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Lesson Study Through the Project-Based Learning Model to Improve Creative Thinking Ability

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Abstract

Thinking creatively is crucial for students' academic and personal development. This study aims to analyze the impact of the Lesson Study-based Project-Based Learning (PjBL) model on the creative thinking skills of seventh-grade students in social studies at SMP Negeri 2 Cimahi. The research was motivated by students' low creative thinking ability, as indicated by their reliance on textbooks and lack of initiative in independent problem-solving. This study employed a quasi-experimental method with a non-equivalent control group design, involving two groups: an experimental group that received Lesson Study-based PjBL and a control group taught using the lecture method. Data were collected through pre-tests and post-tests, classroom observations, and documentation. The data analysis used quantitative statistical techniques to compare the improvement in students' creative thinking abilities. The results revealed a significant difference between the two groups, with the experimental group showing a higher increase in creative thinking skills, particularly in fluency, flexibility, originality, and elaboration. These findings suggest that the Lesson Study-based PJBL model is an effective instructional approach to foster student creativity. Future research should explore its long-term impact and potential application in other subjects and educational levels.

Keywords Berpikir Kreatif; Lesson Study; Project-Based Learning

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1. INTRODUCTION

The current education requires students to have creative thinking skills to face challenges in an ever-evolving world (Haris et al., 2024; Zaki et al., 2024). One approach that can be used to improve creative thinking skills is Lesson Study through Project-Based Learning (PjBL) model (Prihatin et al., 2021; Wijayati et al., 2019). Lesson Study is a collaborative strategy that focuses on improving learning practices through planning, implementation, observation, and reflection (Akiba et al., 2019; Larssen et al., 2018; Takahashi & McDougal, 2016). Meanwhile, the PjBL model emphasizes project-based learning, where students can explore, analyze, and solve problems independently or in groups (de Oliveira Biazus & Mahtari, 2022; Hussein, 2021). Combining these two approaches is believed to enhance students' creativity, especially in Social Studies subjects, which are often perceived as rote learning

rather than problem solving (Khalid et al., 2020; Rozgonjuk et al., 2020; Zevin, 2015). Integrating Lesson Study and PjBL fosters a more student-centered learning environment and encourages collaboration among educators to continuously refine their teaching methods (Farrow et al., 2024; Vaithianathan et al., 2024). Engaging students in meaningful projects and reflective learning processes can bridge the gap between theoretical knowledge and real-world application, ultimately enhancing their critical and creative thinking skills (Molderez & Fonseca, 2018; Rohm et al., 2021).

Although Lesson Study and PjBL have been widely applied in education, there are still gaps in their application to social studies learning at the junior high school level, especially for seventh-grade students who have just transitioned from elementary school. Based on previous research, seventh-grade students of SMP Negeri 2 Cimahi have low self-confidence and a lack of creative thinking in the learning process. This is due to the condition of students, where students in grade VII E in semester 1 transition from elementary school (SD) to junior high school (SMP). The dominant conventional teaching methods also exacerbate this, so the learning process tends to be teacher-centered, providing less space for students to explore new ideas. In addition, many students live far away from their parents, which causes a lack of attention to their academic development and creative thinking.

Table 1. Results of the Creative Thinking Ability Test for Students of Grade VII E SMP Negeri 2 Cimahi

High Thinking Ability	K	Grade Point Average	Capability Categories
Creative thinking skills	73	53	Low

Previous research has shown that Lesson Study can improve the quality of learning through reflection and collaboration between teachers. Birgili (2015), Syahrın et al. (2019), and Ulger (2018) explained that creative thinking involves the ability to generate new ideas and solve problems uniquely, essential for student development. Meanwhile, research by Alabbasi et al. (2022), Ernawati et al. (2019), and Gube & Lajoie (2020) Identified four key indicators of creative thinking: fluency, flexibility, originality, and elaboration, which serve as benchmarks for assessing students' creative abilities. Some studies have also shown that PjBL effectively improves students' problem-solving skills and creativity by allowing them to develop projects relevant to learning (Chang et al., 2022; Ningsih et al., 2020). However, despite its potential, implementing PjBL combined with Lesson Study in Social Studies subjects remains underexplored, particularly in addressing the transition challenges faced by students moving from elementary to junior high school.

