value-based character of Islamic education.

Despite its strong momentum, it is difficult to understand this field as a whole. Various studies are spread among diverse technologies, learning models, and country contexts, and have been published in journals that span from mathematics education journals to educational technology journals and engineering education. This distribution makes it difficult for researchers and teacher educators to see which themes are consolidating, which are still marginal, and where the most productive research direction lies. The consolidated field map will help guide future research, particularly in settings where research capacity in primary school mathematics pedagogy is still evolving.

Systematic literature review addresses this need by synthesizing evidence in a transparent and replicable manner, while bibliometric analysis adds a complementary structural view of how a field is organized through keywords, authors, sources, and citations. A number of recent studies of mathematics education illustrate the value of this approach. For example, a systematic study of feedback in mathematics uses a thematic framework to detail how feedback characteristics differ from one another and which are overlooked (Söderström & Palm, 2026), while a study of teachers' knowledge for problem-solving organizes heterogeneous literature around an established framework to uncover the breadth of competencies teachers need (Lit et al., 2026). Both show that combining systematic selection with structured synthesis can provide coherence to a fragmented evidence base. Bibliometric and systematic approaches have likewise been applied within Islamic education scholarship to consolidate emerging research fields, underscoring the suitability of this method for orienting research communities in madrasah and Islamic higher education contexts.

Building on this tradition, this study maps innovative pedagogy in elementary school mathematics education by integrating a systematic study guided by PRISMA and a bibliometric analysis of the focused Scopus corpus. The goal is twofold: to describe the thematic substance of recent research and to uncover its structural patterns, including its geographical reach and collaborative texture. Three research questions guided the study:

(1) What are the trends in publications, geographical distribution, and journals of the main sources of research on innovative pedagogy in elementary school mathematics education?
(2) What thematic strands and conceptual structures emerge from the analysis of co-occurrence, co-authorship, and co-citation of this literature?
(3) What gaps in research and future research agendas do the overall evidence imply, especially for underrepresented contexts such as Indonesia?

By answering these questions, this study provides an evidence-based orientation to fast-growing fields while identifying where researchers' contributions to contexts such as Indonesia can have the most meaningful impact.

B. METHODS

1. Research Design

This study uses a systematic literature review equipped with bibliometric analysis. The systematic component follows the 2020 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement to ensure that the process of identification, screening, and inclusion of studies is transparent and replicable. The bibliometric component uses VOSviewer to construct and visualize a network of co-occurrence, co-authorship, and co-citation as a structural complement to narrative synthesis. The two components are integrated so that the bibliometric map informs the interpretation of thematic patterns, rather than standing apart from them.

2. Data Sources and Search Strategies

Bibliographic data were drawn from the Scopus database which was selected for its broad and quality-controlled coverage of peer-reviewed literature in the field of education and educational technology. The search combines terms for subject, pedagogical focus, and level of education, which are formulated as ("mathematics" OR "mathematics education") AND ("pedagogy" OR "teaching") AND "primary school". The search is limited to the period 2021–2026 to capture contemporary developments, with particular attention to the emergence of artificial intelligence in the relatively recent learning of elementary school mathematics. Data exports are generated on June 2, 2026 and include complete bibliographic records, including abstracts, author keywords, index keywords, affiliations, and cited references. Scopus was preferred over alternatives such as Web of Science and ERIC because of its broader indexing of educational-technology and mathematics-education journals, its consistent citation metadata for bibliometric mapping, and its wide adoption in comparable systematic and bibliometric reviews, which together make it a suitable single-source base for a focused corpus.

3. Inclusion and Exclusion Criteria

The study is declared eligible if it is a peer-reviewed journal article, written in English, focuses on elementary school mathematics education, and discusses innovative pedagogical approaches or learning technologies. Recordings are excluded when they are outside the subject area of Education, outside the focus of Social Sciences, are not centered on elementary school mathematics education, or are documents other than articles, such as reviews indexed as secondary sources, editorials, or conference notes. This criterion balances completeness with the need for a corpus that is coherent and directly relevant to the research question.

