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Improving Critical Thinking and Collaboration through Problem-Based Learning

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ABSTRACT

Improving critical thinking and collaboration is essential for developing quality individuals, particularly at the elementary school level, where these skills should first be cultivated. Initial classroom observations at SD Negeri 1 Dawuhan Kulon revealed that fourth-grade students showed limited critical thinking, evidenced by inadequate responses to higher-order thinking (HOTS) questions, and limited collaboration due to conventional, teacher-centered learning. This study aimed to improve fourth-grade students' critical thinking and collaboration skills through the Problem-Based Learning (PBL) model on the Natural and Social Sciences (IPAS) topic of Force. This research employed a Collaborative Classroom Action Research design conducted in two cycles, each consisting of one meeting, involving 15 fourth-grade students (8 boys and 7 girls) in the 2023/2024 academic year. Data were collected through evaluation tests and observation sheets, then analyzed using descriptive statistics. Results showed that students' critical thinking scores, measured through evaluation tests, increased from an average of 69.26 in Cycle I to 81.24 in Cycle II, while collaboration scores, measured on a 1-4 scale, increased from 2.95 ("good") to 3.33 ("very good"). These findings indicate that the PBL model effectively enhances fourth-grade students' critical thinking and collaboration skills.

Keywords: Critical Thinking; Collaboration; Problem-Based Learning; Classroom Action Research

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INTRODUCTION

Efforts to improve the quality of a nation are made by improving the quality of education. The better the quality of education, the better the quality of individuals it produces. Education is one part of human needs aimed at developing individual potential so that it can be utilized appropriately in life and for humanity's future. Any discussion of education would be incomplete without addressing learning methods related to shaping the abilities possessed by students. Bloom, as cited in Rifa'i and Anni (2011, p. 86), proposed three taxonomies referred to as learning domains: the cognitive, affective, and psychomotor domains. In education, these three domains must be balanced and aligned. Suparlan (2013, pp. 18–19) explained that there are three essential components in national education; without any one of these components, the educational process cannot occur. This process involves three interrelated components: (1) learners, commonly referred to as students at the primary and secondary level, or as university students at the higher education level; (2) educators, referred to as teachers at the primary and secondary level, and lecturers at the higher education level; and (3) the curriculum or teaching materials. The curriculum is a plan developed as a guideline for implementing an educational process that produces beneficial outcomes. Indonesia is currently developing the new Kurikulum Merdeka (Independence Curriculum), which has just been implemented in Grades I and IV in an effort to

address learning setbacks caused by the Covid-19 pandemic, as well as to evaluate the previous curriculum.

This study is limited to the Natural and Social Sciences (IPAS) subject, Chapter 3, "Force in Our Surroundings," specifically focusing on Topic B, "Properties of Frictional Force," and Topic C, "The Magic of Magnets," each of which has a different focus of learning objectives. Teachers are the factor directly responsible for the success achieved in the classroom. In this regard, teachers are required to be professional, possessing mastery of the subject matter used to educate, guide, train, and develop the curriculum, as reflected in the principle "ing ngarsa sung tulada, ing madya mangun karsa, tut wuri handayani," meaning that a teacher should set an example when in front, build initiative when in the middle, and provide encouragement or motivation when behind. This clearly shows that teachers play a very significant role. Therefore, in implementing instruction, teachers need to pay careful attention to the use of learning models.

Learning models must be adapted to the material contained within each theme so that the material delivered can be well received by students. Teachers also need to use more innovative learning models suited to the demands of the times. The advancement of the times requires teachers not only to use a single learning model, but also to adopt models capable of encouraging students to think beyond their usual patterns while developing their collaborative skills.

"Thinking beyond the usual" refers to students' ability to develop critical thinking skills in order to discover answers or solutions related to the material being studied. In line with this, as the times progress, students are also required to work together with others or in groups in order to channel their ideas in solving problems collectively toward a shared goal. Teachers must therefore be precise in selecting learning models that focus on critical thinking and collaboration skills for students.

In practice, the steps taken by teachers are sometimes not yet appropriate and have not been fully optimal. This is because classroom learning still relies on conventional, teacher-centered instruction, making teacher activity more dominant than student activity. This results in a limited role for students in developing information or answers, as well as underdeveloped critical thinking skills. One-way (teacher-centered) teaching leads to an accumulation of information or concepts that provide limited benefit to students. Teachers consistently demand that students learn, but do not teach them how they should learn and solve problems. To address this learning problem, an improvement in instructional strategy is needed, specifically a learning model expected to facilitate students' critical thinking and problem-solving skills so that better outcomes can be achieved. Another issue observed in the field is that problem-based learning models are still rarely applied, thereby providing limited opportunities for students to develop interaction and collaboration skills. However, according to Hasanah and Himami (2021), problem-based learning provides opportunities for students to learn with their peers through structured tasks. Through problem-based learning, a student also becomes a learning resource for their peers. Therefore, learning that positions students to collaborate with one another in order to develop their thinking skills in completing assigned tasks is needed. Based on this, an instructional innovation can help students develop both critical thinking and collaboration skills in learning.