Although there are many studies on Lesson Study and PjBL, their implementation still has some weaknesses. One of them is the lack of active involvement of teachers in developing innovative learning strategies (Farida & Surjono, 2019; Nugraha et al., 2020). Teachers still often design lessons individually, making it difficult to identify strengths and weaknesses in the methods used (Kundariati et al., 2023; Richit et al., 2024; Rini, 2021). In addition, although PjBL has been proven to increase students' creativity, its implementation in social studies learning at the junior high school level is still not optimal, especially in the context of students who are just adapting to a new learning system after the transition from elementary to junior high school.

This research offers novelty by systematically integrating Lesson Study and PjBL in seventh-grade students' social studies learning. Using the collaborative approach of Lesson Study, teachers can work together to design and evaluate project-based learning models that better suit students' needs. This research will also explore how Lesson Study can support the implementation of PjBL in improving students' creative thinking skills, particularly in fluency, flexibility, originality, and elaboration of thinking.

The main objective of this research is to develop and test the effectiveness of Lesson Study implementation through the PjBL model in improving students' creative thinking skills in social studies. In addition, this study also aims to analyze the extent to which teacher involvement in Lesson Study can influence the success of PjBL implementation in learning. Thus, this research is expected to

contribute to developing more innovative and effective learning models in improving the quality of education at the junior high school level.

2. METHODS

The research method used in this study is the Quasi-Experimental method (Sugiyono, 2019). Quasi-Experimental Research is a research method that includes a control group but cannot fully control external variables that may influence the experiment's implementation. The research design used in this study is the pretest-posttest non-equivalent Control Group Design (Arib et al., 2024), with variable X1 being the Project-Based Learning (PjBL) model based on Lesson Study, and variable Y being students' creative thinking skills (Dewi et al., 2023).

Data Collection

The subjects of this study were seventh-grade students at SMP Negeri 2 Cimahi, with class VII B as the control group and class VII E as the experimental group. The sampling technique used was purposive sampling (Kusumah, 2024). Data collection techniques included written tests in the form of Complex Multiple Choice (PGK) questions, consisting of 30 questions—15 for the pre-test and 15 for the post-test. Data collection during the learning process is done by audiovisual recording by trained multimedia operators. Multimedia operators were previously trained to capture activities during the learning process. The recording techniques carried out include:

a. The documentation process records all activities from the model teacher and the observers' involvement in implementing the lesson study. Recording of the classroom used and the recording of learning media agreed upon between model teachers and observers will be used to collect research evidence.

b. Observation Process in student group discussions by filling out observation assessment sheets based on collaborative learning indicators such as visual, psychomotor, oral, mental, and emotional activities. The model teacher's observation is about implementing the stages of the learning process based on lesson study. Observation assessment sheets were distributed to observers to observe the collaborative activities of student group discussions. The assessment sheet is in the form of a fill-in with the indicators that have been determined.

The procedure for implementing lesson studies is carried out in a series of cycle activities. Each cycle consists of 3 stages, namely the first stage of Plan (planning), the second stage of Do (implementing), and the third stage, namely the See stage (reflecting).

