

SLR: Implementation and Challenges of Using Problem Based Learning Methods in Elementary School Students' Mathematics Problem-Solving Ability

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Abstract

This study aims to examine the implementation and challenges of using the Problem-Based Learning (PBL) model to enhance elementary school students' mathematical problem-solving skills through a Systematic Literature Review (SLR) method. The article analyzes 10 selected studies published between 2020 and 2025. The findings indicate that the application of PBL can improve students' critical thinking, analytical abilities, and social skills. However, several challenges were identified, including student readiness, teacher competence, and limited learning resources. Therefore, appropriate strategies are needed to optimize the implementation of PBL to achieve mathematics learning objectives effectively.

1. Introduction

Mathematics is an important subject so it must be studied by students as their foundation in building mathematical knowledge. Mathematics learning in elementary school needs to be taught to students as a provision for them to develop the ability to think logically, analytically, systematically, critically, creatively, problem-solving skills, and collaboration. However, often mathematics learning is still considered difficult by students, which has an impact on students' low interest and understanding of this subject. Problem-solving skills are considered a core goal in learning mathematics. However, the fact is that in the field, it is still found that problem-solving skills have not been the main focus in learning. One of the learning models that can be used to overcome this problem is the application of *the Problem Based Learning* (PBL) learning model.

PBL is a learning model that presents authentic and meaningful problem situations to students, which serves as a stepping stone in the problem-solving process. PBL involves students to play an active role in solving a problem systematically according to the stages of the scientific method so that with this model, students can understand and solve problems from the root. The syntax or steps of *the Problem Based Learning* learning model are: (1) presenting problems, (2) conveying problems related to daily activities so that students feel the need to learn them, (3) directing students to look for various information to solve problems, (4) carrying out discussions, (5) determining hypotheses and reasons (*students actively grappling*), (6) returning conclusions from *A Problem Learned*. (Hidayatni et al., 2024).

The implementation of PBL in mathematics learning at the elementary school level has shown positive results. Through PBL, students are invited to be actively involved in the learning process by identifying problems, looking for relevant information, and developing solutions independently or in groups. This model not only improves the understanding of mathematical concepts, but also trains students' critical, analytical and problem-solving skills. However, the application of PBL in mathematics learning in elementary schools cannot be separated from various challenges. Some of these include the limited time available to solve complex problems, teachers' readiness to design and facilitate problem-based learning, and students' diverse abilities to understand and solve problems. In addition, limited resources and supporting facilities can also be an obstacle to the effective implementation of PBL.

Nonetheless, studies have proven that the benefits obtained from the application of PBL are proportional to the efforts made to address the problem. This is in accordance with the review of the study conducted that the *Problem Based Learning* model is very suitable to be applied as an effort to improve students' mathematical concepts because this *Problem Based Learning* model has 4 advantages in the course of learning (Hidayatni & Wahyuningsih, 2024). There are studies that show that students who learn through PBL have better problem-solving skills compared to students who follow conventional learning. In addition, PBL can also increase learning motivation and student involvement in the learning process. Therefore, it is important for educators and education stakeholders to understand the implementation and challenges of using the PBL method in mathematics learning in elementary schools.

Thus, the right strategy can be designed to optimize the implementation of PBL, so that students' mathematical problem-solving abilities can be significantly improved. However, until now there is still a lack of systematic studies that specifically classify the impact and challenges of PBL implementation in mathematics learning in elementary schools. Therefore, this article aims to examine the implementation and challenges of the PBL model in mathematics learning for elementary school students based on the results of a literature review.

Based on the above explanation, the researcher conducted research related to the implementation and challenges in implementing the *Problem Based Learning* model. The benefits of this research include (1) providing information related to the implementation and challenges in implementing the *Problem Based Learning* model, (2) Reference sources in improving the quality of strategies to be used in implementing the *Problem Based Learning* model.

2. Method

This study uses the *systematic literature review* (SLR) method. *Systematic literature review* can be defined as a review of existing research, using rigorous and structured research methods, so as to answer research questions. (Andani et al., 2021) This SLR method is carried out by identifying, studying, recording, assessing, and managing information and findings from previous research. Researchers used an electronic database, Google Scholar to search and collect articles that have been published in the period from 2020 to 2025.

The keywords used in finding sources from previous articles are the implementation and challenges of the *Problem Based Learning* model. The articles obtained and used in this study were 10 articles obtained from Google Scholar. The selected article is an article that has similar research and then the article is analyzed and summarized. The results of the research are then used as a complete discussion in this article. This SLR method was chosen based on the purpose of the researcher who wanted to obtain information and data. Not to test hypotheses, but to get information about the implementation and challenges of applying the *Problem Based Learning* model.

No.	Discussion Categories		Search Engines	Search Results
1.	Identification	Articles found	<i>Google Scholar</i>	21
2.	Filtering	Articles to be read by title, abstract, year of publication 2020-2025, non-SLR research, and relevant	<i>Google Scholar</i>	10
		Articles that are removed because they do not match the title,	<i>Google Scholar</i>	11

		abstract, 2020-2025 publication year, non-SLR research, and are irrelevant.		
3.	Credentials	Fully read article	Google Scholar	10
		The article is removed because the method or topic is not appropriate	Google Scholar	11
4.	Articles used in the final study		Google Scholar	10

3. Results and Discussion

3.3 Results

Based on the results of the analysis of the theoretical studies that have been described, it can be seen that *the Problem Based Learning* model can consistently have a positive impact on improving the mathematical problem-solving skills of elementary school students. The application of Problem Based Learning showed a significant increase in learning outcomes. (Dwi Safirah et al., 2024) The implementation of *Problem Based Learning* (PBL) makes a positive contribution to the mathematical problem-solving ability of elementary school students. PBL encourages students to actively identify problems, design solutions, and collaborate with their peers. This is in line with the constructivist theories of Piaget and Vygotsky, which emphasize the importance of active and social learning experiences in developing students' thinking skills. The application of Problem Based Learning showed a significant increase in learning outcomes.