Teachers should adopt a problem-based learning model, one example being Problem-Based Learning (PBL). PBL is a learning model that engages students in attempting to solve problems through several stages of the scientific method, so that students are expected to learn knowledge related to the problem while also developing problem-solving skills. PBL serves as a learning approach that applies real-world problems as a context for students to practice critical thinking and acquire problem-solving skills (Ibrahim & Nur, 2010; Butcher, 2006).

Many learning models aim to build good collaborative attitudes and develop critical thinking skills; however, there are several reasons underlying the researcher's choice of the Problem-Based Learning model, including: this model is still rarely used in classroom instruction in general; it functions to improve students' ability to collaborate in class; and it requires cohesion among group members to develop critical thinking skills in answering questions. Students collaborate more effectively under time pressure, and healthy competition with other groups increases solidarity among group members in achieving a shared goal.

For the researcher, the Problem-Based Learning model is well suited to the IPAS Chapter 3 material, "Force in Our Surroundings," because the content is designed to train collaboration in finding answers or solutions while developing students' thinking skills, making the material learned more meaningful. This is achieved by implementing learning through group experiments guided by stimulus questions in the tasks. Group members must be able to answer each question by collaborating in discussion and problem-solving.

METHOD

The research design used was Collaborative Classroom Action Research (CAR). Classroom Action Research is a scientific action carried out by a teacher in his or her own classroom by designing, implementing, observing, and reflecting on actions through several cycles, conducted collaboratively and participatively, with the aim of improving the quality of the learning process in the classroom. In this study, the practice was carried out by a Pre-Service Teacher Professional Education (PPG Prajabatan) Batch 2 student undertaking a teaching internship (PPL) at SD Negeri 1 Dawuhan Kulon, in collaboration with the fourth-grade classroom teacher, the mentoring teacher, and the field supervising lecturer. This study employed a combined qualitative and quantitative approach, used to observe the findings obtained from the implementation of the Problem-Based Learning model in the Natural and Social Sciences (IPAS) subject, Chapter 3, Force in Our Surroundings. The subjects of this classroom action research were all fourth-grade students of SD Negeri 1 Dawuhan Kulon, Banyumas Regency, in the 2023/2024 academic year. The number of fourth-grade students was 15, consisting of 8 male students and 7 female students. The research was conducted in the fourth-grade classroom of SD Negeri 1 Dawuhan Kulon. The object of this study was the implementation of the Problem-Based Learning model to improve critical thinking and collaboration skills in the IPAS subject, Chapter 3, Force in Our Surroundings. The research was carried out from July to August, using independent teaching practices 3 (Properties of Frictional Force) and 4 (The Magic of Magnets) within the IPAS subject as the research cycles.

The procedures followed in this study were implemented through research cycle activities. This classroom action research was planned across several cycles and sessions to examine the critical thinking and collaboration abilities of fourth-grade students in the IPAS subject, Chapter 3, Force in Our Surroundings, at SD Negeri 1 Dawuhan Kulon, through the implementation of the Problem-Based Learning model. According to Arikunto (2012, pp. 17-21), as cited in Paizaluddin and Ermalinda (2013, p. 33), each research cycle consists of four main activities: planning, implementation, observation, and reflection. The researcher carried out the study across two cycles, with each cycle consisting of one meeting. The study then proceeded through Cycle I and Cycle II, beginning with planning, followed by implementation, observation, and reflection. The results of the data analysis and reflection obtained from Cycles I and II were used as a reference to determine the extent to which the teacher's objectives were achieved in improving students' critical thinking and collaboration skills through the Problem-Based Learning model.

