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Trends in Implementation of Problem-Based Learning with Flashcard Media in Improving Elementary Students Mathematical Abilities: A Systematic Literature Review

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A B S T R A C T

Mathematics learning in elementary schools often faces obstacles due to the abstract nature of the material, which is difficult for students in the concrete operational stage to understand. This condition requires learning models and learning media that can bridge abstract concepts to make them more tangible and easier to understand. This review aims to examine trends in problem-based learning models and flashcard media in mathematics learning in elementary schools during the period 2020–2025. The research methods used are a systematic literature review with bibliometric analysis. Data were collected through the Publish or Perish (POP8) application connected to Google Scholar. The search yielded 210 articles, which were then selected based on inclusion and exclusion criteria, leaving 25 articles relevant for analysis. The results of the analysis showed that the problem-based learning model and flashcards in mathematics learning in elementary schools experienced a significant increase in the 2020–2025 period. Overall, the problem-based learning model and flashcards proved to be effective in increasing student motivation, engagement, and understanding of mathematical concepts. This study provides a comprehensive overview of the direction and potential for creative, interactive, and relevant research for mathematics learning in elementary schools.

1. Introduction

Education in elementary school is the main foundation for the formation of scientific thinking, attitudes, and actions. Logical-mathematical thinking is an important foundation in children's cognitive development, and is very relevant in decision making and problem solving. (Jimenez et al., 2020). Through mathematics learning, students are trained to hone their abstract thinking skills and solve

problems in a structured manner. However, the abstract nature of mathematics learning often poses an obstacle in the learning process in elementary schools. Students in the concrete operational stage of cognitive development find it easier to understand concepts that are tangible and contextual, rather than symbolic (Dewi & Ardiansyah, 2022)

Mathematics education should focus on developing mathematical thinking and reasoning skills, not just mechanical calculation skills (Hadi, 2017). This is in line with Bruner's theory as explained by Arends (2015) which explains that learning will be more meaningful if concepts are presented concretely first before moving on to symbolic and abstract representations. This finding is still relevant to the latest study by Sari (2025) which confirms that concrete experience-based mathematics learning can improve higher-order thinking skills in elementary school students. The success of mathematics learning in elementary schools depends not only on the material taught, but also on the models and media used. The reality of mathematics learning in elementary schools still faces various obstacles. This situation is caused by conventional learning processes such as lectures and written exercises, without the support of interesting and contextual learning media. In line with the results of surveys and research, mathematics learning is still dominated by conventional methods such as lectures and written exercises, which make students passive and less involved in the learning process (Suryadi, 2019)

This condition makes students tend to be passive, less motivated, and have difficulty understanding abstract concepts. At the elementary school level, students need learning experiences that involve concrete and visual activities in order to understand mathematical concepts more meaningfully (Santrock, 2018). According to Piaget's theory of cognitive development as explained by Santrock (2018) Elementary school children are in the concrete operational stage, so they find it easier to understand learning through real objects or visual media. This stage is characterized by children's ability to reason logically about concrete objects but not yet fully capable of abstract thinking. Therefore, the mathematics learning process in elementary school needs to be facilitated by the use of media or tools that can help students connect abstract concepts with their concrete experiences. This view is also in line with modern research that emphasizes the importance of integrating technology and interactive media to support students' transition from concrete to abstract thinking (Rahman, 2022; Hapsari, 2024)

The Problem-Based Learning (PBL) model is an appropriate and effective learning approach to meet the cognitive development needs of students. By presenting contextual problems at the beginning of the learning process, PBL encourages students to explore, discuss, and build understanding through direct experience. The active involvement of students in solving real problems not only increases participation and motivation to learn, but also helps them connect concrete experiences with abstract mathematical ideas. This approach provides opportunities for students to practice critical thinking, reflection, and collaboration in a learning process that places students at the center of activities. When combined with concrete media, the application of PBL becomes a learning strategy that has the potential to deepen overall understanding of mathematics. The use of appropriate

learning media helps bridge abstract concepts so that the material becomes more concrete, enjoyable, and meaningful for students, while also improving critical thinking skills and learning motivation (Nugroho, 2021).