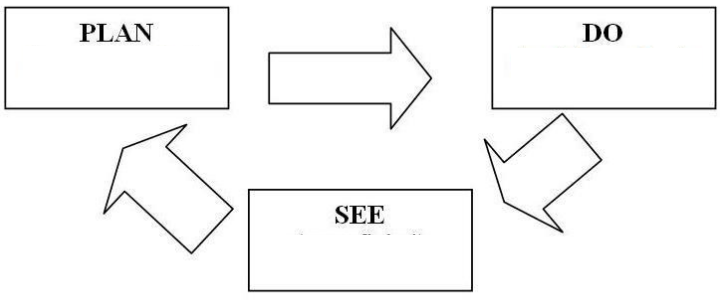

Figure 1. Flow of Lesson Study Activities at school

The learning model to be used is Project-Based Learning (PJBL). In learning, teaching materials in the form of package books, interactive learning media used, namely videos and PPT, the instruments to

be developed are assessments in the form of PGK questions that measure students' creative thinking skills.

Data Analysis

This study's data analysis techniques included quantitative and qualitative analyses to evaluate students' creative thinking skill development comprehensively. Quantitative analysis was conducted through statistical calculations of pre-test and post-test results, allowing researchers to measure the extent of students' improvement (Suwendra, 2018). This involved calculating mean scores, standard deviations, and normalized gain (N-gain) scores to determine the effectiveness of the Lesson Study-based Project-Based Learning (PjBL) model compared to the traditional lecture method. Additionally, statistical tests such as t-tests or ANOVA were used to assess the significance of the differences between the experimental and control groups.

Qualitative analysis was done through direct observations during the lesson study, focusing on students' engagement, interactions, and participation in collaborative learning activities. These observations were documented using observer assessment sheets, which captured student discussions, problem-solving approaches, teamwork, and overall involvement in project-based learning tasks. The qualitative data were further examined through thematic analysis, identifying patterns and key insights related to students' learning behaviors and creative thinking processes.

By integrating quantitative and qualitative approaches, this study provided a more holistic understanding of how Lesson Study-based PjBL influences students' creative thinking. Combining numerical data and observational insights ensured that learning outcomes and learning processes were thoroughly evaluated, offering valuable implications for future teaching strategies and curriculum development.

3. FINDINGS AND DISCUSSIONS

Findings

Pretest Data

The initial test in this study was given to two research classes, the experimental and the control classes, before being given treatment. The questions given for the pretest were five questions for one meeting, while the researcher conducted three meetings with students, so the total number was 15 pretest questions. The pretest analysis of the control and experimental classes is based on the data processing.

Table 2. Initial Test Results (Pretest)

It	Research Data	Eksperimen	Control
1	N	27	28
2	Max	80	67
3	Min	47	33
4	Range	33	33
5	Average	65	53
6	SD	9,3957	9,1442

The results in Table 2 indicate a noticeable difference in the initial creative thinking abilities between the experimental and control classes. The experimental class, which implemented the Lesson Study-based Project-Based Learning (PjBL) model, had a higher average pretest score (65) compared to the control class, which used the lecture (ceramah) method and had an average pretest score of 53. This

suggests that even before the intervention, students in the experimental class demonstrated better initial creative thinking abilities.

Additionally, the range of scores in both classes was the same (33 points), indicating a similar level of score distribution. However, the highest score in the experimental class (80) was notably higher than in the control class (67). The lowest score in the experimental class (47) was also higher than in the control class (33). This difference implies that students in the experimental class already had a better baseline understanding or capability before applying the treatment.

The standard deviation (SD) values, which measure the dispersion of scores, were 9.3957 for the experimental class and 9.1442 for the control class, showing that the variation in student performance was relatively similar between both groups. Despite this similarity in score dispersion, the significant difference in mean scores suggests that students in the experimental group might have had better initial preparation or prior exposure to problem-solving-based learning than those in the control group.

The pretest results indicate that the experimental class started with a stronger foundation in creative thinking, which could influence how effectively they respond to the PjBL model intervention in the subsequent learning process. The next analysis stage will determine whether this initial advantage significantly improves after the intervention.

The results of comparing the experimental class's pretest using the Lesson study-based Project-Based Learning *(*PjBL*)* model with the control class using the lecture method can be seen in the following diagram.