4. Selection Process

The selection process is summarized in Figure 1 in the form of a PRISMA 2020 flowchart. Initial searches identified 1,002 records. After two duplicate records are issued, 1,000 records are filtered by title and abstract; at this stage 893 recordings were issued because they were outside the subject area of Education (268) or outside the focus of Social Sciences (625). A total of 107 remaining recordings were sought and assessed for feasibility, and 88 of them were reissued because they did not focus on elementary school mathematics education (71) or were not articles (17). Nineteen studies met all the criteria and formed the final corpus for systematic review as well as bibliometric analysis. The Scopus search and data export were conducted on 2 June 2026, and this cut-off date should be borne in mind when interpreting the 2026 figures, which are necessarily partial.

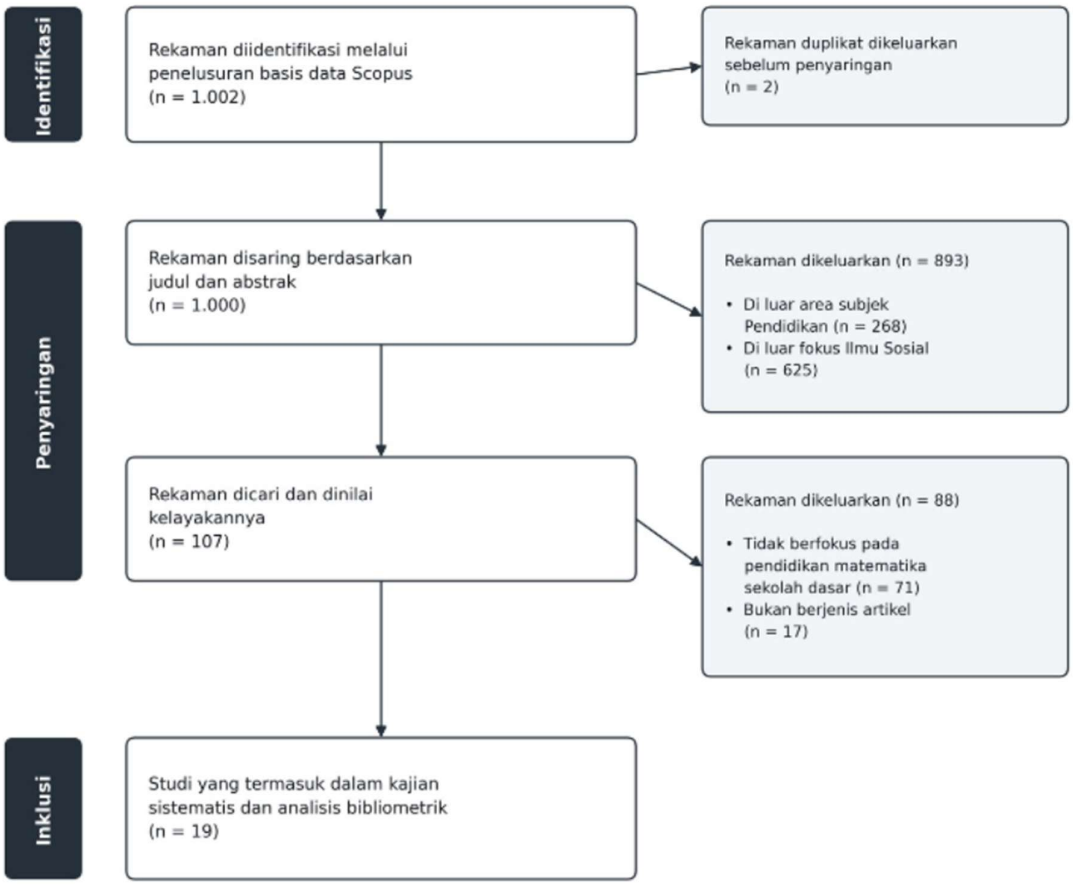


Figure 1. PRISMA 2020 flowchart for the study selection process.