One of the media that supports the success of the problem-based learning model is flashcards. Flashcards are also widely used in mathematics learning. Flashcards are cards with pictures or symbols that help strengthen students' memory and understanding. The use of flashcards has been proven to improve students' memory and engagement in the learning process (Hapsari & Kristin, 2024). Flashcards can help students connect numbers or symbols with visual representations that are easier to remember, thereby simplifying abstract mathematical concepts and facilitating students' understanding (Maulyda et al., 2022). The development of flashcards as a learning medium in elementary school mathematics education has shown rapid progress in the last five years. Flashcards, both physical and digital, have been proven effective in increasing student motivation, independence, and learning outcomes (Athoillah et al., 2025). This development indicates a new direction in basic education strategies that emphasize active, creative, and interactive learning experiences. This medium serves as a bridge between classical learning theory and modern technology, supporting the creation of an active, creative, and enjoyable learning process. Therefore, educators tend to choose flashcards as a learning medium, especially in mathematics, to attract students' interest in learning and facilitate their understanding of abstract concepts.

Flashcards, both physical and digital, have been shown to improve student motivation, independence, and learning outcomes by bridging classical learning theory with modern technological innovation. When integrated with the Problem-Based Learning (PBL) model, flashcards can support contextual and engaging learning experiences. However, no systematic study has comprehensively analyzed research trends on PBL and flashcard media during the 2020–2025 period. Therefore, a systematic literature review is needed to examine these research developments in elementary mathematics learning. Based on these issues, the problem statement of this review is: what are the trends in the use of Problem-Based Learning (PBL) models and flashcard media in elementary schools during the 2020–2025 period? The results of this review are expected to provide benefits in the form of mapping effective and relevant PBL models and flashcard media, as well as recommendations for educators and learning media developers in improving the quality of mathematics learning at the elementary level. Thus, the findings of this study can serve as a reference for developing more creative and interactive learning models and media that align with students' needs. Therefore, this study aims to examine and analyze the trends in the use of PBL models and flashcard media in elementary school mathematics learning during the 2020–2025 period.

2. Methodology

This review uses a systematic literature review with bibliometric analysis approach to identify and examine various research results related to the application of the PBL model and the use of flashcards in mathematics learning at the elementary

school level (SD) during the period 2020 to 2025. The review preparation process follows the PRISMA guidelines to ensure openness and transparency of the research. The steps in conducting the SR/MA included: (1) identifying the problem and formulating research questions; (2) conducting a systematic literature search; (3) selecting articles based on inclusion and exclusion criteria; (4) extracting data; (5) assessing study quality; and (6) synthesizing quantitative and qualitative data. This approach was chosen because it provides a comprehensive overview of the effectiveness and trends in research on PBL and flashcard models in learning, particularly mathematics in elementary schools, for the period 2020–2025.

Population and Sample

The population in this study consists of all scientific articles discussing the Problem-Based Learning (PBL) model and the use of flashcards in mathematics learning at the elementary school level published between 2020 and 2025. The sample was determined based on specific inclusion criteria, namely: scientific articles published within the period of 2020–2025, articles discussing the PBL model and flashcard media in the context of elementary school mathematics learning, articles presented in the form of empirical research that report research data, and articles that are available in full text so they can be analyzed comprehensively. In addition, exclusion criteria were also applied to ensure the relevance and quality of the selected sources. Articles that were not selected include conceptual articles that do not present empirical data, articles that focus on the PBL model but use learning media other than flashcards, and articles that are identified as duplicates or incomplete. By applying these inclusion and exclusion criteria, the selected articles are expected to be relevant and capable of providing accurate information regarding the implementation of the PBL model with flashcard media in elementary school mathematics learning.

Data Collection Techniques

Data was collected using the Publish or Perish (POP8) application to search for articles from the Google Scholar database. Data collection was carried out as follows: 1) Determine the title words "problem-based learning." 2) Determine search keywords such as "flashcards," "problem-based learning," "elementary school," and "mathematics." 3) Set the publication time range to 2020–2025. 4) Select articles based on inclusion and exclusion criteria. The selection process was conducted in two stages: 1) Screening based on titles and abstracts 2) Full-text screening based on suitability with inclusion criteria. From the initial search results using Publish or Perish (POP8) with the Google Scholar database, 210 scientific articles were obtained. After going through the selection process according to the inclusion and exclusion criteria, 25 articles were obtained and used as the final sample in the bibliometric analysis using VOSviewers.