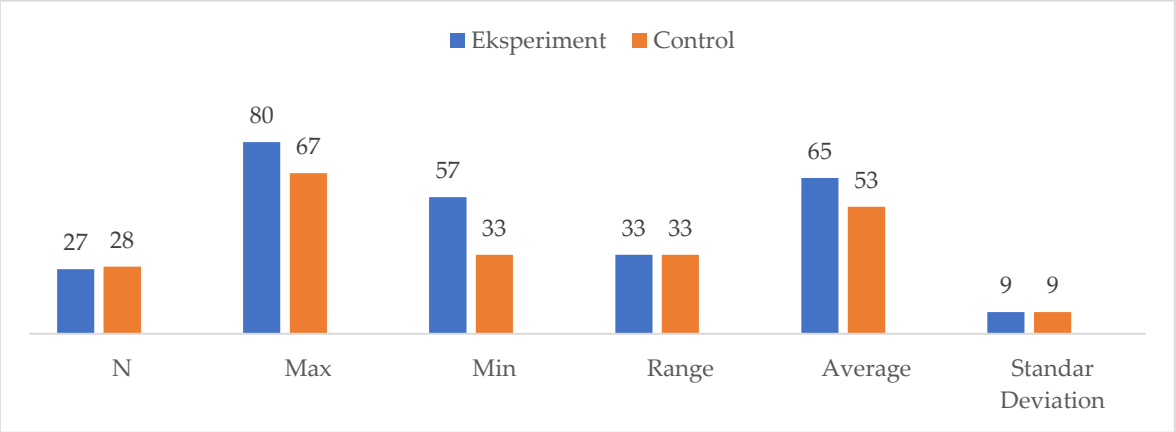

Diagram 1. Experiment Control

Final Test Data (Post-test)

The following data were obtained based on the processing of final test results data (Post-test) between the experimental class using the Project-Based Learning (PJBL) model based on Lesson Study and the control class using the lecture method.

Table 3. Final Test Results (Post-test)

No	Research Data	Eksperiment	Control
1	N	27	28
2	Max	100	87
3	Min	60	47
4	Range	40	40
5	Average	84	72
6	SD	10,2640	9,2584

The results in Table 3 demonstrate a significant improvement in the Post-test scores for the experimental and control classes, with a higher average score observed in the experimental class. The experimental class, which implemented the Lesson Study-based Project-Based Learning (PjBL) model, achieved an average Post-test score of 84, compared to 72 in the control class, which used the lecture (ceramah) method. This 12-point difference suggests that the PjBL model had a greater impact on students' creative thinking abilities than the traditional lecture method.

Additionally, the highest score in the experimental class (100) was notably higher than in the control class (87). The lowest score in the experimental class (60) was also higher than in the control class (47). This indicates that students in the experimental class performed better on average and had a higher upper limit of achievement. The range of scores (40 points) remained the same in both groups, suggesting a similar distribution of student performance across different ability levels.

The standard deviation (SD) values show that score variation increased slightly in the experimental class (SD = 10.2640) compared to the control class (SD = 9.2584). This suggests that while the PjBL model effectively improved creative thinking skills, it also led to greater variability in student performance. Some students may have benefited significantly from the approach, reaching perfect scores (100), while others still showed varying levels of improvement.

Overall, the Post-test results indicate that Lesson Study-based PjBL is more effective than the traditional lecture in enhancing students' creative thinking abilities. The higher average and maximum scores in the experimental class suggest that active, collaborative, and project-oriented learning helped students develop better problem-solving and innovative thinking skills. The findings reinforce that engaging, student-centered approaches are beneficial for fostering creativity, especially in subjects traditionally perceived as rote-based.

The results of the Post-test comparison of the experimental class using the Project-Based Learning (PJBL) model based on Lesson Study with the control class using the lecture method can be seen in the following diagram.

