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IMPLEMENTATION OF PROJECT BASED LEARNING TO IMPROVE FIFTH-GRADE STUDENTS' COLLABORATION SKILLS IN SCIENCE LEARNING

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Abstract: This study aims to improve fifth-grade students' collaboration skills in science learning through the implementation of the Project Based Learning (PjBL) model. This research employed Classroom Action Research (CAR) consisting of one cycle that included planning, action, observation, and reflection stages. The participants were 16 fifth-grade elementary school students. Data were collected using observation sheets, interviews, documentation, and pre-test and post-test instruments. The results show a significant improvement in students' collaboration skills, as indicated by an increase in the average score from 67.8% in the pre-test to 79.3% in the post-test. In addition, mastery learning improved from 25% to 87%. The improvement was evident in students' ability to communicate effectively, share responsibilities, and actively participate in group work during project implementation. These findings indicate that Project Based Learning is effective in fostering collaboration skills in elementary science learning. Future research is recommended to conduct the study using more action cycles, involve a larger number of participants, and compare PjBL with other instructional models to obtain more comprehensive insights into the development of students' collaboration skills.

Keywords: *Project Based Learning, collaboration skills, elementary school, science learning, classroom action research*

INTRODUCTION

Collaboration is one of the essential competencies required in 21st-century learning. In elementary education, particularly in science learning, collaboration enables students to work together, exchange ideas, solve problems, and complete tasks collectively. Through collaborative activities, students can develop social interaction skills, responsibility,

communication abilities, and mutual respect, which are crucial for meaningful and effective learning experiences (Fitria, 2023).

However, based on preliminary observations conducted in a fifth-grade classroom, students' collaboration skills were found to be relatively low. Many students tended to work individually, showed limited participation during group discussions, and lacked responsibility in completing group tasks. Some students were passive, while others dominated group activities, resulting in ineffective teamwork. These conditions negatively affected the learning process and hindered students' achievement in science learning.

This situation indicates a learning problem in which existing instructional practices have not optimally facilitated students' collaboration skills, even though science learning inherently requires cooperative activities such as observation, experimentation, and problem-solving. Therefore, an instructional approach that actively involves students in meaningful collaborative learning is needed.

Project Based Learning (PjBL) is considered an appropriate instructional model to address these challenges. PjBL emphasizes student-centered learning through authentic projects that require students to collaborate, communicate, think critically, and solve real-world problems (Mulyasa, 2020). Through project activities, students are encouraged to actively construct knowledge by planning, investigating, creating products, and presenting their work collaboratively, thereby strengthening their collaboration skills.

Previous studies have demonstrated the effectiveness of PjBL in improving students' collaborative behavior. Rahmawati (2021) reported that PjBL significantly enhanced teamwork and responsibility among elementary school students. Sari (2022) found increased student engagement and communication in science learning through the implementation of PjBL. Similarly, Lestari (2023) showed that PjBL promoted student activeness and interaction during group-based learning activities. Nevertheless, most of these studies focus on general learning outcomes or student engagement, while research that specifically examines the improvement of collaboration skills in fifth-grade science learning through classroom action research remains limited.

This research gap highlights the need for a focused investigation on how Project Based Learning can systematically improve collaboration skills in elementary science classrooms. Therefore, this study aims to answer the following research question: How can Project Based Learning improve fifth-grade students' collaboration skills in science learning?

The significance of this study lies in its contribution to both theory and practice. Theoretically, it enriches the literature on collaborative learning and Project Based Learning in elementary science education. Practically, the findings are expected to provide teachers with an effective instructional strategy to enhance students' collaboration skills and improve the quality of science learning in elementary schools.

METODOLOGI

Research Design

This study employed a Classroom Action Research (CAR) design aimed at improving fifth-grade students' collaboration skills in science learning through the implementation of the Project Based Learning (PjBL) model. Classroom Action Research was selected because it focuses on solving practical problems encountered in the classroom and improving the quality of the teaching and learning process through systematic and reflective actions.

The research design was based on the Kemmis and McTaggart model, which consists of four interconnected stages: planning, action, observation, and reflection (Yushalihin, 2017). These stages form a cyclical process that allows the researcher to evaluate the effectiveness of instructional strategies and make improvements based on observed outcomes.

In the planning stage, the researcher identified problems related to students' low collaboration skills through preliminary observations and discussions with the classroom teacher. Learning instruments were prepared, including lesson plans based on the Project Based Learning model, student worksheets, collaboration skill observation sheets, interview guidelines, and assessment instruments. The success indicators of the research were also determined at this stage.

In the action stage, the Project Based Learning model was implemented in science learning. Students were organized into small groups and engaged in project activities such as planning, data collection, problem-solving, product creation, and presentation. The teacher acted as a facilitator, guiding students and ensuring active participation during group work.

The observation stage was conducted simultaneously with the action stage. During this stage, students' collaboration skills were observed and recorded using structured observation sheets. Observations focused on indicators such as active participation, communication, responsibility, and cooperation among group members.

