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Utilization of the Problem-Based Learning (PBL) Model to Develop Critical Thinking Skills of Fourth-Grade Elementary School Students

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ABSTRACT

This study aims to improve the critical thinking skills of fourth-grade elementary students through the implementation of the Problem Based Learning (PBL) model. Critical thinking is a vital 21st-century skill that must be nurtured from an early stage in education. Based on initial observations in Class IVB of SD Negeri 2 Purwokerto Wetan, it was found that most students were unable to express opinions, engage actively, or identify information effectively during thematic learning. Therefore, the PBL model was implemented in IPAS (Integrated Science and Social Studies) learning through two cycles of classroom action research (CAR). The research design followed the Kemmis and McTaggart model, including planning, action, observation, and reflection stages. Data were collected using observation, interviews, written tests, and documentation. The results showed a significant improvement in students' critical thinking skills after the application of PBL. In cycle I, the average critical thinking score was 70.3%, which increased to 84.1% in cycle II. Key aspects of critical thinking, such as providing basic explanations, making inferences, evaluating, and planning strategies, improved across most students. Additionally, the classroom atmosphere became more active, participatory, and collaborative, with more students able to present logical arguments and solve problems independently. The study concludes that the PBL model is an effective approach to enhancing elementary students' critical thinking abilities, especially in thematic IPAS learning.

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1. INTRODUCTION

One of the most important skills in learning in the 21st century is the development of critical thinking. Students are required to learn new material as well as analyze, assess, and apply it to real-world scenarios in a world characterized by automation, information overload, and global challenges (Sudirman et al., 2020). Students who have critical thinking skills are better equipped to solve complex problems, make logical decisions, and critically consider the material and its consequences (Wardani & Fiorintina, 2023).

Many elementary school students still struggle to acquire critical thinking skills despite this. Initial observations in Class IVB of SD Negeri 2 Purwokerto Wetan revealed that students often gave weak responses, found it difficult to articulate their thoughts effectively, and lacked the courage to take part in class discussions.

These symptoms suggest the need for a more effective learning model that can facilitate inquiry, reasoning, and active participation.

One of the best teaching methods for developing critical thinking skills is problem-based learning, or PBL. PBL uses inquiry, reflection, and teamwork to get students to solve open-ended, real-world problems. In groups, students explain the problem, determine what they need to learn, conduct research, and provide solutions based on solid evidence (Lim, 2023). Along with learning new information, students also develop critical thinking skills such as analyzing, arguing, and evaluating (Widiastuti, Mantra, Utami, Sukanadi, & Susrawan, 2023).

The usefulness of PBL in developing higher-order thinking skills has been supported by recent research. In a quasi-experimental study, for example, Sutika et al. (2023) found that students taught using the PBL paradigm performed significantly better on critical thinking assessments than students taught in regular classes. Similarly, research by Sutika et al., (2023) concluded that PBL not only improved cognitive outcomes but also promoted better student engagement and independence in learning.

Providing explanations, drawing conclusions, assessing arguments and formulating solutions are just some of the many abilities that make up critical thinking. PBL offers an interdisciplinary and contextualized platform that facilitates meaningful and real learning experiences when incorporated into thematic lessons such as IPAS (Natural and Social Sciences), which combines natural and social sciences. To improve the critical thinking skills of fourth grade students, this project intends to apply a PBL approach to IPAS instruction.

Using the Kemmis and McTaggart spiral model, which consists of cycles of planning, action, observation, and reflection, Classroom Action Research (PTK) is the methodology used (Kemmis et al., 2014). It is expected that this method will result in a more dynamic and inquiry-based learning environment that encourages students to improve their critical thinking skills.

2. METHOD

This study examines how the use of the Problem Based Learning (PBL) model can improve students' critical thinking skills using the Classroom Action Research (CAR) approach. The Kemmis and McTaggart spiral model, which consists of four stages executed iteratively: (1) Planning, (2) Action, (3) Observation, and (4) Reflection, was used as the research model (Kemmis et al., 2014). The study was conducted over two research cycles, each of which included two learning sessions centered around curriculum-relevant thematic IPAS content for grade four.