Data Analysis Techniques

Data analysis was conducted to maintain the credibility of the articles reviewed in this review using the following approaches: 1) quantitative descriptive analysis to

systematically describe previous research results based on title, method, subject, and findings; 2) qualitative analysis of journal articles based on predetermined and reviewed indicators. The results of the analysis are presented in the form of a narrative description supported by data visualization to illustrate research trends and focus. The stages of the analysis process in this systematic literature review are illustrated in Figure 1.

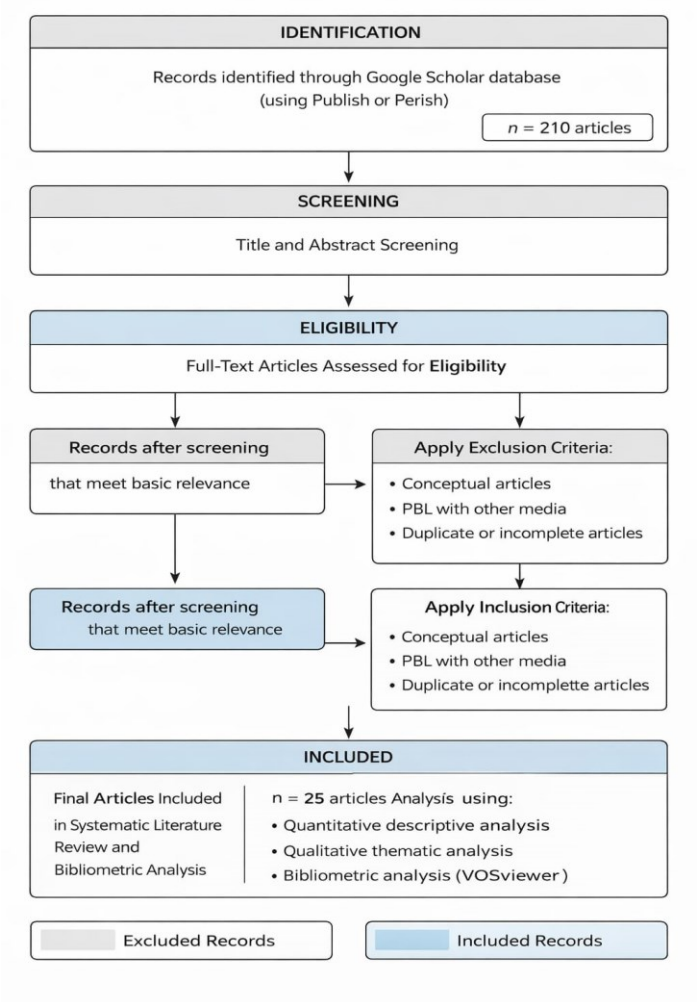

Figure 1. Flowchart of Systematic Literature Review with Bibliometric Analysis

3. Results and Discussion

Results

a. General Description of Article Selection Results

Based on the results of a literature search using the Publish or Perish (POP8) application with the Google Scholar database, 210 scientific articles were found

related to Problem-Based Learning (PBL) and flashcard media in elementary schools (SD) for the period 2020–2025. After screening and selection based on the established criteria, 25 articles were considered appropriate and relevant for further analysis in this study. The identification process began by collecting articles using keywords related to PBL, flashcard media, and mathematics learning at the elementary school level. Furthermore, the screening stage was carried out by reviewing the titles and abstracts to ensure that the articles matched the research focus. Articles that did not meet the inclusion criteria were removed from the list. The remaining articles were then examined through a full-text review to determine their eligibility. At this stage, articles that were conceptual, incomplete, or used learning media other than flashcards were excluded. Finally, 25 selected articles met all the inclusion criteria and were used as the main data sources for the analysis in this study. The stages of the article selection process are presented in Table 1.

Table 1. Article Selection Stages

Selection Stages	Number of Articles	Percentage
Initial search results	210	**100%**
After screening titles and abstract	58	**27,6%**
After full-text screening	25	**11,9%**
Final articles analyzed	25	**100%**

b. Distribution of Articles Based on Publication Year

The purpose of distributing articles based on the year of publication is to identify research trends related to the topic studied from year to year so that increases or decreases in the number of studies relevant to the literature review can be identified, and to determine the development of researchers' interest in the topic. By organizing the articles according to their publication year, researchers can observe how the focus on Problem-Based Learning (PBL) and flashcard media in elementary school mathematics learning has evolved over time. This distribution also helps to highlight periods when research activity on the topic increased significantly. In addition, it allows researchers to identify whether the topic has gained more attention in recent years. Understanding these trends is important to see how the topic develops within the field of education. It also provides an overview of the continuity of research related to PBL and flashcard media. Furthermore, this analysis helps support the relevance of the current study within the broader body of research. Therefore, the classification of articles by year of publication becomes an important step in the literature review process. The details of the number of articles analyzed based on the year of publication can be seen in Table 2.