The implementation of PBL is also effective in improving the ability to solve story problems in low grades, not only for high grades. There is an increase in scores in students because students are actively involved in learning, learn from real problems, and are encouraged to think critically and creatively in solving problems. The implementation of (Dirmansyah & Febriandi, 2023) this contextual and real-experience Problem Based Learning model can increase the active involvement of students in learning. PBL is able to make students more active and trained in solving math problems, especially story problems that require analysis, This PBL model has a positive impact on the way students think in solving math problems, especially story problems or contextual problems. The implementation of the PBL model shows that students are actively involved in the learning process through real problem-solving so as to help them understand the material better. In addition, learners show involvement in class discussions, show high enthusiasm in asking questions, and show initiative in seeking answers to given challenges. PBL also facilitates the development of social skills and collaboration between students (Hasriyani et al., 2022) (Nurul Hikmah & Eka Putri Atjo, 2023) (Wahyuningsih & Alimuddin, 2024)

However, in the implementation of *the Problem Based Learning* model, there are still challenges faced. Based on research from several related journals, there are challenges related to the implementation of *the Problem Based Learning model* in the problem-solving ability of elementary school students, namely:

Table 1. Challenges of the *Problem Based Learning Model*

No.	Researcher and Year	Tantangan Model <i>Problem Based Learning</i>
1	Rahajeng Achyani et al. (2024)	Students are not familiar with story and contextual problems.
2	Besse Nurul Hikmah et al. (2023)	The Problem Based Learning model requires time and careful planning.
3	Oktania Dewantari & Christian B.N. Djami (2022)	The Problem Based Learning model requires appropriate learning tools/media.

3.4 Discussion

The challenges in implementing the Problem Based Learning model found in the field are quite complex and diverse. The challenge can be categorized into three aspects:

1. Student aspect: Students are not familiar with story and contextual questions. There are students who have difficulty in understanding story problems, so regular practice using story and contextual questions that are familiar to their lives is needed. In addition, (Natalia et al., 2024) the challenges faced include the lack of students' ability to reflect on the answers they give, students tend to be in a hurry and do not double-check their answers. This shows that teacher guidance in the PBL reflection stage still needs to be strengthened. (Dirmansyah & Febriandi, 2023).
2. Teacher aspect: Teacher readiness in designing a *Problem Based Learning* model is a crucial factor. The limitations in understanding and designing the *Problem Based Learning model*, as well as the lack of professional training, have caused many teachers to still not be used to using this approach, and prefer traditional methods that are considered more practical. Limitations in understanding and designing PBL, as well as lack of professional training. Many teachers are still unfamiliar with this approach, preferring traditional methods that are considered more practical. Teachers need time and careful planning so that during the learning process, the steps used do not deviate from the PBL path (Nurul Hikmah & Eka Putri Atjo, 2023).
3. Facilities and media aspects: Limited appropriate learning aids and adequate technological support. *The Problem Based Learning* model requires appropriate learning media and teachers need to guide students so that they can use media properly (Oktania Dewantari & Djami, 2022). Technological challenges also arise in the implementation of digital-based PBL because not all teachers are proficient in using digital media or tools in (Ripai et al., 2020), terms of digital media that can help increase motivation and understanding of mathematical concepts.

From some of these challenges, there needs to be follow-up so that the *Problem Based Learning* model can run optimally. Follow-up can be done by holding continuous training to improve teachers' ability to design and implement PBL effectively, develop contextual and accessible learning aids, including the use of digital technology, familiarizing students with story questions and contextual questions through continuous exercise.

3.5 Conclusion

This article reinforces the position of PBL as a contextual approach to mathematics learning in elementary school, in line with constructivist theories that emphasize the importance of active and collaborative learning experiences. The implementation of *the Problem Based Learning* (PBL) model in mathematics learning in elementary schools has consistently shown a positive impact on improving students' problem-solving skills. PBL encourages students' active engagement, improving their critical, analytical, and social thinking skills. However, the implementation of PBL faces various challenges, especially in terms of students' readiness to understand contextual problems, teachers' skills in designing problem-based learning, and limited supporting facilities and infrastructure. For further research, it is suggested that the focus be directed to the analysis of effective strategies in

overcoming the challenges of implementing *Problem Based Learning* (PBL) at various levels and conditions of elementary schools. Empirical research based on experiments or case studies also needs to be conducted to obtain more concrete data on the effectiveness of PBL implementation in improving students' mathematical problem-solving skills. In addition, the development of innovative learning media and PBL-based modules can be the focus of research to support a more interesting and effective learning process. Future research is also recommended to examine the integration between the PBL model and the use of digital technology in mathematics learning, so that the application of PBL can be more optimal and in accordance with the times.

Author Contributions

Shefila Sakina Azzahro: Conceptualization, Methodology, Investigation, Writing – original draft preparation, Visualization. Candra Utama: Supervision, Writing – review & editing, Validation.

All authors have equal contributions to the paper. All the authors have read and approved the final manuscript.

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