In the reflection stage, the data obtained from observations, tests, interviews, and documentation were analyzed to evaluate the effectiveness of the implemented learning model. Reflection results were used to determine whether the predetermined success indicators were achieved. Since more than 75% of students reached mastery learning and showed improvement in collaboration skills, the research was conducted in one cycle.

Research Subject

The research was conducted at an elementary school located in Lubuklinggau, Indonesia, during the 2025 academic year. The subjects of this study were 16 fifth-grade students, consisting of 7 male students and 9 female students.

The selection of the research subjects was based on preliminary observations indicating that students' collaboration skills in science learning were relatively low. Common problems included limited participation during group discussions, uneven task distribution, lack of responsibility, and minimal communication among students. These conditions made the class suitable for the implementation of Project Based Learning as an intervention to improve collaboration skills.

The fifth-grade students were considered appropriate research subjects because, at this developmental stage, students begin to develop social interaction skills and are capable of engaging in cooperative and project-based learning activities. Furthermore, science learning at the elementary level provides ample opportunities for collaborative work through experiments, problem-solving, and inquiry-based activities.

The classroom teacher collaborated with the researcher throughout the research process, particularly during the planning and observation stages, to ensure that learning activities aligned with the curriculum and classroom conditions. This collaboration also contributed to the objectivity and validity of the data collected during the study.

Data Collecting

Data were collected using the following techniques:

1. Tests, to measure changes in students' learning outcomes related to collaboration skills.
2. Observation, to assess students' collaboration behavior during project-based learning activities.
3. Interviews, to obtain qualitative information regarding students' learning experiences and responses.
4. Documentation, to support observational and interview data through photographs and learning records.

Data Analysis

Data analysis in this study was conducted using a mixed-method approach, combining qualitative descriptive analysis and quantitative analysis to obtain comprehensive findings regarding the improvement of students' collaboration skills through the implementation of Project Based Learning (PjBL).

1. Qualitative Data Analysis

Qualitative data were obtained from observation sheets, interviews, and documentation. These data were analyzed using descriptive qualitative techniques following the stages of data reduction, data display, and conclusion drawing.

a. Data reduction was carried out by selecting and focusing on relevant information related to students' collaboration skills, including indicators such as active participation, communication, responsibility, and cooperation during group activities. Irrelevant data were excluded to ensure clarity and focus.
b. Data display involved organizing the reduced data into descriptive narratives and observation summaries to illustrate changes in students' collaborative behavior before and after the implementation of Project Based Learning. This stage enabled the researcher to identify patterns and trends in students' interactions during science learning activities.
c. Conclusion drawing and verification were conducted by interpreting the displayed data to determine whether there was an improvement in collaboration skills. The conclusions were continuously verified by comparing observation results, interview responses, and documentation to ensure consistency and accuracy.

Qualitative analysis showed that students demonstrated noticeable improvements in collaboration behaviors, such as increased willingness to express ideas, improved teamwork, better task distribution, and more effective communication during project activities.

2. Quantitative Data Analysis

Quantitative data were obtained from pre-test and post-test results, which measured students' collaboration skills before and after the implementation of Project Based Learning. The data were analyzed using descriptive statistical techniques in the form of percentages and mean scores.

The average score of students' collaboration skills was calculated to determine overall improvement. In addition, mastery learning was determined by calculating the percentage of students who achieved the Minimum Mastery Criterion (KKM) of 75 using the following formula:

$$\text{Mastery Percentage} = \frac{\text{Total Number of students achieving KKM}}{\text{Total students}} = \times 100\%$$

The results showed an increase in the average score from 67.8% in the pre-test to 79.3% in the post-test. Furthermore, mastery learning improved from 25% to 87%, indicating that most students met the predetermined success indicators after the implementation of Project Based Learning.

3. Data Triangulation and Validity

To ensure the validity and reliability of the research findings, data triangulation was applied by comparing data obtained from different sources and techniques, including tests, observations, interviews, and documentation. The consistency between qualitative and quantitative findings strengthened the credibility of the results.

The success indicators of this Classroom Action Research were achieved when at least 75% of students reached mastery learning and demonstrated improvement in collaboration skill indicators. Based on the results of data analysis, these criteria were successfully met.

RESEARCH RESULT

Finding

This section presents the results of the Classroom Action Research conducted through the implementation of Project Based Learning (PjBL) to improve fifth-grade students' collaboration skills in science learning. The data were obtained from observation sheets, interviews, documentation, and pre-test and post-test results.

1. **Students' Initial Collaboration Skills (Pre-Test Results)**

   Before the implementation of Project Based Learning, a pre-test and initial observation were conducted to identify students' baseline collaboration skills. The results showed that students' collaboration abilities were relatively low. The average pre-test score was 67.8%, which was below the school's minimum mastery criterion (KKM) of 75. Only 4 out of 16 students (25%) achieved mastery learning.