Table 2. Articles by Year of Publication

Year	Number of Articles	Percentage (%)
2020	3	12%
2021	1	4%
2022	2	8%
2023	2	8%
2024	7	28%
2025	10	40%
Total	**25**	**100%**

c. Research Variables and Themes

The focus of variables and research themes was analyzed to determine the direction and trends of studies conducted by researchers on the topics examined. The results of this analysis can be used to provide an overview of the development and concentration of research relevant to the topic. In addition, this analysis helps identify the most frequently studied variables in relation to the use of Problem-Based Learning (PBL) and flashcard media. It also shows how different researchers approach the topic from various perspectives in the field of education. Furthermore, the analysis provides insight into the dominant themes that appear in previous studies. This information is useful for understanding research gaps and opportunities for further studies on the topic. The distribution of the focus of variables and research themes is presented in Table 3 below.

Table 3. Focus Variables and Research Themes

Research Focus	Number of Articles	Percentage
Pure PBL in mathematics learning	10	40%
Use of flashcards (physical/digital)	11	44%
Integration of PBL + Flashcards	4	26%
Total	**25**	**100%**

d. Key Findings Review

Analysis of the review findings provided an overview of the effectiveness, innovation, and direction of further research. The findings generally show that the implementation of the Problem-Based Learning (PBL) model combined with flashcard media has a positive impact on students' mathematics learning outcomes. In addition, several studies reported an increase in students' learning motivation and engagement during the learning process. Some articles also highlighted the role of flashcard media in helping students understand mathematical concepts more easily. Therefore, these findings indicate that the integration of PBL and flashcard media can be an effective strategy in elementary school mathematics learning. Based on the 25 articles analyzed, several patterns of findings were identified, as presented in Table 4.

Table 4. Key Findings of the Review

Aspect	General Findings
Problem-Based Learning (PBL)	The PBL model effectively improves learning outcomes, participation, and critical thinking skills at the elementary school level. A number of studies have proven a significant increase in conceptual understanding, learning motivation, and mathematical problem-solving skills. The role of teachers is important in designing contextual problems and facilitating group discussions. The PBL research trend has experienced rapid development since 2024–2025, dominated by quasi-experimental studies and action research.
Flashcards	The use of flashcards, both physical and digital, has been proven to increase learning motivation, memory, and understanding of basic mathematical concepts. This media innovation continues to evolve through the application of technologies such as QR codes, Android applications, and augmented reality (AR). Flashcards are also often adapted using an ethnomathematics

	approach and environmentally friendly materials to increase the relevance and sustainability of the learning process.
Combination of PBL + Flashcards	The integration of PBL and flashcards can create a more meaningful and interactive learning process. The collaboration between these two approaches helps students understand contextual problems through concrete visual representations. The results of the study show a significant increase in students' cognitive abilities, creativity, and collaboration. This approach is considered effective for learning abstract concepts such as fractions, spatial figures, and units of measurement.
Research Trends	Recent research for the 2024–2025 period shows an increase in interest in the development of innovative PBL-based learning with interactive digital media such as flashcards, AR, and Android applications.

e. Research Trends in Problem-Based Learning (PBL) Models and Flashcards in Elementary School Mathematics Education 2020–2025

The results of the review of articles that met the inclusion criteria showed that the application of the PBL model in mathematics learning at the elementary school level showed a significant increase during the 2020–2025 period. This visualization illustrates the network and connections between keywords related to the research topic. It also shows the strength of relationships between concepts that frequently appear together in the analyzed articles. Furthermore, the visualization helps researchers understand the patterns and development of studies related to PBL and flashcard media in elementary school mathematics learning. The visualization of the relationship between the Problem-Based Learning (PBL) model and flashcards generated using VOSviewer can be seen in Figure 2.

