

STRENGTHENING SELF-CONFIDENCE STRATEGIES IN PROBLEM-SOLVING AND LEARNING OUTCOMES IN ELEMENTARY SCHOOLS

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ABSTRACT

This study examines the effectiveness of Project-Based Learning (PjBL) and Problem-Based Learning (PBL) in enhancing self-confidence, problem-solving skills, and learning outcomes among elementary school students in Arjawinangun District. Preliminary observations revealed low academic confidence, limited participation, and difficulties in higher-order thinking, indicating the need for constructivist learning strategies that promote active engagement. Using a quasi-experimental design, the study involved 200 fifth-grade students from five elementary schools, divided into two treatment groups. Research instruments included a self-confidence questionnaire, problem-solving test, learning achievement test, and observation sheets assessing the implementation fidelity of both models. Findings indicate that PjBL produced the highest improvements across all variables, as reflected in greater gain scores and statistically significant results. The project-oriented nature of PjBL provides authentic learning experiences, supports collaborative work, and encourages reflective thinking, all of which contribute to stronger confidence and deeper conceptual understanding. Although PBL also improved students' analytical abilities, the complexity of open-ended problems created higher cognitive demands for some learners, resulting in smaller gains than those achieved through PjBL. Overall, the study highlights the importance of integrating active, contextual, and student-centered learning approaches to strengthen 21st-century competencies in elementary education.

Keywords: Project-Based Learning, Problem-Based Learning, Self-Confidence, Problem-Solving Skills, Learning Outcomes

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INTRODUCTION

The phenomenon of low self-confidence among elementary school students in Arjawinangun District, Cirebon Regency, has become increasingly concerning in relation to the demands of 21st-century learning. Preliminary observations conducted in several public and private elementary schools in the area revealed that many students hesitate to express their opinions, fear making mistakes when answering questions, and tend to rely heavily on teacher guidance when faced with tasks requiring higher-order thinking skills. This condition aligns with the findings of Humaeroh et al. (2024), who emphasized that low self-confidence is one of the major barriers to active student participation, particularly when students are required to make academic decisions. In Arjawinangun, this issue is reflected in several indicators, including passive involvement during discussions, limited independence in solving problems, and difficulty maintaining focus when engaging in explorative or investigative tasks. Such challenges pose significant concerns within the framework of 21st-century competencies that prioritize critical thinking, problem-solving, and communication.

Self-confidence serves as a crucial psychological variable influencing students' academic success. Irman and Amir (2022) highlighted that self-confidence has a significant relationship with learning outcomes, particularly in subjects requiring conceptual understanding and accurate reasoning, such as mathematics. Students with strong confidence are more willing to attempt problem-solving strategies, persist when encountering obstacles, and evaluate their abilities more realistically. Conversely, students with low confidence tend to struggle with conceptual errors and difficulties completing tasks that require reasoning. These findings reinforce the need for pedagogical interventions that simultaneously strengthen self-confidence and critical thinking skills. Masyitoh and Safmi (2024) also emphasized the vital role of teachers in creating active learning environments that foster confidence through participation, exploration, and direct experience.

In addition to self-confidence, problem-solving skills are fundamental competencies in 21st-century learning. Problem solving involves not only answering questions but also identifying, analyzing, and executing strategic steps to find solutions. In the context of Arjawinangun elementary students, various obstacles remain evident due to conventional teaching approaches and limited opportunities for meaningful learning experiences. Hasibuan et al. (2024) and Putri and Sya (2025) found that difficulties in basic mathematical operations are often linked to limited conceptual understanding and minimal exposure to active learning strategies. This situation mirrors classroom conditions in Arjawinangun, where teacher-centered instruction and repetitive exercises dominate, providing little room for students to develop effective problem-solving skills.

Two pedagogical strategies considered most promising for enhancing self-confidence and problem-solving abilities are Project-Based Learning (PjBL) and Problem-Based Learning (PBL). PjBL emphasizes project creation as a medium for students to construct knowledge, manage information, and collaborate. This approach encourages decision-making, idea expression, and independent exploration, ultimately fostering motivation, autonomy, and self-confidence, as supported by Purwani et al. (2020). PBL, on the other hand, centers on authentic problems that stimulate critical inquiry, questioning, and reasoning. Khasanah et al. (2021) demonstrated that thematic learning through PBL can improve academic outcomes and self-confidence, as it places students at the center of the learning process.

Despite the strong evidence supporting both approaches, research gaps remain, particularly regarding the integration of PjBL and PBL in addressing self-confidence, problem-solving, and learning outcomes simultaneously in elementary schools in Arjawinangun. Previous studies often examined these variables separately, lacking a comprehensive framework that evaluates their interconnected effects. Therefore, this research aims to analyze the comparative effectiveness of PjBL and PBL in improving the three variables and to identify supporting and

inhibiting factors in their implementation. This study also offers recommendations for adaptive learning models suitable for the needs of students in the region.