5. Data Analysis

The analysis took place on two tracks. For a systematic study, the full text of each article is read and thematically coded following an approach that is in line with the established study of mathematics education (Lit et al., 2026; Söderström & Palm, 2026). The code was first derived from the research question, then refined inductively as repeated concerns emerged across the corpus, resulting in four thematic strands reported in the results section. For the bibliometric path, the Scopus record is imported into VOSviewer to generate an author keyword co-occurrence map and index keywords, an author and country co-authorship map, and a source and reference co-citation map. Descriptive indicators, including the annual distribution of publications, the geographical distribution of contributor affiliations, the number of citations, and the most frequently cited source journals, are calculated from bibliographic exports to describe the corpus. The coding process was carried out independently by the two authors, and discrepancies were resolved through discussion until consensus was reached, in order to enhance the consistency and reliability of the thematic classification.

C. RESULT & DISCUSSION

RESULT

1. Publication Trends and Corpus Overview

The nineteen studies that came in, although limited, showed a rapidly growing field. As Figure 2 shows, annual output was still sparse and uneven in the early part of the period, namely two articles in 2021, one in 2022, four in 2023, and one in 2024, before jumping sharply to seven articles in 2025 and four in the current year 2026. The studies published in 2025 and 2026 together account for 58%

of the corpus, a concentration that signals a strengthening of scientific attention instead of mature and evenly developed literature. The novelty of this corpus also explains the citation profile: the total citations of 19 articles totaled 122, with an average of 6.4 per article, a figure influenced by the short span of time the most recent studies were available for citation.

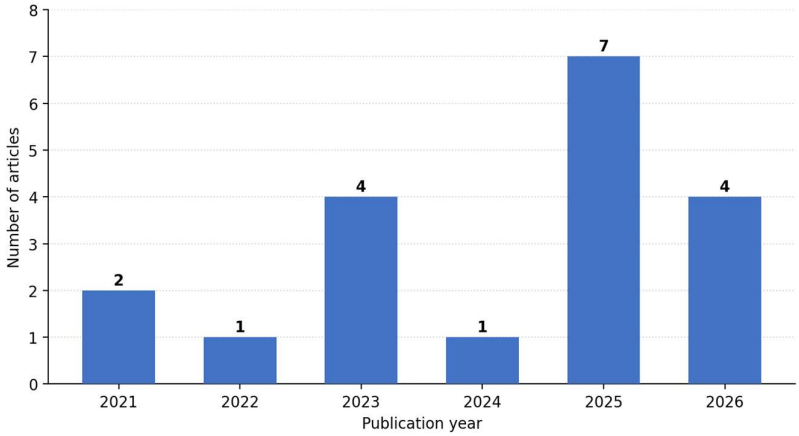


Figure 2. Annual distribution of publications in the corpus (2021–2026).

The most cited works become the thematic anchor of the corpus. A learning analytics study on personalized homework for fractional understanding obtained the highest number of citations (Rodríguez-Martínez et al., 2023), followed by a scoping review of robotics in early childhood education (Mangina et al., 2024) and an analysis of the challenges of elementary school teachers in applying ICT to STEM (Kibirige, 2023). The excellence of these works shows that technology-mediated learning and the conditions of its application have become the center of gravity of this field.

2. Source Journal

The corpus is spread over a small group of repeating journals, as presented in Table 1. The British Journal of Educational Technology and Computers and Education: Artificial Intelligence each contributed two articles, as did the International Electronic Journal of Mathematics Education and the International Journal of Learning, Teaching and Educational Research, while the International Journal of Technology and Design Education also appeared twice. The rest of the articles are spread in single appearances in journals that span from educational technology, mathematics education, to engineering education. This pattern, visualized on the source co-citation map in Figure 3, confirms that this literature is at the intersection of mathematics education and educational technology rather than under the auspices of a single disciplinary house.