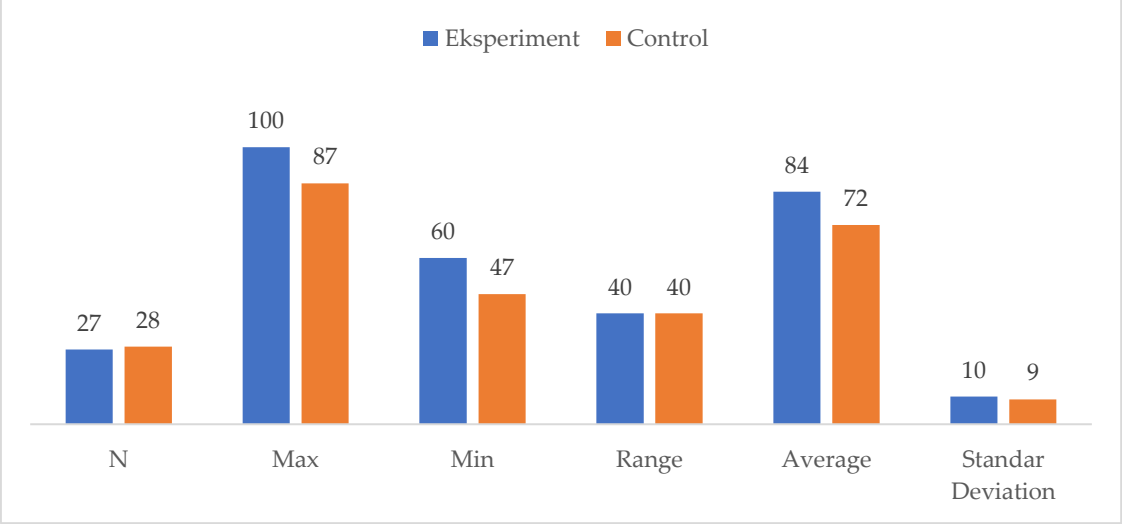

Diagram 2. Eksperimen Control

Description of Critical Thinking Skill Improvement

To determine the improvement of students' creative thinking skills between the experimental class that received the *Lesson Study-based* Project-Based Learning *(PjBL) learning model* and the control class that received the lecture learning method. The gain or improvement data between the experimental and control classes of the researcher are presented in the following description.

Table 4. Increasing the Value of Critical Thinking Skills

Class	Number of students	Overnight Gain	Criterion
Eksperimen	27	0,57	Keep
Control	28	0,40	Keep

Table 4 illustrates the improvement in students' critical thinking skills based on the normalized gain (N-gain) score. The experimental class, which applied the Lesson Study-based Project-Based Learning (PjBL) model, achieved an N-gain of 0.57, whereas the control class, which used the lecture method, obtained a lower N-gain of 0.40. Both values fall within the medium improvement category, but the experimental class demonstrated a higher rate of progress in developing critical thinking skills than the control class.

The 17-point difference in gain scores suggests that the PjBL model was more effective in enhancing students' ability to think critically. This aligns with the idea that active learning approaches, such as project-based learning and collaborative reflection through Lesson Study, allow students to engage more deeply with the material, leading to better problem-solving and analytical skills. In contrast, while still contributing to improvement, the lecture method resulted in a lower overall gain, possibly due to its more passive learning approach.

Additionally, while both groups experienced progress, the experimental class's higher gain score reinforces the effectiveness of interactive and student-centered learning methods. The findings highlight the importance of engaging instructional strategies that encourage students to explore, analyze, and apply their knowledge rather than passively receiving information. This further supports the argument that Lesson Study-based PjBL can be a valuable pedagogical approach for fostering higher-order thinking skills, particularly in subjects that require creativity and critical analysis.