To obtain objective, complete, and accountable data and information, the researcher employed both test and non-test techniques. The test used in this study was an evaluation test administered at the end of each learning session in Cycles I and II, aimed at measuring students' critical thinking skills. The test consisted of multiple-choice and short-answer items. The non-test technique used was observation, aimed at determining students' collaboration skills during the learning process. According to Widoyoko (2017, p. 64), observation is generally defined as the systematic observation and recording of elements that appear in a phenomenon within the object being measured. Hadi (1986), as cited in Sugiyono (2010, p. 196), describes observation as a complex process composed of various biological and psychological processes. Observation techniques are used to examine

human behavior, work processes, or natural phenomena when the number of respondents is relatively small, making this technique suitable for assessing the collaboration and critical thinking skills of fourth-grade students in the IPAS subject, Chapter 3, Force in Our Surroundings. Observations were conducted during the learning process by scoring collaboration and critical thinking observation sheets, along with observer sheets recording teacher and student activities to determine whether the Problem-Based Learning model had been implemented appropriately. Documentation was also used to collect lesson plans (RPP), a list of students, semester grade data, and photographs taken during the implementation of the Problem-Based Learning model.

The data collection instruments used in this study were evaluation test sheets and observation sheets. The test items, used to measure students' critical thinking skills, were presented in multiple-choice and short-answer formats at cognitive levels C4 to C6. The items were developed with reference to the indicators and learning objectives to be measured, allowing critical thinking skills to be assessed in both Cycle I and Cycle II. The evaluation test was used to determine student ability after learning was conducted using the Problem-Based Learning model. Observation sheets were used for both students and teachers. The teacher observation sheet was used to collect data related to teacher activity during the learning process, in order to determine whether the activities carried out were consistent with the Teaching Module implementing the Problem-Based Learning model. After the data were collected through the observation technique, they were processed using the percentage formula of Anas Sudijono (2014), as cited in Pohan (2021, pp. 33-34). The student observation sheet was used to obtain information regarding student performance during the learning process, in accordance with the planned lesson design. These data were likewise processed using the percentage formula of Anas Sudijono (2014), as cited in Pohan (2021, pp. 33-34). This observation sheet was used to determine the extent of change or improvement in students' collaboration and critical thinking skills, based on indicators outlined in the instrument grid. For the collaboration observation sheet, the data analysis technique used was descriptive analysis with a percentage technique based on the formula of Syaiful Bahri Djamarah and Aswan Zain (2010, pp. 252-253), while critical thinking skills were analyzed using the formula of Anas Sudijono (2010, p. 43).

The data obtained were subsequently analyzed using descriptive statistical analysis, aimed at describing students' critical thinking and collaboration skills during the learning process. Data analysis of critical thinking and collaboration was carried out by examining the consistency between the planning and implementation of the actions taken. This analysis was conducted for each individual subject as a whole, comparing data from learning without the implementation of the Problem-Based Learning model and data from learning with the implementation of the Problem-Based Learning model, in order to determine whether this learning model could improve the critical thinking and collaboration skills of fourth-grade students at SD Negeri 1 Dawuhan Kulon. The success indicators served as criteria to assess the level of success of the classroom action research in improving the teaching and learning process in the classroom. The implementation of the Problem-Based Learning model in the fourth-grade classroom of SD Negeri 1 Dawuhan Kulon was considered successful if there was an improvement in students' critical thinking and collaboration skills in the IPAS subject, Chapter 3, Force in Our Surroundings, from Cycle I to Cycle II. Collaboration among students, including collaborative learning, required emotional adjustment between students. Several indicators of collaboration were adapted from Ludgren, as cited in Pohan (2021, p. 19), while several indicators of critical thinking were used as research guidelines. In addition,

data were obtained from the evaluation results of each cycle, with the minimum expected achievement being a score above the KKM (Minimum Mastery Criterion) of 65.

FINDINGS AND DISCUSSION

Data are presented first as findings, based on the observation, evaluation, and questionnaire instruments used across the two implementation cycles, followed by a discussion that interprets these findings in relation to the Problem-Based Learning (PBL) model applied in this classroom action research.

Findings

Classroom observation prior to the action research revealed that Grade IV students at SDN 1 Dawuhan Kulon had limited critical thinking skills, shown by inconsistent answers on HOTS questions, reluctance to ask or answer questions, and a lack of collaboration due to conventional, teacher-centered instruction using only the textbook. Based on this, the researcher implemented two cycles of Problem-Based Learning, each consisting of one meeting: Cycle I on Monday, 7 August 2023 (IPAS Chapter 3, Topic B: Properties of Frictional Force) and Cycle II on the following meeting (IPAS Chapter 3, Topic C: The Magic of Magnets), both attended by 15 students.

Each cycle followed the same five PBL phases (orienting students to the problem, organizing students, guiding investigation, developing and presenting results, and analyzing/evaluating outcomes) and was observed by a peer observer, Ade Lia, using student-activity, teacher-activity, critical-thinking, and collaboration instruments. The results are presented in Tables 1 to 4.