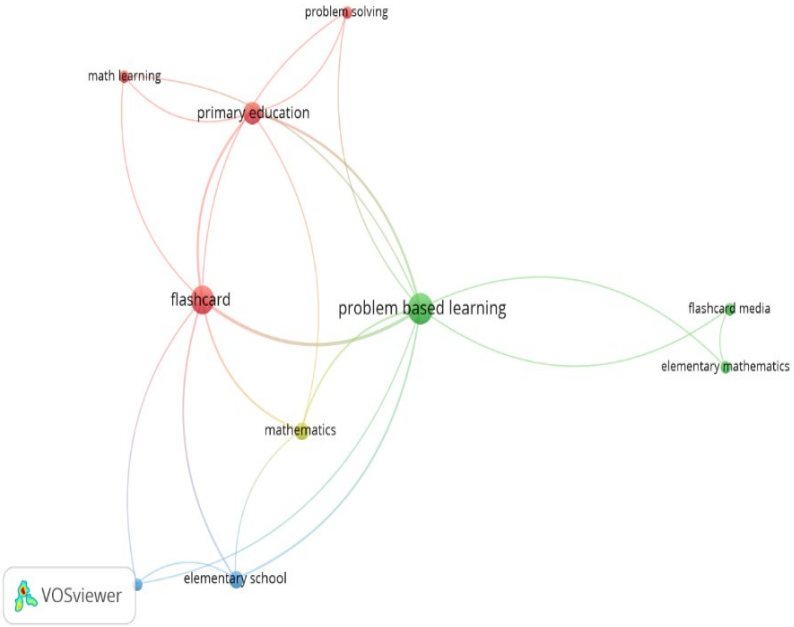

Figure 2. Visualization of the Relationship between the Problem-Based Learning Model and Flashcards

Figure 2 shows a visualization of a keyword co-occurrence network generated using VOSviewer. This map illustrates the relationships between research topics that frequently appear together in studies related to Problem Based Learning (PBL) and

flashcards in elementary school mathematics education. From the map, it can be seen that "problem-based learning" is the main center (the largest node), indicating that this topic is the dominant focus in the collection of studies analyzed. PBL is directly connected to several other important keywords such as "flashcards," "mathematics," "elementary school," "primary education," "problem solving," and "flashcard media." The keyword "flashcards" has a strong connection with "primary education," "math learning," and "elementary school," indicating that this medium is widely used in elementary education to help students understand mathematical concepts. Meanwhile, the connection between "problem-based learning" and "problem solving" confirms that PBL emphasizes critical thinking and problem-solving skills. In addition, different color groups indicate research topic clusters:

1) The red cluster focuses on flashcards and their application in elementary education and mathematics learning.
2) The green cluster focuses on problem-based learning and its implementation in the context of elementary mathematics learning.
3) The blue cluster focuses on the elementary school context, indicating the educational environment where this learning strategy is applied.

Overall, the analysis results show that the research direction focuses heavily on the application of the PBL model combined with the use of flashcards in the mathematics learning process at the elementary school level. The synergy between the two is effective in developing problem-solving skills, deepening understanding of mathematical concepts, and improving the overall learning outcomes of students. This visualization also illustrates the development of research trends over time based on the analyzed keywords. It helps identify which topics are more recent and frequently discussed in the latest studies. The overlay visualization map of the Problem-Based Learning model and flashcards can be seen in Figure 3.