Table 1. Distribution of the corpus in the source journal.

Title of the source journal	Number of articles	Field orientation
British Journal of Educational Technology	2	Educational technology
Computers and Education: Artificial Intelligence	2	AI in education
International Electronic Journal of Mathematics Education	2	Mathematics education
International Journal of Learning, Teaching and Educational Research	2	General education
International Journal of Technology and Design Education	2	Technology education
Education and Information Technologies	1	Educational technology
IEEE Transactions on Learning Technologies	1	Learning technology
Computers and Education	1	Educational technology
Other journals (single appearances)	6	Miscellaneous

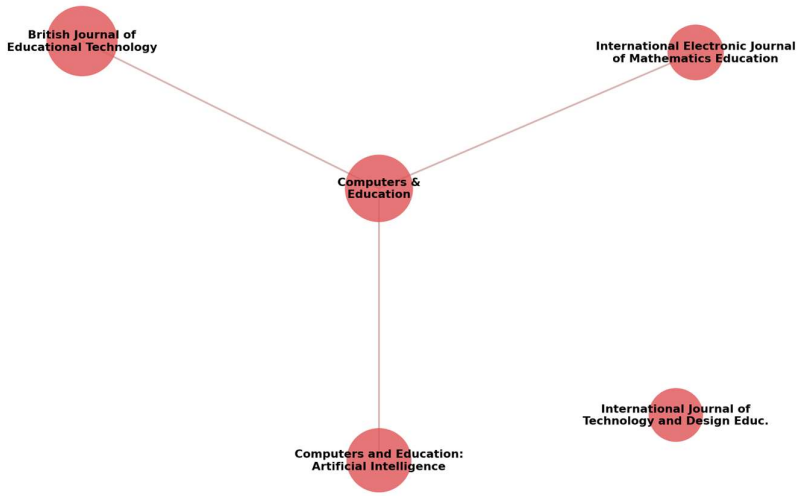


Figure 3. A map of co-citation sources showing the central position of the journal of educational technology and mathematics education.

3. Geographic Distribution and Collaboration

Donor affiliations span fourteen countries, but they are unevenly distributed and, more strikingly, poorly connected. Malaysia and South Africa each contributed three articles, Hong Kong and mainland China, Australia, and Ireland two articles each, with single contributions from Italy, New Zealand, the Netherlands, India, Spain, the United States, Vietnam and Jordan. It is noteworthy that none of the studies originated in Indonesia, although the country has a large basic education system and an active mathematics education research community. This absence is particularly notable given that Indonesia operates a dual basic-education system in which conventional public elementary schools sit alongside a substantial national network of Islamic primary schools (Madrasah Ibtidaiyah). Both sub-systems teach elementary mathematics to very large cohorts, yet neither is represented in the current corpus, leaving a major and educationally distinctive context outside the international evidence base on innovative mathematics pedagogy.

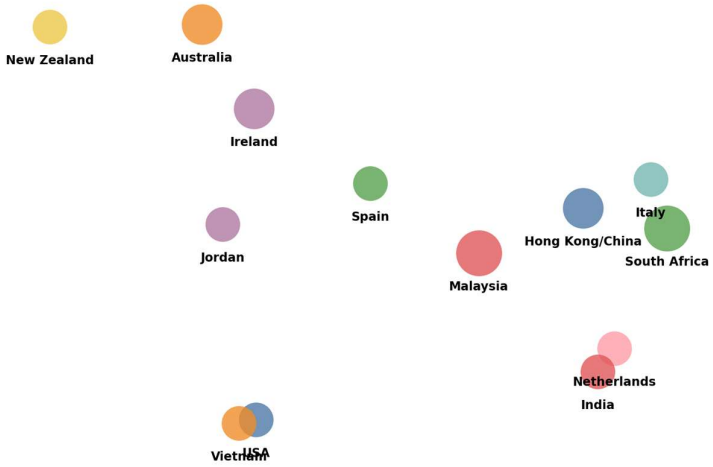


Figure 4. Map of the donor's affiliate countries. The absence of a connecting line indicates very minimal cross-border co-authorship collaboration.