   Observation data revealed several problems during group activities. Most students tended to work individually rather than collaboratively. Some students dominated group discussions, while others were passive and reluctant to express opinions. In addition, responsibility sharing among group members was not optimal, as tasks were often completed by only one or two students. Communication among group members was limited, and conflicts were not managed effectively.

   These findings indicate that students had not yet developed adequate collaboration skills, particularly in terms of active participation, responsibility, communication, and teamwork during science learning activities.

2. **Improvement of Collaboration Skills After PjBL Implementation (Post-Test Results)**

   After implementing Project Based Learning, a post-test was administered to measure changes in students' collaboration skills. The results showed a significant improvement. The average post-test score increased to 79.3%, exceeding the KKM. A total of 14 students (87%) achieved mastery learning, indicating a substantial increase compared to the pre-test results.

   Observation during the learning process showed positive changes in students' behavior. Students actively participated in planning project activities, discussing ideas, collecting data, and completing group tasks. They demonstrated better communication skills by listening to peers' opinions, expressing ideas confidently, and providing

constructive feedback. Responsibility sharing among group members improved, as tasks were distributed more evenly and completed collaboratively.

Project activities such as group planning, experimentation, problem-solving, presentation, and reflection played a crucial role in fostering collaboration. Students were required to interact continuously, negotiate roles, and work together to achieve common goals. These activities contributed significantly to the development of collaboration skills.

3. Summary of Learning Outcome Improvement

Overall, the results indicate that Project Based Learning effectively improved students' collaboration skills in science learning. The increase in average scores and mastery learning percentage demonstrates that the success indicators of the Classroom Action Research were achieved. Therefore, the implementation of PjBL can be considered successful in improving collaboration skills among fifth-grade students.

Discussion

The findings of this study indicate that the implementation of Project Based Learning (PjBL) has a positive impact on improving fifth-grade students' collaboration skills in science learning. The significant increase in students' average scores and mastery learning percentage demonstrates that PjBL provides meaningful learning experiences that support the development of collaboration skills.

Project Based Learning emphasizes student-centered learning, where students actively engage in planning, implementing, and evaluating learning activities through projects. This learning model encourages students to work together, communicate effectively, and take responsibility for group tasks. As stated by Mulyasa (2020), PjBL facilitates the development of 21st-century skills, including collaboration, communication, critical thinking, and creativity.

The improvement observed in this study aligns with previous research. Rahmawati (2021) reported that PjBL enhances teamwork and responsibility among elementary school students. Similarly, Sari (2022) found that PjBL creates an interactive learning environment that promotes communication and cooperation. Lestari (2023) also emphasized that project-based activities encourage students to actively participate and interact with peers.

From a theoretical perspective, the results support constructivist learning theory, which emphasizes that knowledge is actively constructed through social interaction and meaningful experiences. Through collaborative project activities, students were able to share ideas, negotiate meaning, and solve problems collectively. This process contributed to deeper understanding and improved collaboration skills.

The findings also highlight the importance of teacher facilitation during project-based learning. The teacher played a crucial role in guiding discussions, assigning roles, monitoring group progress, and providing feedback. Effective facilitation ensured that all students were involved and contributed to group activities, reducing passive participation and dominance by certain students.

Although this study was conducted in only one cycle, the achievement of more than 75% mastery learning indicates that the research objectives were met. However, conducting additional cycles may provide more comprehensive insights into long-term improvements in collaboration skills. In addition, involving a larger number of participants and comparing PjBL with other instructional models could strengthen the generalizability of the findings.

Overall, the discussion confirms that Project Based Learning is an effective instructional model for improving collaboration skills in elementary science learning and supports its implementation in classroom practice.

CONCLUSION

Based on the results of this Classroom Action Research, it can be concluded that the implementation of Project Based Learning (PjBL) effectively improved fifth-grade students' collaboration skills in science learning. The improvement was evident in both quantitative and qualitative data. Quantitatively, students' average collaboration score increased from 67.8% in the pre-test to 79.3% in the post-test, while mastery learning improved significantly from 25% to 87%, exceeding the predetermined success indicators.

Qualitatively, students demonstrated positive changes in collaborative behavior, including increased active participation, improved communication among group members, better responsibility sharing, and stronger cooperation during project activities. The learning process encouraged students to engage in meaningful interactions through planning, problem-solving, project implementation, presentation, and reflection. These activities supported the development of collaboration skills as part of essential 21st-century competencies.

The findings confirm that Project Based Learning provides a student-centered learning environment that fosters social interaction and teamwork in elementary science classrooms. Therefore, PjBL can be recommended as an effective instructional model for teachers to enhance students' collaboration skills and learning engagement.

However, this study was limited to one action cycle and a relatively small number of participants. Future research is recommended to implement multiple action cycles, involve larger and more diverse samples, and compare Project Based Learning with other instructional models to obtain more comprehensive and generalizable findings related to the development of students' collaboration skills.

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