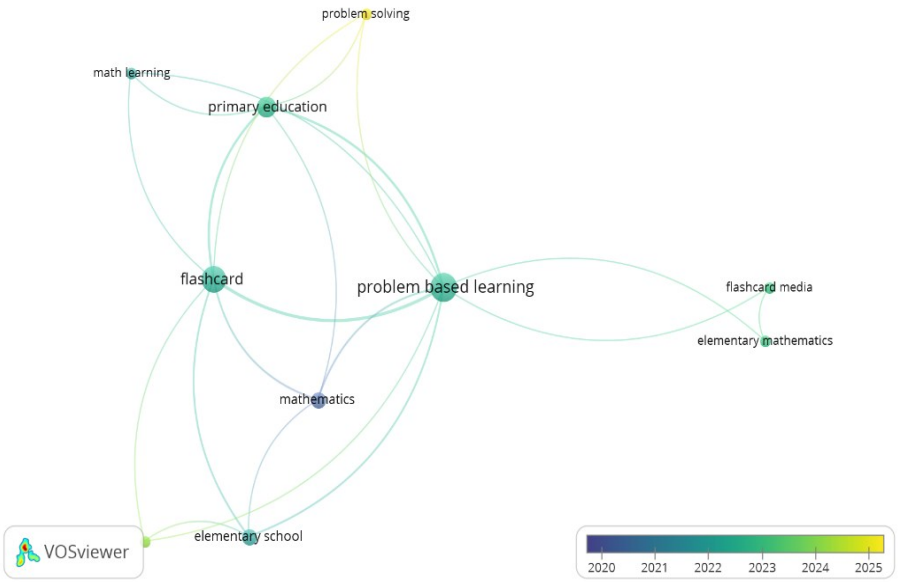

Figure 3. Overlay Visualization Map Model of Problem-Based Learning and Flashcards

Next, Figure 3 shows a VOSviewer overlay map visualization that illustrates the relationships and chronological development of research on models and flashcards in the context of mathematics learning in elementary education. The color and size of the dots (nodes) indicate the frequency and year of appearance of keywords in various scientific publications. Based on this map, research that appeared in the early years (2020–2021) is marked in blue, such as the keywords mathematics, elementary school, and math learning, which indicate an initial focus on the general application of the PBL model and flashcard media to improve mathematics learning outcomes. Entering 2022–2023, the color green dominates the keywords problem-based learning, flashcards, and primary education, indicating an increased focus on integrating these two approaches to improve student engagement and understanding. Meanwhile, in the more recent period (2024–2025), highlighted in yellow, the keyword "problem solving" emerges as the latest trend, indicating that research has evolved toward a more complex focus, namely strengthening students' problem-solving skills through the application of PBL models combined with interactive learning media such as digital flashcards. Overall, this map shows the progressive development of research from the mere application of methods to technology-based learning innovation and the development of higher-order thinking skills in the field of basic mathematics education. The density visualization of the Problem-Based Learning and flashcard models can be seen in Figure 4.

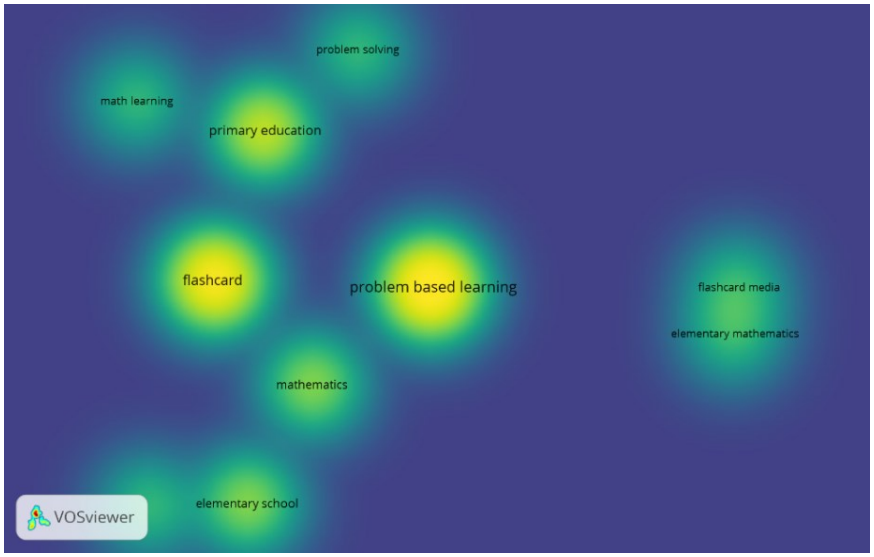

Figure 4. Density Visualization Map of Problem-Based Learning and Flashcard Models

Figure 4. Density Visualization Map generated from bibliometric analysis using VOSviewer. This map shows the density or intensity of research on topics related to problem-based learning (PBL) and the use of flashcards in the context of mathematics learning in primary education. Yellow indicates areas with a high frequency of keyword occurrences or topics that have been researched extensively, while green to blue indicates areas with lower research intensity. The image shows that the keywords "problem-based learning" and "flashcards" are highlighted in bright yellow, indicating that these two topics are the focus of the research. They

are often studied together in the context of improving mathematics learning outcomes and developing students' thinking skills. Meanwhile, keywords such as "primary education," "mathematics," and "problem solving" also have a fairly high density, indicating that research is largely focused on the application of the PBL model at the elementary school level to develop mathematical problem-solving skills. Other areas such as "elementary school," "flashcard media," and "elementary mathematics" are colored green to light blue, indicating that these topics are beginning to develop and still have great potential for further research. Overall, this map shows that the collaboration between the problem-based learning model and flashcard media is a dominant trend in mathematics learning research in elementary education, with a primary focus on improving student learning outcomes and problem-solving skills.