Table 1. Student Activity, Cycle I and Cycle II

Cycle	Student Activity (Achievement Percentage)	Category
I	69.17%	Good
II	84.14%	Very Good

Table 2. Teacher Activity During Learning, Cycle I and Cycle II

Cycle	Teacher Activity (Achievement Percentage)	Category
I	61.36%	Good
II	84.09%	Very Good

Table 3. Critical Thinking Ability, Cycle I and Cycle II

Description	Cycle I	Cycle II
Highest score	100	100
Lowest score	30	39
Students ≥ KKM (65)	9	11
Students < KKM (65)	6	4
Completion percentage	34.2%	84.38%
Average score	69.26	81.24

Table 4. Collaboration Ability, Cycle I and Cycle II

Indicator	Cycle I	Cycle II
Number of students	15	15
Overall average score	61.9	70.1
Cycle average (scale 1 to 4)	2.95	3.33
Criterion	Good	Very Good

Discussion

The findings show a clear improvement from Cycle I to Cycle II across all four indicators. Student activity rose from 69.17% (good) to 84.14% (very good), and teacher activity from 61.36% (good) to 84.09% (very good). In Cycle I, several planned teacher actions, such as clarifying discussed problems and managing discussion time, were not yet carried out, which held the score in the "good" rather than "very good" category. By Cycle II, the teacher had addressed these gaps: ice-breaking activities were more varied, PowerPoint use was better balanced against the already-distributed textbooks, and students were more confident asking questions and giving feedback to presenting groups.

Critical thinking ability improved substantially, with the completion percentage rising from 34.2% to 84.38% and the average score from 69.26 to 81.24, surpassing the study's 80% success indicator. This aligns with the premise of PBL, in which authentic problem-solving tasks (the frictional-force and magnetism experiments) push students beyond rote recall toward analysis and evaluation, the higher tiers of HOTS.

Collaboration also improved, from 2.95 (good) to 3.33 (very good). However, in both cycles the lowest-scoring indicators were consistently Indicator 1 (building and maintaining peer relationships) and Indicator 3 (facing problems together, including turn-taking), with students remaining reluctant to voice opinions in group discussion. This persistent gap suggests that while PBL strengthened task-oriented collaboration (completing worksheets, presenting results), the interpersonal dimension of collaboration, negotiating turns and expressing disagreement within a group, needs more deliberate scaffolding than one cycle of intervention can provide, for example through explicit norm-setting or structured turn-taking protocols in future implementation.

Overall, the two-cycle implementation of Problem-Based Learning was effective in improving both critical thinking and collaboration among Grade IV students, with all indicators reaching or exceeding the "very good" category and the completion percentage surpassing the 80% success threshold, indicating that the research objective was achieved and further cycles were not required.

CONCLUSION

This classroom action research set out to address a concrete instructional gap: Grade IV students at SDN 1 Dawuhan Kulon showed limited critical thinking, shown in inconsistent HOTS answers, reluctance to ask or answer questions, and weak collaboration under conventional, teacher-centered instruction. The findings confirm that this gap was substantially closed through two cycles of Problem-Based Learning. Student and teacher activity both moved from the good to the very good category (69.17% to 84.14% and 61.36% to 84.09%, respectively), critical thinking completion rose from 34.2% to 84.38% with the average score increasing from 69.26 to 81.24, and collaboration improved from 2.95 to 3.33 on the four-point scale. All four indicators reached or exceeded the study's 80% success threshold by the end of Cycle II, so the compatibility between what was proposed in the Introduction and what was achieved in the Findings and Discussion is established: Problem-Based Learning, implemented through its five phases and

supported by concrete, hands-on problems (frictional force and magnetism), gave students authentic reasons to investigate, argue, and coordinate with peers rather than receive information passively.

Even so, the results also point to a boundary of what two short cycles can achieve. Both cycles showed the same two weakest collaboration indicators, peer relationship-building and shared problem-facing or turn-taking, suggesting that task-oriented collaboration (finishing worksheets, presenting results) developed faster than the interpersonal skills of negotiating turns and voicing disagreement within a group. This is a reasonable direction for future research and classroom practice: subsequent studies or teaching cycles could pair Problem-Based Learning with explicit collaboration scaffolds, such as structured turn-taking protocols or group norm-setting, and track whether this narrows the gap on those two specific indicators. Future research might also extend the design beyond two single-meeting cycles, or apply it to other IPAS topics, to test how durable the gains in critical thinking and collaboration are over a longer period.

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