RESEARCH METHODOLOGY

This study employed a quasi-experimental design to examine the effectiveness of Project-Based Learning (PjBL) and Problem-Based Learning (PBL) in enhancing self-confidence, problem-solving skills, and learning outcomes among elementary school students. A quasi-experimental approach was selected because classroom conditions did not allow for random assignment of participants; thus, the experimental and control groups were determined based on pre-existing classes, as recommended by Arikunto (2019) and Creswell (2018). The research was conducted in five elementary schools located in Arjawinangun District, namely SDN 6 Arjawinangun, SDN 5 Arjawinangun, SDN 5 Jungjang, SDN 1 Tegalbugub, and SDN 1 Geyongan. The study population consisted of all fifth-grade students from these schools, totaling 200 participants. A cluster random sampling technique was employed, given that the sampling units were classes rather than individuals, consistent with Sugiyono's (2021) guidelines.

The research instruments included: (1) a self-confidence questionnaire developed based on psychological indicators; (2) a contextual problem-solving test; (3) a learning achievement test assessing mastery of instructional content; and (4) observation sheets to evaluate the implementation fidelity of the PjBL and PBL models. Instrument validity was established through expert judgment, while reliability was assessed using Cronbach's Alpha.

Data collection procedures consisted of a pretest, the implementation of PjBL and PBL treatments over eight instructional sessions, and a posttest, following the normalized gain measurement approach proposed by Hake (1998). Data analysis techniques included t-tests to identify pre-post differences, ANOVA to compare effectiveness across groups, and linear regression to examine the contribution of self-confidence and problem-solving skills to learning outcomes. All analyses were conducted based on inferential statistical principles outlined by Sugiyono (2017).

RESULTS & DISCUSSION

Research Findings

This study involved 200 fifth-grade students from five elementary schools in Arjawinangun District. Each school contributed 40 students, resulting in a total sample of 98 male and 102 female students. Two instructional models Project-Based Learning (PjBL) and Problem-Based Learning (PBL) were implemented, each applied to 100 students. The evaluation consisted of pretests and posttests measuring three key variables: self-confidence, problem-solving ability, and learning outcomes.

Table 1 Respondent Characteristics

School	Male	Female	Total
SDN 6 Arjawinangun	18	22	40
SDN 5 Arjawinangun	20	20	40
SDN 5 Jungjang	17	23	40
SDN 1 Tegalbugub	22	18	40
SDN 1 Geyongan	21	19	40
Total	98	102	200

Table 1, The distribution of students across schools and gender categories was relatively balanced, ensuring that demographic factors did not threaten the validity of the findings. Equal representation from each school also strengthened the statistical power of the sample.

Table 2 Self-Confidence Scores

Model	n	Pretest		Posttest		Gain
		Mean	Standard Deviation	Mean	Standard Deviation	
PJBL	100	62.4	8.1	79.8	7.5	17.4
PBL	100	63.1	7.9	75.2	8.3	12.1

Table 2, Results showed a clear increase in self-confidence after both treatments:

a) In the PjBL group, the mean score rose from 62.4 to 79.8 (gain = 17.4).

b) In the PBL group, scores increased from 63.1 to 75.2 (gain = 12.1).

This indicates that PjBL provided broader opportunities for students to take initiative and demonstrate academic confidence.

Table 3 Problem-Solving Ability

Model	Pretest		Posttest		Gain
	Mean	Standard Deviation	Mean	Standard Deviation	
PJBL	58.2	9.0	81.4	7.2	23.2
PBL	59.8	8.7	77.1	7.4	17.3

In Table 3, problem-solving skills increased significantly in both groups. PjBL produced the highest gain (23.2), indicating that investigative project activities enhanced students' analytical abilities and promoted deeper conceptual application compared to PBL.

Table 4 Learning Outcomes

Model	Pretest		Posttest		Gain
	Mean	Standard Deviation	Mean	Standard Deviation	
PJBL	60.5	7.4	84.6	6.8	24.1
PBL	61.2	7.0	79.3	7.1	18.1

In Table 4, learning outcomes in the PjBL group showed the greatest improvement (gain = 24.1) compared to the PBL group (gain = 18.1). This finding reflects that concrete, project-based activities are more effective in strengthening material retention and deepening conceptual understanding.

Tabel 5 Hasil Uji Statistik

Variabel	Uji Statistik	Nilai	p-value	Interpretasi
Rasa percaya diri	t(198) = 4.12	4.12	<0.001	Perbedaan signifikan
Pemecahan masalah	t(198) = 5.03	5.03	<0.001	PJBL lebih efektif
Hasil belajar	t(198) = 5.88	5.88	<0.001	Efek signifikan
ANOVA	F = 18.44	18.44	<0.001	Model berpengaruh
Effect size (Cohen's d)	D = 0.62			Efek Medium-Large

Table 5 Statistical Test Results

Variable	Statistical Test	Value	p-value	Interpretation
Self-confidence	t(198) = 4.12	4.12	< 0.001	Significant difference
Problem-solving	t(198) = 5.03	5.03	< 0.001	PjBL more effective
Learning outcomes	t(198) = 5.88	5.88	< 0.001	Significant effect
ANOVA	F = 18.44	18.44	< 0.001	Model effect significant
Effect size (Cohen's d)	d = 0.62			Medium-Large effect

Table 5 shows that all variables achieved a p -value < 0.001 , indicating that the differences between PjBL and PBL are statistically significant. The effect size value of $d = 0.62$ signifies a substantial influence of PjBL, falling within the medium-large category. The findings further demonstrate that Project-Based Learning (PjBL) produced the greatest impact on enhancing self-confidence, problem-solving ability, and learning outcomes among elementary school students in Arjawinangun. The consistent pattern across the pretest and posttest results confirms that PjBL yielded higher gains than PBL in all measured variables.