Discussion

a. Problem-Based Learning (PBL) Model in Mathematics Education in Elementary Schools

Based on a review of various scientific publications from 2020 to 2025, the application of Problem-Based Learning (PBL) in mathematics education at the elementary school level shows a consistent upward trend. A number of studies confirm that the PBL approach has been proven effective in developing critical thinking skills, problem-solving skills, understanding mathematical concepts, and increasing student motivation to learn. Preliminary research such as that conducted Puspitasari (2020) Through the Classroom Action Research (CAR) approach, it was proven that the application of the PBL model was able to increase student engagement and mathematics learning outcomes in spatial geometry material in elementary schools. Research Agustin et al. (2020) also used the PTK approach in fifth grade elementary school and obtained the same results, namely that the application of the PBL model improved students' problem-solving skills and motivation to learn. Problem-based learning activities made students more active in finding solutions, rather than just accepting explanations from the teacher. Nashiroh et al. (2024) presenting a classroom action research study that applied the PBL model to mathematics material in elementary schools. The results of the study showed an increase in students' conceptual understanding and learning completeness after the application of PBL.

Meanwhile, Sutrisno (2022) conclude that the PBL model is effective in elementary school mathematics learning because it can increase students' cognitive and social engagement, while developing critical and collaborative thinking skills. (Dimu, 2015) stated that the PBL model had a positive effect on elementary school students' mathematics learning outcomes, as it encouraged engagement and critical thinking skills. In line with this Utami (2021) also emphasized that the PBL model has been proven to improve learning outcomes and student engagement in mathematics learning in elementary schools. Ranisa et al. (2025) Adding this model is effective because it can foster critical, creative, and collaborative thinking skills, which are important aspects of contextual problem solving.

Research by Lasni & Sujarwo (2025) aims to examine the extent to which the application of the PBL model affects creative thinking skills and motivation to learn mathematics in elementary school students. Meisari et al. (2025) found that the PBL model had a positive effect on improving mathematical problem-solving skills in elementary schools. In line with this, Provitasari et al. (2025) the study concluded that the PBL model had a positive and effective influence on improving elementary school students' mathematical critical thinking skills, particularly in the areas of GCF and LCM.

b. Flashcards in Mathematics Learning in Elementary Schools

Based on a review of various scientific publications from 2020 to 2025, the use of flashcards has been proven to be effective in increasing learning motivation, memory, and understanding of basic mathematical concepts such as arithmetic operations, geometric shapes, and number symbols (Hapsari, 2024). Flashcards serve as concrete tools that connect symbols with visual representations, helping students move from the concrete operational stage to abstract understanding as described in Piaget's theory. Flashcards, which were originally just physical cards, have now been developed into digital and interactive media that make it easier for students to understand mathematical concepts. Research by Ulumudin et al. (2024) shows that the development of flashcards on spatial figures can improve students' understanding of abstract material. Meanwhile, research by Peramudita et al. (2025) Digital flashcards based on applications for number recognition and counting indicate that digital-based media provide easier access and greater appeal for elementary school students.

In addition, technological innovations such as augmented reality (AR) have also become a trend in the development of mathematics flashcards. Putra et al. (2025) Developing AR-based flashcards effectively improves fraction problem-solving skills for fourth-grade elementary school students. This is in line with the findings Cindya et al. (2024) which integrates AR into flashcards on fractions, which can improve self-regulated learning through team play methods. The use of this technology shows that flashcards not only serve as a visual aid, but can also encourage increased interaction and motivation among students.