The country map in Figure 4 is just as informative from what it doesn't show as it is from what it shows. Country nodes appear without a connecting line, which indicates that the studies are produced by a single national team or institution rather than through international collaboration. The only dense co-authorship cluster, visible on the authors' network, is the Monash University team,

namely Li, Vale, Tan, and Blannin, whose two articles on the integration of digital technologies in elementary school mathematics learning in China form a closely connected component (Li et al., 2025a, 2025b). The broader picture, therefore, is a geographically fragmented field, where knowledge is produced in parallel rather than through a program of joint work. This suggests that international collaboration in the field is currently confined to a few highly productive research groups rather than being distributed across a broad, connected community, which in turn limits the cross-contextual testing of innovations.

4. Conceptual Structure: Keyword Co-occurrence

The keyword co-occurrence map in Figure 5 arranges the vocabulary of this field into two interrelated clusters. The first cluster collects terms oriented to learners and learning systems, including primary mathematics education, learning systems, students, and mathematics. The second cluster is centered on learning actions and settings, which link teaching, primary schools, and engineering education. The largest and most connected nodes are teaching and primary schools, which together bridge the two clusters and mark the conceptual core that becomes the point of literary cohesion. The author's keyword frequency reinforces this reading: primary schools and primary mathematics education appear five times each, mathematics three times, while TPACK, digital technology integration, and learning analytics two times each, with long tails containing single-frequency terms, from large language models to inclusive education, reflecting the breadth of current research themes.

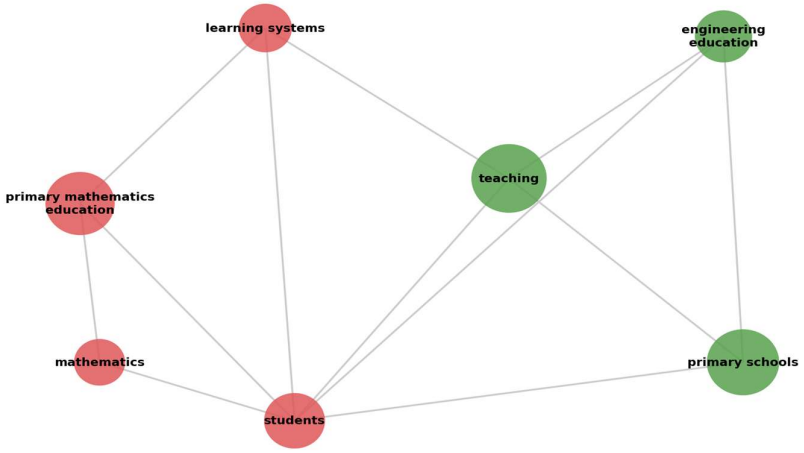


Figure 5. A keyword co-occurrence map showing two clusters bridged by the central node of teaching and primary schools.

5. Thematic synthesis

By reading the full text against the backdrop of the structure, the four thematic strands organize this corpus, as summarized in Table 2.

Table 2. Thematic strands identified in the corpus.

Thematic strands	Representative studies	Focus
Technology-assisted learning	Liu et al. (2025); Looi et al. (2026); Na et al. (2025); Mangina et al. (2024); Kumar & Vasimalairaja (2022); Alzubi (2023)	Tutoring AI/LLM, AR, robotics, gym, computer modeling
Teacher competence and readiness	Abdulah & Mahmud (2025); Li et al. (2025a, 2025b); Kibirige (2023); Mullane et al. (2026); Fox-Turnbull & Wu (2026)	TPACK, ICT readiness, teaching readiness
Inclusive and equitable practices	Abdulah et al. (2025); Mawela & Mahlambi (2021); Porteus (2023); Hoi (2021)	Inclusion, code switching, material design, STEAM access
Design assessments and feedback	Rodríguez-Martínez et al. (2023); van Kessel et al. (2026); Ahmad Fuad Khoo et al. (2025)	Learning analytics, dashboards, conceptual models