Implementing Lesson Studies

The implementation of the lesson study carried out at SMP Negeri 2 Cimahi began with a discussion with partner teachers to analyze the problems that occurred in learning, the analysis of learning problems was carried out on August 12, 2024 at 10.00, then the focus of the problem to be solved after an in-depth identification between the model teacher and other fellow teachers who acted as observers. The focus of the problem to be solved is to improve students' creative thinking skills.

a. Plan

The planning process for open classes 1, 2, and 3 activities begins with a discussion with partner teachers by designing a monthly activity schedule, conducting an initial study to analyze school learning problems. Partner teachers presented an analysis of learning problems in schools. They identified several school problems, including low learning motivation, students being shy to express their opinions, fear of mistakes, low creative thinking skills, low problem-solving skills, and many others.

The Model Teacher for cycles 1, 2, and 3 open class is Rismawati. The learning material is determined according to the ongoing material. The next learning material for the open class cycle 1 is the definition and types of needs, the material for the open class cycle 2 is the factors and problems that affect needs, and the open class material for cycle 3 is the types of tools to satisfy needs. Teaching modules are arranged, including learning objectives, learning materials, learning models, and assessment instruments.

The learning steps include opening, core, and closing activities. Learning model applies the Model Project-Based Learning (PjBL) by the syntax, starting from basic questions, designing product planning, following the manufacturing schedule, monitoring the activity and development of the project, testing the results, and evaluating the learning experience. Teaching materials are prepared to support the

learning process. Learning media, prepared through creating presentations using the Microsoft PowerPoint/Canva application. Learning instruments such as Student Worksheets (LKPD), post-test questions, and assessment worksheets are designed to cover the cognitive, affective, and psychomotor domains.

In the planning, it is also prepared for the documentation process for open class activities, cycles 1, 2, and 3. The equipment for photos of the implementation of the open class cycles 1, 2, and 3 uses a hand-held camera.

Figure 2. Plan Activities at SMP Negeri 2 Cimahi

The planning process for open class cycles 1, 2, and 3 demonstrates a structured and collaborative approach in addressing school learning challenges. Identifying key learning problems, such as low motivation, reluctance to express opinions, fear of mistakes, and limited creative thinking skills, provides a strong foundation for designing targeted interventions. The involvement of partner teachers in problem identification ensures that the learning strategies implemented are contextually relevant and responsive to students' needs.

The selection of Project-Based Learning (PJBL) as the instructional model aligns with efforts to enhance students' critical thinking, problem-solving, and engagement. By incorporating structured learning steps, including inquiry-based exploration, product design, and evaluation, PjBL encourages active participation and fosters independent learning. Additionally, integrating multimedia resources such as PowerPoint and Canva, Student Worksheets (LKPD), and assessment instruments ensures comprehensively addressing of the cognitive, affective, and psychomotor domains.

b. Do (Implementation)

The implementation of open classes cycles 1 to 3, with the model teacher, Rismawati, learning Project-Based Learning (PjBL). This model is applied by the planning (Plan) when compiling a lesson design, where this model has been adjusted to the material to be delivered. Model teachers carry out the learning process by following the learning steps, starting with an introduction in the form of prayer activities, making attendance, conveying learning objectives in the form of triggering questions, providing motivation, and providing pretests to measure the extent of students' understanding of the material to be studied. Followed by the core activity, where the teacher presents the material, displays a case related to the material, and students in groups discuss to identify the video that has been aired, and then find solutions related to the video. Students collect information from various sources and present it in front of the class. The learning activity ends with a closing activity, where the teacher and students conclude. The students do a post-test, the teacher conveys the material discussed at the next meeting, and closes with a prayer.

Figure 3. Open Class Activities at SMP Negeri 2 Cimahi

Implementing open class cycles 1 to 3 using the Project-Based Learning (PjBL) model demonstrates a structured and student-centered approach to learning. The adherence to the planned lesson design ensures that the learning objectives, materials, and activities are well-aligned with the intended instructional outcomes. The initial activities, including prayer, attendance, and pretests, serve as a foundation to prepare students for the learning process by establishing a focused and structured classroom environment. Using triggering questions and motivational activities effectively stimulates students' curiosity and engagement.

