

Implementation of Problem-Based Learning with a Deep Learning Approach to Improve Elementary Students' Critical Thinking Skills

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ABSTRACT

This study is situated within the context of the increasing need to develop students' critical thinking skills as part of 21st-century competencies, particularly in elementary education where meaningful and active learning is essential. The purpose of this study is to examine the effectiveness of implementing Problem-Based Learning (PBL) integrated with a Deep Learning approach in improving students' critical thinking skills in IPAS (Integrated Natural and Social Sciences) learning. This study employed a quantitative approach using Classroom Action Research (CAR), conducted in two cycles consisting of planning, action, observation, and reflection stages. The participants were fourth-grade students of SDN 1 Blang Mangat. Data were collected through observation and written tests based on critical thinking indicators, including interpretation, analysis, evaluation, inference, explanation, and self-regulation, and analyzed using descriptive quantitative techniques. The results showed a significant improvement in students' critical thinking skills, as indicated by the increase in learning mastery from 60% in Cycle I to 85% in Cycle II. In addition, students demonstrated higher engagement, active participation in discussions, and improved ability to analyze and solve contextual problems. These findings suggest that the integration of PBL with a Deep Learning approach not only enhances students' critical thinking skills but also promotes meaningful and student-centered learning. Therefore, this approach can be considered an effective instructional strategy for improving the quality of learning in elementary schools, particularly in fostering higher-order thinking skills.

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1. INTRODUCTION

Education plays a strategic role in developing high-quality human resources capable of adapting to the rapid advancement of science and technology. At the elementary school level, learning processes should be designed to be active and meaningful, enabling students not only to memorize information but also to develop deep conceptual understanding and critical thinking skills. Critical thinking is an essential competency in 21st-century learning, allowing students to analyze, evaluate, and solve problems logically (Hidayat & Khalika, 2019).

One subject that supports the development of these skills is IPAS (Integrated Natural and Social Sciences), a subject in the Merdeka Curriculum that integrates scientific and social concepts. IPAS learning requires students to understand natural and social phenomena and relate them to real-life contexts. However, previous studies indicate that learning in elementary schools is still dominated by teacher-centered approaches, resulting in low student engagement and underdeveloped critical thinking skills (Cichocka, 2016; Ikhwan, 2019).

Preliminary observations at SDN 1 Blang Mangat reveal that IPAS learning remains conventional, with teachers relying heavily on lectures and individual assignments. This condition leads to passive student participation, limited problem analysis skills, and difficulties in connecting concepts to real-life situations. These findings are consistent with prior research showing that traditional instructional approaches are less effective in promoting Higher Order Thinking Skills (HOTS) (Marchlewska et al., 2019).

To address these challenges, an innovative student-centered learning model is required. Problem-Based Learning (PBL) is one such model that uses real-world problems as a context to develop critical thinking and problem-solving skills (Kamba, 2018). In PBL, students actively engage in identifying, analyzing, and solving problems collaboratively. However, there are differing perspectives regarding its effectiveness, as some studies suggest that without proper guidance, PBL may not sufficiently support deep conceptual understanding.

Therefore, the Deep Learning approach is introduced to strengthen the learning process. In the educational context, Deep Learning refers to an approach that emphasizes deep conceptual understanding, connections between concepts, and reflective and applied thinking. This approach contrasts with surface learning, which focuses primarily on memorization (Rakhmat, 1989). The integration of PBL and Deep Learning is expected to enhance student engagement while fostering deeper understanding and critical thinking skills.

Based on this background, this study aims to analyze the implementation of Problem-Based Learning with a Deep Learning approach to improve students' critical thinking skills in IPAS learning at the elementary level. The findings indicate that this integrated approach enhances student participation, deepens conceptual understanding, and significantly improves critical thinking skills.

2. METHODS

This study employs a quantitative approach using Classroom Action Research (CAR) aimed at improving students' critical thinking skills through the implementation of Problem-Based Learning (PBL) with a Deep Learning approach. The quantitative approach is used because this study focuses on

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measuring the improvement of students' critical thinking skills objectively through numerical data in the form of test scores analyzed using simple statistical methods. According to Arikunto (2019), Classroom Action Research is a reflective research method conducted by teachers to improve the quality of the learning process through systematic actions in the classroom.

The subjects of this study were fourth-grade students of SDN 1 Blang Mangat, Lhokseumawe. The sample was selected using purposive sampling, considering that the class exhibited low critical thinking skills and predominantly teacher-centered learning practices. The research was conducted in two cycles, each consisting of four stages: planning, action, observation, and reflection. Each cycle included three meetings: two instructional sessions and one formative test session.

The research procedure began with the planning stage, which involved preparing instructional materials such as lesson plans based on PBL integrated with a Deep Learning approach, student worksheets, and research instruments including observation sheets and critical thinking tests. During the action stage, the learning process followed the steps of Problem-Based Learning, including problem orientation, student organization into groups, investigation, presentation of results, and reflection. The Deep Learning approach was integrated by emphasizing deep conceptual understanding, analytical thinking, and reflective learning processes.