The first and largest strand, technology-assisted learning, captures the clearest trajectory in this area. Earlier studies examined stand-alone tools, such as educational games for problem-solving (Kumar & Vasimalairaja, 2022) and computer modeling for mathematical reasoning (Alzubi, 2023), while more cutting-edge work turned to adaptive and intelligent systems. Augmented reality is used to support geometry learning, with comparisons between marker-based and markerless approaches showing different effects on young learners (Na et al., 2025), and robotics being mapped as a broad pedagogical resource for early childhood education (Mangina et al., 2024). The most typical recent development is the influx of generative artificial intelligence, with one study designing an AI-assisted environment for storytelling and reporting improved performance and engagement (Liu et al., 2025), and another study formalizing design principles for rule-integrated large language model tutoring to limit the unpredictability of unguided systems (Looi et al., 2026).

The second strand concerns the competence and readiness that teachers bring to innovation. Studies on this strand have consistently framed technology integration as something that depends on the capacity of the teacher, not solely on the tools. Research rooted in the TPACK tradition examines the demographic factors and influences that shape the use of digital technology by Chinese educators in primary school mathematics learning (Li et al., 2025a, 2025b), while work in Uganda documents the practical obstacles teachers face in applying ICT to STEM in the post-pandemic period (Kibirige, 2023). Related studies extend the question of this readiness to pre-tenured technology teachers and to the teaching of computational thinking in authentic contexts (Fox-Turnbull & Wu, 2026; Mullane et al., 2026).

The third strand discusses inclusion and justice. Here the literature considers who is afforded by elementary school mathematics learning and under what conditions. Two studies examined the competencies needed to teach mathematics in an inclusive manner as well as the perspectives of inclusive education experts (Abdulah & Mahmud, 2025; Abdulah et al., 2025), while another study explored linguistically responsive practices through code-switching in grade 4 mathematics (Mawela & Mahlambi, 2021) as well as the design of supporting materials for early grade mathematics learning in resource-constrained settings (Porteus, 2023). The STEAM-based approach is also framed as an avenue to expand access and engagement (Hoi, 2021).

The fourth strand, the design of assessment and feedback, is smaller in size but conceptually important. This strand links innovation with a circle of information that guides learning. A learning analytics study built on personalized homework from formative assessment data and showed its effect on the fractional understanding of fifth-graders (Rodríguez-Martínez et al., 2023), while a study on teacher dashboards examined how dashboard-triggered feedback varied across learning phases (van Kessel et al., 2026). Other studies introduced conceptual models for teaching fractions and decimals, which placed innovation on representation design rather than on technology alone (Ahmad Fuad Khoo et al., 2025). Overall, these strands show areas where innovation is concentrated on technology and assessment, with teacher capacity and justice acting as enabling conditions.

DISCUSSION

The overall evidence answers all three research questions and, thus, clarifies both the substance and structure of current research on innovative pedagogy in primary school mathematics education. With regard to the first question, trend analysis shows that the field has accelerated sharply since 2025 and is pivoting towards artificial intelligence and analytics, which are spread across educational technology journals and mathematics education instead of resting on a single discipline base. This pattern interprets the excellence of the most cited works not as evidence of an established canon, but as an initial consolidation of technology-mediated learning as the main concern of this field.