The development of flashcards is also carried out through a variety of innovative methods and materials. For example, the development of QR Code-based flashcards by Anisa et al. (2024) and Kurniawati et al. (2023) providing students with easy access to learning content in a fast and interactive manner. In addition, cultural and sustainability aspects are beginning to be taken into account, as raised by Sari (2025) in the development of ethnomathematics-based flashcards and by Andini et al. (2025) which uses coconut fiber waste as a learning medium. This approach not only facilitates the mathematics learning process but also develops students' environmental and cultural awareness.

Flashcards have also been developed for various mathematics subjects and different grade levels, ranging from basic arithmetic to fractions and sets. Nofriani et al. (2024) developing Android-based flashcards for multiplication and division

material in third grade elementary school, while Ayu et al. (2023) developing HOTS (Higher Order Thinking Skills)-based flashcards on fractions. Research by Wiratami et al. (2025) also emphasizes the importance of flashcards in helping students understand fractions effectively. These innovations demonstrate continuous efforts to adapt learning media to the needs and characteristics of elementary school students.

c. Integration of the Problem-Based Learning (PBL) Model and Flashcard Media

Based on the results of the literature review, there appears to be a tendency for researchers to combine problem-based approaches with the use of concrete media, so that students can more easily understand the contextual problems given by teachers in depth. Research by Tsalsabila et al. (2024) emphasizes that the combination of PBL and flashcards can create interactive, engaging, and effective learning in improving mathematical concept understanding. Students are not only trained to solve problems collaboratively, but also to use visual cards as tools to represent ideas and solutions concretely. Research Afandi et al. (2025) found that the application of the PBL model supported by flashcards can significantly improve the learning outcomes of first-grade students. Meanwhile, Rizkyani & Amelia (2020) proving that the use of flashcards in teaching length units can improve understanding and retention among second-grade elementary school students. Concrete visual media such as flashcards have been shown to help students understand and remember concepts better than conventional methods without the use of media. Furthermore, Zahra & Soebagyo (2025) also suggests that the use of flashcards in mathematics learning, especially in flat shape material with a PBL approach, is effective in improving the cognitive abilities of fourth-grade students at SDIT Global Insan Madani. It can be concluded that the integration of the PBL model and flashcards has a significant positive effect on improving elementary school students' understanding of mathematical concepts and learning outcomes. This approach not only creates a more active and enjoyable learning process, but also helps students develop their thinking and problem-solving skills. Thus, the combination of PBL and flashcards can be considered an innovative strategy that is worth implementing in learning.

Previous studies have shown that the use of innovative learning media and active learning models can improve the quality of learning in elementary schools. The application of interactive flashcard media has been proven to increase students' learning outcomes and literacy skills because it helps students remember concepts and participate more actively in the learning process (Sofiana et al., 2025). In addition, the implementation of the Problem-Based Learning (PBL) model supported by interactive learning media has been reported to improve the effectiveness of learning and student engagement in elementary school classrooms (Safitri et al., 2025). Furthermore, the development of technology-based learning media integrated with the PBL approach has been proven to be valid, practical, and effective for supporting elementary learning processes (Sakinah, 2025; Kurnia et al., 2025. Other studies also highlight that the integration of PBL with digital

learning media can enhance students' creativity and conceptual understanding (Al-Zahra & Handayani, 2025).

4. Conclusion

A literature review shows that the use of Problem-Based Learning (PBL) models and flashcards in elementary school mathematics education will increase significantly between 2020 and 2025. PBL models have been proven effective in improving students' critical thinking skills, problem-solving skills, and motivation to learn. Meanwhile, flashcards, both physical and digital, have been successful in helping students understand abstract mathematical concepts through concrete and engaging visual representations. The integration of these two approaches creates a more interactive, contextual, and meaningful learning experience, encouraging students to actively engage in the learning process and deepen their understanding of concepts. Overall, the results of the study confirm that the collaboration between the PBL model and flashcards can have a positive impact on improving mathematics learning outcomes, strengthening higher-order thinking skills, and shaping students' independent learning character. Research trends also point to a direction of development that focuses on the integration of learning technologies such as digital flashcards and augmented reality (AR), which strengthen the effectiveness of PBL implementation in the modern learning era. Based on the results of this study, educators in elementary schools are expected to consider the PBL model with contextual learning media such as flashcards to improve the quality of learning and make it more interesting and meaningful. Thus, the collaboration between problem-based learning approaches and interactive visual media can be an effective strategy in creating a mathematics learning process that is not only meaningful but also oriented towards the development of 21st-century thinking skills.

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