The core learning process, which involves case-based discussions, group work, and presentations, encourages active student participation, collaboration, and critical thinking. By analyzing case studies from videos and gathering information from various sources, students are encouraged to develop problem-solving skills and independent learning habits. This aligns with the objectives of PjBL, which emphasizes learning through real-world contexts and student-driven inquiry. However, potential challenges may arise in ensuring that all students actively participate and effectively engage in group discussions. Teacher facilitation and structured guidance are crucial to maintaining balanced participation and ensuring all students benefit from the learning process.

The closing activities, including post-tests and reflective conclusions, provide a structured method for assessing student understanding and reinforcing key concepts. This step is essential in measuring the effectiveness of the learning experience and identifying areas for improvement. Further research or implementation improvements could explore more interactive assessment techniques and personalized feedback mechanisms to enhance student learning outcomes.

c. See (Discussion and reflection)

Activities See It was held after implementing the Open Class cycles 1, 2, and 3. Model teachers convey reflections on the implementation of learning. Then the observer conveyed the results of the observation of the student group discussion process in the form of findings that can be used to improve the learning process further. Model teachers and observers concluded that in the learning process, several problems were found, including:

1) Students tend to be shy in expressing their opinions in group discussions
2) Some educators still lack focus in the discussion process due to a lack of understanding of the material
3) Students have difficulty establishing communication with other students
4) Students are not brave in presenting the results of their discussions, because students think that the results of the discussion are not optimal

By applying the learning model Project-Based Learning (PjBL) from open classes 1, 2, and 3, students' creative thinking process was changed in their efforts to solve problems in related materials. Students have begun to show courage in expressing their opinions in group discussions and playing an active role in their respective groups. In making presentations in learning, students have shown their confidence well. Students have begun to focus on discussing and solving problems.

Figure 4. See activities at SMP Negeri 2 Cimahi

The See It activity conducted after the Open Class cycles 1, 2, and 3 serves as a critical reflection and evaluation phase, allowing both model teachers and observers to assess the effectiveness of the Project-Based Learning (PjBL) model. The identified challenges, such as students' hesitation to express opinions, lack of confidence in presenting, and communication difficulties, highlight common obstacles in student-centered learning environments. These issues suggest that while PjBL encourages active participation and critical thinking, additional support mechanisms are needed to address students' social and cognitive barriers in learning.

Despite these challenges, notable improvements were observed in students' creative thinking and problem-solving abilities. The gradual increase in student engagement, confidence, and focus indicates consistent exposure to PjBL encourages independent thinking and collaborative learning. However, to further enhance learning outcomes, structured interventions such as peer mentoring, guided discussions, and confidence-building activities could be integrated into future implementations. Additionally, providing explicit scaffolding strategies for educators, such as training in discussion facilitation and material mastery, can help improve the overall effectiveness of PjBL in fostering a dynamic and interactive learning environment.

Discussion

The findings of this study indicate that implementing the Lesson Study-based Project-Based Learning (PjBL) model positively influences students' critical and creative thinking skills. Based on the results presented in Tables 2, 3, and 4, there is a clear improvement in students' performance from the pretest to the Post-test, with the experimental class outperforming the control class in both assessments. The pretest results show that the experimental class had an average score of 65, whereas the control class had an average of 53. After the intervention, the Post-test results demonstrated a significant increase, with the experimental class achieving an average score of 84 and the control class attaining 72. Additionally, the gain score for the experimental class was 0.57, which is categorized as medium, while the control class had a gain score of 0.40, also in the medium category.

The results align with critical thinking theories, which suggest that active learning strategies such as PjBL can enhance students' problem-solving abilities, analytical reasoning, and self-confidence

(Loyens et al., 2023; Suradika et al., 2023). The Lesson Study-based PjBL model emphasizes collaboration, discussion, and problem-solving, fostering higher-order thinking skills as defined by Bloom's Taxonomy (Liline et al., 2024; Martawijaya et al., 2023; Zaidi et al., 2018). By engaging in group discussions, identifying problems, gathering relevant information, and presenting their findings, students naturally develop their ability to analyze, evaluate, and create—core components of critical thinking (Alsaleh, 2020; Buckley et al., 2015; Fuad et al., 2017).