With regard to the second question, the bibliometric map and thematic synthesis together show that these fields cohesive around the teaching act in elementary school classrooms while branching out into increasingly specialized applications of technology. The structure of the two keyword clusters, bridged by teaching and primary schools, indicates that innovation is being theorized in relation to learning and setting, rather than as technology for the sake of technology itself. This reading is in line with the way recent mathematics education studies have asserted that the value of an innovation lies in how it is pedagogically manifested, both in the feedback characteristics (Söderström & Palm, 2026) and in the knowledge that teachers deploy to orchestrate problem-

solving (Lit et al., 2026). The corpus in this study extends the principle into the realm of digital and intelligent tools, where the question is no longer whether technology is present, but rather whether its use is pedagogically transparent and learner-centered, a concern that is explicit in the shift towards rule-integrated tutoring (Looi et al., 2026).

The structural findings also carry a message to watch out for. The absence of connecting lines on the country map reveals a growing field within national partitions, with only one substantial cluster of authors. This kind of fragmentation limits cumulative progress, because innovations validated in one setting are rarely tested collaboratively in another. The heavy skew of the literature towards technology, while the competence of teachers and justice is still relatively thin, further shows that the conditions that allow innovation are less theoretical than the innovations themselves. This inequality is important because application studies in the corpus, particularly those documenting teachers' difficulties with ICT (Kibirige, 2023), show that pedagogical innovations succeed or fail depending on the strength of teacher capacity and contextual support.

With regard to the third question, the most significant gaps are contextual. None of the studies in the corpus originated in Indonesia, and the broader literature is concentrated on a small number of national education systems. Given that effective early mathematics learning is a shared global priority, the near-absence of evidence from large and diverse education systems limits the diversion of current findings. The field will benefit from research that examines innovative pedagogy in underrepresented settings and that builds cross-border collaboration, which the map in this study shows is still lacking.

Implications

These findings carry particular significance for Islamic education. The near-total absence of evidence from Indonesia means that the Madrasah Ibtidaiyah system—one of the largest faith-based primary-education networks in the world—has yet to be represented in the international literature on innovative mathematics pedagogy. The four thematic strands identified here map onto concerns that are highly salient for madrasah settings. Technology-assisted learning raises the question of how AI, augmented reality, and learning analytics can be adopted in Islamic schools in ways that remain consistent with the madrasah curriculum and with Islamic values, including the ethical use of generative AI with young learners. Teacher competence and readiness are equally central, since teachers in Islamic schools must integrate digital and intelligent tools while aligning them with Islamic pedagogical principles, adding a value-based dimension to the TPACK-oriented readiness described in the corpus.

The strands of inclusion and equity, and of assessment and feedback, are similarly relevant. Linguistically responsive practices such as code-switching resonate with the multilingual reality of Islamic education, where Arabic as a religious language coexists with the national language and local languages in the classroom. Because much of the reviewed innovation was validated in non-Indonesian and non-Islamic contexts, findings cannot be assumed to transfer directly; an innovation shown to be effective in, for example, a Chinese classroom may require careful adaptation before it is appropriate for an Indonesian Madrasah Ibtidaiyah. Islamic higher education institutions and Islamic teacher-education programmes are especially well positioned to lead this adaptation, developing programmes that prepare madrasah teachers to integrate technology in ways that are pedagogically sound and consistent with Islamic educational values, and fostering cross-border collaboration among Muslim-majority countries that share these institutional contexts.

Several implications emerge for research, teacher education, and policy. For researchers, these findings advocate studies that combine technological innovation with explicit attention to the pedagogical and contextual conditions that make them successful, rather than treating tools in isolation. The rapid entry of artificial intelligence into elementary school mathematics learning, in particular, demands design-based and embedded studies in the classroom that examine transparency, equity of access, and the maintenance of students' reasoning. For teacher education, the prominence of the teacher competency strand indicates that the program needs to foster the technological pedagogical knowledge that teachers need to integrate digital and intelligent tools in a meaningful way, side by side with inclusive and linguistically responsive practices. For policy, the geographic concentration of literature implies the importance of underpinning research capacity and

cross-border collaboration in underrepresented systems, so that evidence on innovative pedagogy reflects a wider range of classrooms. In addition, Islamic teacher-education institutions should develop programmes that prepare teachers to integrate technology in ways that align with Islamic pedagogical values, and Islamic education networks across Muslim-majority countries could serve as a practical vehicle for the cross-border, multi-site collaboration that the country map shows is currently lacking.