Data were collected through observation and testing techniques. Observation was conducted to examine teacher and student activities during the learning process, while tests were used to measure improvements in students' critical thinking skills. The test instruments were developed based on Facione's critical thinking indicators, including interpretation, analysis, evaluation, inference, explanation, and self-regulation. Supporting data were also obtained through documentation such as students' scores and instructional materials used during the research.

Data analysis was carried out using descriptive quantitative techniques by calculating the percentage of learning mastery. The formula used was $P = (F/N) \times 100\%$, where P represents the percentage of mastery, F is the number of students achieving mastery, and N is the total number of students. The results of the analysis were used as a basis for reflection and improvement in the subsequent cycle.

To ensure data validity, the researcher applied method triangulation by comparing observation and test results. Additionally, reflective discussions between the researcher and the observer were conducted to ensure that the data accurately represented the actual classroom conditions. Therefore, the findings of this study are expected to provide a valid and comprehensive description of the effectiveness of implementing Problem-Based Learning with a Deep Learning approach in improving students' critical thinking skills.

3. FINDINGS AND DISCUSSION

This study aims to improve students' critical thinking skills through the implementation of Problem-Based Learning (PBL) with a Deep Learning approach. The findings were obtained from two research cycles, each consisting of planning, action, observation, and reflection stages. The data were collected from critical thinking tests and observations of student activities during the learning process.

3.1. Research Findings

3.1.1. Students' Critical Thinking Skills

The results show a significant improvement in students' critical thinking skills from Cycle I to Cycle II. This improvement can be seen in the percentage of students achieving learning mastery.

Table 1.
Improvement of Students' Critical Thinking Skills

Cycle	Students Achieving Mastery	Total Students	Percentage (%)
I	12	20	60%
II	17	20	85%

Based on Table 1, the percentage of learning mastery increased from 60% in Cycle I to 85% in Cycle II. This indicates that the implementation of PBL with a Deep Learning approach effectively improves students' critical thinking skills.

3.1.2. Observation of Student Activities

In addition to test results, student learning activities also showed improvement. In Cycle I, students were relatively passive and unfamiliar with problem-based learning. However, in Cycle II, students became more active in discussions, expressed their ideas, and collaborated effectively in groups.

Figure 1. Improvement of Student Activities

- (a) Student activities in Cycle I (low engagement)
 (b) Student activities in Cycle II (significant improvement)

The observed student activities include:

- Participation in group discussions
- Ability to express opinions
- Problem analysis skills
- Collaboration within groups

3.2. Discussion

The findings indicate that the implementation of Problem-Based Learning with a Deep Learning approach effectively enhances students' critical thinking skills. This improvement occurs because students are actively engaged in solving real-world problems during the learning process.

From the perspective of the research objectives, these findings answer the research question by demonstrating that the application of PBL combined with Deep Learning significantly improves students' critical thinking skills. This is evidenced by the increase in learning mastery from 60% to 85%. Scientifically, this improvement can be explained by the nature of PBL, which promotes higher-order thinking skills such as analysis, evaluation, and inference.

Furthermore, the Deep Learning approach strengthens conceptual understanding by encouraging students to connect ideas, reflect on their learning, and apply knowledge in meaningful contexts. This supports the theory that meaningful learning enhances critical thinking abilities.

These findings are consistent with previous studies indicating that PBL is effective in improving critical thinking and problem-solving skills. However, this study contributes a novel aspect by integrating the Deep Learning approach, which enhances deeper conceptual understanding and reflective thinking.

Several factors contributed to the success of this study:

1. Contextual problem-based learning
2. Active student engagement in group discussions
3. Emphasis on reflection and deep understanding

However, some challenges were identified during the research:

- Students required time to adapt to the learning model
- Time management during lessons needed improvement
- Not all students were actively involved at the beginning

Future research is recommended to:

1. Involve a larger sample size
2. Integrate digital technology into the learning process
3. Examine the impact on other skills such as creativity

Overall, the findings suggest that integrating Problem-Based Learning with a Deep Learning approach is an effective strategy for improving elementary students' critical thinking skills, particularly in IPAS learning.

4. CONCLUSION

This study aimed to improve elementary students' critical thinking skills through the implementation of Problem-Based Learning (PBL) integrated with a Deep Learning approach. The findings demonstrate that this instructional model effectively enhances students' critical thinking abilities, as evidenced by the significant increase in learning mastery from Cycle I to Cycle II. The integration of real-world problem-solving activities with deep conceptual understanding encourages students to actively engage in analysis, evaluation, and reflection, which are essential components of higher-order thinking skills.

Beyond merely improving test scores, this study reveals that students become more active, collaborative, and confident in expressing their ideas during the learning process. The findings also confirm that combining PBL with a Deep Learning approach provides a more meaningful and student-centered learning experience, particularly in IPAS subjects at the elementary level.

However, this study is limited to a specific classroom context with a relatively small sample size and a short research duration. Therefore, future research is recommended to involve larger and more diverse samples, extend the duration of implementation, and explore the integration of digital technologies to further support Deep Learning practices. Further studies may also investigate the impact of this approach on other competencies, such as creativity, communication skills, and collaborative abilities. Ongoing research in this area continues to examine the effectiveness of innovative learning models in enhancing 21st-century skills in elementary education.

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