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LITERATURE REVIEW: IMPROVING PHYSICS LEARNING OUTCOMES AND CRITICAL THINKING SKILLS OF STUDENTS THROUGH THE PROBLEM-BASED LEARNING MODEL

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Abstract: This study aims to analyze the effectiveness of implementing the Problem-Based Learning (PBL) model in improving high school students' physics learning outcomes and critical thinking skills. The research method used is a literature review by examining 50 relevant classroom action research (CAR) articles obtained from national journals and proceedings. The data were analyzed descriptively and qualitatively through a categorization process based on the research focus. The results of the study show that 28 articles (56%) focused on improving physics learning outcomes, 12 articles (24%) highlighted the development of critical thinking skills, and 10 articles (20%) integrated both. In general, the application of PBL has been proven to improve understanding of physics concepts, learning outcomes, and train students to analyze and evaluate problems critically. These findings confirm that PBL is an effective alternative learning strategy for improving the quality of physics learning in high school.
Keywords: Literature Review, Problem- Based Learning, Physics Learning Outcomes, Critical Thinking

1. INTRODUCTION

21st-century education requires students to possess high-order thinking skills, including critical, creative, collaborative, and communicative thinking (4Cs). Unfortunately, the results of the 2022 PISA study show that Indonesian students' abilities in mathematics, reading, and science are still ranked low (Alberida, H. 2023). This indicates an urgent need for a learning model that can improve the quality of learning outcomes and students' critical thinking skills.

Problem-Based Learning (PBL) is one effective learning model for addressing these challenges. PBL emphasizes active student involvement in solving real-world problems, thereby enhancing conceptual understanding while training critical thinking skills (Istiatutik and Ardianti; Laili, A, Q, et al. 2025). Through stages such as problem identification, investigation, solution development, and evaluation, students not only learn concepts but also become accustomed to analyzing, evaluating, and drawing logical conclusions (T, Utomo, et al. 2014).

Previous studies have shown that the implementation of PBL has a positive impact on improving student learning outcomes and critical thinking skills at various levels of education.

PBL in biology learning was able to significantly improve students' critical thinking skills. Similar findings were also reported by Delfiza, M and Fuadiyah, S (2024) reported that PBL improves students' critical thinking skills and problem-solving abilities in science learning. Based on this background, this study conducted a literature review to analyze the effectiveness of Problem-Based Learning (PBL) in improving high school students' physics learning outcomes and critical thinking skills.

2. RESEARCH METHODS

This study uses a literature review approach to analyze the effectiveness of the Problem-Based Learning (PBL) model in improving high school students' physics learning outcomes and critical thinking skills. Data were obtained from 50 relevant classroom action research (CAR) articles, as recorded in the journal review results. The articles reviewed were from accredited national, proceedings, and university repositories with a publication range of 2014-2024.

Inclusion Criteria

a. The article is a classroom action research (CAR) or experimental research discussing the application of PBL.
b. The research subjects are high school students or equivalent.
c. The article focuses on one or both aspects: physics learning outcomes and critical thinking skills.
d. The article is available in full text (full paper).

Analysis Technique

The analysis was conducted using a qualitative descriptive method. Articles were categorized based on the main focus of the research, namely:

a. Improvement in physics learning outcomes.
b. Improvement in critical thinking skills.
c. Simultaneous improvement in both.

The review results data were presented in the form of distribution tables and analyzed to find trends, research gaps, and implications of PBL implementation in physics learning.

3. RESULTS AND DISCUSSIONS

Based on a review of 50 Classroom Action Research (CAR) articles that used the Problem-Based Learning (PBL) model in physics education in senior high schools, the

distribution of research focus was obtained as shown in Table 1.

Table 1. Distribution of Articles Based on Research Focus

Research Focus Category	Number of Article	Percentage (%)	Example Findings
Improvement in Physics Learning Outcomes	28	56%	Students' scores improved with each cycle, and learning completion rates rose significantly
Improvement in Critical Thinking Skills Improvement in Learning	12	24%	Students were more active in asking questions, discussing, and evaluating solutions
Improvement in Learning Outcomes & Critical Thinking	10	20%	Conceptual understanding improved while critical skills developed
Total	50	100%	-

Table 1 shows that the majority of studies (56%) focused on improving physics learning outcomes. This indicates that PBL is widely considered effective in improving students' conceptual understanding and cognitive achievement, the development of critical thinking skills, while 20% of studies integrated both simultaneously.

These results are in line with research by Widuri et al (2023), which states that PBL has a significant impact on improving students' critical thinking skills in science learning, and even adds that PBL not only improves learning outcomes but also fosters students' metacognitive abilities.

Thus, it can be concluded that PBL is an effective learning strategy for improving the quality of physics learning in high school. However, the implementation of PBL requires teacher readiness, good time management, and adequate learning facilities to run optimally.

4. CONCLUSION AND SUGGESTION

CONCLUSION

Based on a review of 50 CAR articles on Problem-Based Learning (PBL) in high school physics, PBL has been shown to effectively improve learning outcomes (56%) and critical thinking skills (24%), with 20% of studies reporting improvements in both.

SUGGESTION

It is recommended that physics teachers integrate PBL into their learning activities. Schools should support this by providing teacher training and sufficient learning resources.

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