The observation results from the open class implementation further support this theory. Before the intervention, students were hesitant to express their opinions, had difficulties in group discussions, and lacked confidence in presenting their work. However, after participating in multiple PjBL cycles, students showed improved confidence, active participation, and a stronger ability to articulate their thoughts, all essential components of critical thinking development.

The findings of this study are consistent with previous research on Project-Based Learning and Lesson Study methodologies. Studies conducted by Goshu & Ridwan (2024), Paleenud et al. (2024), and Vaithianathan et al. (2024) Compared to traditional lecture-based instruction, PjBL enhances students' engagement, critical thinking, and problem-solving skills. Similarly, Dudley et al. (2019) and ElSayary (2024) reported that the Lesson Study approach improves teacher collaboration and students' learning outcomes, aligning with this study's results that showed increased students' performance and critical thinking abilities.

However, some studies argue that PjBL alone may not be sufficient to develop all aspects of critical thinking. Research by Wati & Wutsqa (2024) and Wu (2024) Suggests that minimally guided learning methods like PjBL may not be effective for all students, particularly those who lack prior knowledge or self-regulation skills. This aligns with some of the challenges observed in this study, such as students' initial reluctance to participate, difficulties in group communication, and lack of confidence in presenting their work. These challenges suggest that additional scaffolding or structured guidance may be necessary to optimize the effectiveness of PjBL in fostering critical thinking.

The findings of this study have several important implications for educational practice, particularly in fostering students' critical thinking skills through the implementation of the Lesson Study-based Project-Based Learning (PjBL) model. The significant improvement in students' post-test scores and the observed behavioral changes in classroom discussions suggest that active and student-centered learning approaches can effectively enhance critical thinking abilities. Educators should consider integrating collaborative and problem-solving activities into their teaching strategies to create more engaging and meaningful learning experiences.

Additionally, the results highlight the need for professional development programs that equip teachers with the necessary skills to facilitate project-based learning effectively. The observed challenges, such as students' reluctance to express their opinions and difficulties in communication, indicate that further scaffolding and guidance are needed to ensure all students benefit from this approach. Schools should also provide adequate resources, including structured lesson plans, relevant teaching materials, and supportive learning environments, to maximize the effectiveness of the PjBL model. From a theoretical perspective, this study reinforces the importance of constructivist learning theories, emphasizing the role of active engagement and social interaction in knowledge construction. Future research could explore the long-term impact of this approach on students' critical thinking skills and examine how different contextual factors, such as classroom culture and teacher expertise, influence its effectiveness.

4. CONCLUSION

Implementing the Lesson Study-based Project-Based Learning (PjBL) model has been proven effective in enhancing students' creative and critical thinking skills. The results of this study indicate a

significant improvement in students' test scores and observable behavioral changes, particularly in aspects of fluency, flexibility, originality, and elaboration in problem-solving. These findings support the theoretical foundation that active learning strategies, such as PjBL, foster student engagement, collaboration, and independent problem-solving, thereby contributing to higher-order thinking skills. Despite these positive outcomes, several challenges were identified, particularly in student participation and confidence during discussions and presentations. Some students hesitated to express their opinions and collaborate effectively with their peers. This suggests that while PjBL is beneficial, additional scaffolding may be necessary to optimize student learning experiences.

The implications of this study highlight the need for structured guidance and support mechanisms in implementing PjBL effectively. Future research should explore strategies to enhance student engagement, such as integrating peer mentoring, differentiated instruction, and blended learning approaches. Additionally, longitudinal studies are recommended to examine the long-term impact of PjBL on students' academic performance and problem-solving abilities beyond the immediate learning context. Investigating its effectiveness across subjects and educational levels could validate its applicability as an innovative learning model.

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