2.1 Participants

In Banyumas Regency, Central Java, Indonesia, at SD Negeri 2 Purwokerto Wetan, this study was conducted. A total of eighteen Class IVB students, aged nine to ten years old, participated in the study. Initial observations indicating low student engagement and weak critical thinking skills-as demonstrated by their inability to voice their ideas, participate in group discussions, and solve contextual problems during IPAS lessons-led to the selection of the class. Purposive sampling was used in the participant selection process, with an emphasis on the relevance of the group to the research objectives. With permission from the class instructor and principal, each student took part voluntarily.

2.2 Instruments and Data Collection

To Several tools were used to collect quantitative and qualitative data to ensure a thorough evaluation of the impact of the intervention:

a. An observation sheet

Was used to monitor engagement, involvement, teamwork, and fidelity to the PBL model during each learning session. The researcher conducted the observations with the help of the classroom teacher.

b. Critical Thinking Test

This assessment, given at the end of each cycle, included scenario-based and open-ended questions that aligned with critical thinking metrics. Facione's critical thinking framework informed the development and validation of the test items.

c. Semi-structured interviews

Were conducted to probe perceptions, challenges, and thoughts about the learning process with a select group of students and the classroom teacher. Audio recordings of the interviews were made, and the transcriptions were analyzed.

d. Documentation

Included lesson plans, student worksheets, reflective journals, and photographs of classroom activities. This data served to triangulate findings from other instruments.

2.3 Indicators of Critical Thinking

The indicators used to measure students' critical thinking were adapted from Facione (2015) and aligned with 21st-century learning competencies. These indicators were:

a. Giving Simple Explanations

Students' ability to articulate concepts, ideas, or reasoning using clear and logical language.

b. Making Inferences
The capacity to draw conclusions from facts or given information, especially in problem-solving contexts.
c. Evaluating Arguments
Judging the credibility of claims, identifying logical fallacies, and distinguishing between fact and opinion.
d. Planning and Problem-Solving Strategies
The ability to organize information, identify possible solutions, and decide on effective courses of action.

Rubrics with four levels of mastery-Beginning, Developing, Proficient and Advanced-are used to evaluate each indicator. Throughout the learning cycle, formative and summative evaluations are based on this rubric.

2.4 Data Analysis

Descriptive statistics were used to examine quantitative test score data to calculate the average growth of students' critical thinking skills between cycles. Thematic analysis was used to examine qualitative data from observations and interviews, focusing on trends related to student participation, quality of reasoning, and cooperative problem-solving techniques. To ensure that the results were reliable and valid, data triangulation was used.

3. RESULTS AND DISCUSSIONS

The results of two cycles of Classroom Action Research (PTK) are presented in this section, with an emphasis on how the Problem-Based Learning (PBL) approach helped students develop their critical thinking skills. A combination of observation sheets, critical thinking exercises, interviews, and documentation analysis were used to collect data. The results are categorized into three sections: overall observation findings, Cycle I results, and Cycle II results.

3.1 Cycle I

During the first cycle, the PBL model was introduced to the students for the first time. The learning activities were structured around an open-ended real-world problem relevant to the IPAS topic. Students worked in small groups to analyze the problem, formulate hypotheses, gather information, and present solutions. The classroom dynamic began to shift. Students who were previously passive started to engage in discussions, respond to guiding questions, and contribute to group problem-solving.

Although some students still relied heavily on teacher direction, there was a clear increase in their willingness to express opinions and interact with peers. Based on the rubric-based critical thinking assessment, the average class score increased from a baseline of 55.3% (pre-cycle) to 70.3% at the end of Cycle I. Specific improvements were observed in the following areas:

a. Giving simple explanations: Students were able to define terms and describe ideas using clearer language.
b. Making inferences: Most students began to connect information logically but still required scaffolding.
c. Evaluating arguments: Some students could identify weaknesses in reasoning but struggled to provide justification.

While these results were promising, reflection with the classroom teacher revealed several limitations. Time management was suboptimal, and some students remained confused about task expectations. This insight informed refinements for the next cycle.