Research Gaps and Future Research Agendas

The four gaps emerge clearly enough to support the future research agenda. First, the contextual gap: the absence of studies from Indonesia and the concentration of more extensive research on a small number of education systems leave most of the world's primary school mathematics classrooms unrepresented. Future research can investigate how innovative pedagogies, from AI tutoring to learning analytics, function in these settings, taking into account teacher infrastructure, language, and readiness. Second, the collaboration gap: very minimal cross-border co-authorship, as revealed on the country map, presents an opportunity for comparative, multi-site studies that test cross-contextual innovation rather than in a single system. Third, the thematic balance gap: the slope of the field towards technology makes teacher competence, inclusion, and justice relatively underdeveloped, so research is needed that explores the conditions for enabling innovation as carefully as the innovation itself. Fourth, the consolidation gap related to artificial intelligence: because generative AI and large language tutoring models have only entered elementary school mathematics learning since 2025, their pedagogical effects, risks, and design principles are still unsynthesized and deserve critical and ongoing investigation. Fifth, an Islamic-values gap: the integration of Islamic values and the distinctive context of Madrasah Ibtidaiyah within innovative mathematics pedagogy remains almost entirely unexplored, leaving open how technology-assisted, inclusive, and assessment-oriented innovations can be designed and evaluated in ways that are coherent with Islamic education.

For researchers in Indonesia, these gaps combine to create a clear opportunity. Studies that adapt and evaluate innovative elementary school mathematics pedagogy in Indonesian classrooms, as well as those connected to international work programs, will simultaneously address contextual gaps, collaboration, and balance, while contributing evidence from one of the major education systems that is currently absent from this field. This opportunity is especially pertinent for researchers in Islamic higher education institutions, who are well positioned to investigate innovative mathematics pedagogy within Madrasah Ibtidaiyah and to bring the Islamic primary-school context into the international evidence base.

D. CONCLUSION

This study maps the landscape of innovative pedagogy in elementary school mathematics education by combining a systematic study guided by PRISMA and bibliometric analysis of 19 Scopus indexed articles published between 2021 and 2026. The field is growing rapidly, with most studies published in 2025 and 2026 as well as a noticeable shift towards artificial intelligence, large language model tutoring, augmented reality, and learning analytics. Four thematic strands organize this literature: technology-assisted learning, teacher competence and readiness, inclusive and equitable practices, and assessment design and feedback. Structurally, this field is cohesive around the act of teaching in elementary school classrooms, but remains geographically fragmented, with very minimal cross-border collaboration and no representation from Indonesia. By integrating thematic and structural perspectives, the study offers an orientation to the rapidly evolving field while identifying where future research, particularly context-sensitive and collaborative work in underrepresented settings, can make the greatest contribution. Its main limitation is the simple size of the corpus, which reflects the scope of the deliberately focused search; Therefore, bibliometric maps should be read as indicative of the structure, not as a comprehensive picture. Nevertheless, the convergence of evidence provides a reliable basis for the agenda proposed here. Given the growing emphasis on Islamic education and the extensive network of Madrasah Ibtidaiyah in Indonesia, future research should examine how innovative mathematics pedagogy can be adapted, implemented, and evaluated in Islamic primary-school contexts, so that the value-based and

linguistically diverse realities of the madrasah are reflected in the evidence base on early mathematics innovation. The modest corpus of nineteen articles reflects the deliberately narrow search string and single-database strategy rather than an exhaustive sweep of the literature; it is likely that broader terms or additional databases would have surfaced further relevant work. The small corpus therefore constrains the generalizability of the bibliometric structure, and the maps are best read as indicative of an emerging and still-consolidating field, consistent with the limited size reported in comparable bibliometric reviews of specialized education topics.

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