3.2 Cycle II

In Cycle II, the learning design was adjusted based on the reflections from Cycle I. Changes included:

a. Providing clearer problem scenarios with visual aids and real-life context.
b. Introducing guiding questions to support group inquiry.
c. Allocating more structured time for group presentation and peer feedback.
d. Strengthening teacher facilitation techniques to better scaffold student thinking.

As a result, the learning atmosphere became more focused and productive. Students demonstrated improved collaboration, and the depth of their reasoning increased significantly. Many began to question assumptions, propose alternative solutions, and use evidence to support their arguments.

The average critical thinking score increased further to 84.1%, indicating substantial growth. Gains were noted particularly in:

a. Evaluating arguments: Students could now distinguish between strong and weak reasoning with justification.
b. Problem-solving strategies: Groups were more systematic in identifying root causes and proposing feasible actions.
c. Self-reflection: Some students could articulate how their thinking evolved during the problem-solving process.

The improvement across cycles suggests that with consistent exposure and proper scaffolding, the PBL model can foster substantial development in students' critical thinking capabilities.

3.3 Observational Findings

The quantitative results were further validated by qualitative information collected through interviews and observations. The classroom climate changed over the two cycles from teacher-centered to inquiry- and student-centered. Among the most important findings were:

a. Greater student autonomy in group time and work management.
b. Students actively collaborated with each other by giving and receiving feedback.
c. Increased student-led questioning, where students ask questions to gain a deeper understanding of the subject.
d. Students' confidence and vocal expression increased as they found it easier to express their thoughts out loud.

The instructors also noted a marked increase in student motivation and excitement during class. In conversations and presentations, a number of students who had previously shown hesitation began to take control. Overall, the results show that the Problem-Based Learning model greatly enhances the cognitive and affective aspects of learning, especially in encouraging critical thinking, communication and teamwork, when methodically applied through action research cycles.

4. CONCLUSIONS

The conclusion of this study provides strong evidence of the ability of the Problem-Based Learning (PBL) model to improve the critical thinking skills of elementary school students. The improvements seen over two cycles of Classroom Action Research (PTK) demonstrate how structured, problem-oriented learning experiences can have a major impact on students' capacity for reasoning, inference, evaluation and cooperative problem solving.

The PBL paradigm encourages the creation of an environment where students actively generate knowledge rather than passively absorb it. Students are encouraged to ask questions, collect data, test theories and reach conclusions together as they investigate real-world problems. Important components of critical thinking, such as explanation, inference, evaluation, and problem solving, are directly promoted by this process, according to Facione's (2015) approach.

This result is in line with recent empirical research. According to Sutika et al. (2023), PBL significantly increases the critical thinking capacity of elementary school students when learning science. Similarly, PBL encourages deeper participation in challenging cognitive activities and student independence, according to Arviani, Wahyudin, & Dewi (2023). This finding is supported by the research findings, especially when considering the thematic learning approach of the Indonesian IPAS curriculum, which contextualizes the integration of social studies and science.

From a pedagogical point of view, constructivist learning theory, which highlights how students acquire knowledge through active participation and social interaction, is in line with the PBL approach. In this study, it was evident that the more the students were exposed to problem scenarios and inquiry-based tasks, the more they developed autonomy, critical awareness, and reflective habits.

Furthermore, the observed shifts in the classroom environment from teacher-centered to student-centered and from passive to engaged demonstrate how PBL can have a transformative effect on classroom culture and academic outcomes. Students showed increased motivation, confidence and teamwork-qualities that are essential for learners in the 21st century. However, the implementation of PBL in elementary schools is not without its difficulties.

To change their task from imparting knowledge to facilitating learning, teachers need training. Furthermore, careful planning is required to create age-appropriate, cognitively demanding and real-world problems. Based on the research findings, problem-based learning - especially in IPAS thematic learning - is a successful pedagogical approach to improve critical thinking skills of fourth grade elementary school students. Students' ability to explain, infer, assess and problem solve improved significantly over the two cycles of action research.

They also showed increased engagement and excitement in the learning process. The effectiveness of this intervention suggests that PBL can be a good teaching model for primary schools in Indonesia and elsewhere, especially when it comes to encouraging 21st century skills such as creativity, teamwork and critical thinking.

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