In terms of self-confidence, PjBL offered learning experiences that required students to take active roles. Through project activities that involved presenting results, collaborating with peers, and making academic decisions, students obtained meaningful experiences that strengthened their sense of competence. Although PBL also contributed positively, some students felt pressured when confronted with open-ended problems that lacked a single clear solution.

Regarding problem-solving skills, PjBL provided a project context that required ongoing investigation, exploration of resources, and the formulation of product-based solutions, which explains the high gain score of 23.2. PBL remained effective, yet its classroom discussion-oriented structure often led to more conceptual rather than practical exploration.

For learning outcomes, PjBL produced the highest improvement. Engaging in concrete project tasks facilitated meaningful learning, strengthened retention, and promoted deep conceptual understanding. The significant posttest increase (84.6) is consistent with constructivist principles. Overall, the statistical results confirm that the observed differences are not due to chance but reflect the real influence of the instructional models, with the medium-large effect size indicating meaningful practical significance.

Discussion

The results of this study indicate that both Project-Based Learning (PjBL) and Problem-Based Learning (PBL) significantly enhance self-confidence, problem-solving skills, and learning outcomes among elementary school students. These findings can be explained through the theoretical frameworks of constructivism, active learning, information-processing theory, and social cognitive development, all of which emphasize the importance of direct student engagement. The increase in self-confidence across both learning models is attributed to the active participation, collaboration, and decision-making required during instruction. In PjBL, students build confidence through project planning, managing group tasks, and presenting final products. These experiences create meaningful academic success, which gradually strengthens self-belief. This aligns with Fajrin and Christiana (2020), who highlight that self-confidence develops when students have opportunities for expression and receive positive social validation within a supportive environment. Although PBL also contributes to self-confidence by exposing learners to contextual problems requiring critical analysis, its more abstract structure may impose greater cognitive pressure on students with lower initial readiness, resulting in smaller gains than PjBL.

Enhancement of problem-solving skills in both models is supported by the principle that each requires higher-order thinking. PjBL allows students to understand problems more holistically through discussion, exploration of ideas, and creation of concrete products. This process stimulates metacognitive activity, strengthening students' abilities to plan, monitor, and evaluate problem-solving strategies. PBL, meanwhile, reinforces problem-solving by presenting authentic, open-ended problems that require individual construction of meaning. These findings are consistent with Lolang et al. (2023), who found that problem-solving-oriented instruction significantly improves both analytical thinking and self-confidence. Students who consistently engage with complex problems develop greater independence and intellectual courage.

In terms of learning outcomes, both models produced significant improvements, with PjBL demonstrating the strongest effect. PjBL provides authentic learning experiences that integrate new knowledge with hands-on activities, reinforcing long-term retention and deep conceptual understanding. This aligns with constructivist theory, which posits that meaningful learning occurs when students actively construct knowledge through real experiences. PBL also enhances learning outcomes through critical and analytical reasoning; however, the depth of engagement enabled by concrete project work makes PjBL more effective for elementary students. This finding supports Zuliyawati and Agustin (2024), who emphasize that contextual and experiential learning strengthens conceptual mastery and promotes differentiated learning. Regarding the relationships among variables, the study shows that self-confidence is strongly linked with problem-solving ability. Confident students are more willing to explore multiple strategies, take intellectual risks, and persist through challenges. This relationship is supported by Astalini et al. (2020), who demonstrated that attitudes and self-belief are essential contributors to academic success, particularly in science learning. Problem-solving ability also correlates positively with learning outcomes, as students with strong problem-solving skills tend to possess deeper conceptual understanding and can apply knowledge more effectively. Both PjBL and PBL foster higher-order thinking processes that strengthen conceptual mastery and performance. Additionally, self-confidence demonstrates a positive association with learning outcomes, as confident students participate more actively, exhibit higher persistence, and are more resilient when faced with academic challenges. This aligns with Sundari et al. (2022), who found that learning independence—shaped by confidence—directly contributes to academic achievement.

When compared with previous studies, the findings reveal strong consistency. Character building and confidence enhancement as part of holistic educational strategies are emphasized by Rahman et al. (2024), who argue that active and contextual learning supports positive character development. Similarly, Nurul Khofifah and Supriyadi (2023) highlight the importance of psychological support, including confidence and motivation, within language learning contexts. The superior improvement in problem-solving ability under PjBL can also be explained through its collaborative and creative nature, which provides learners with more sustained exploratory opportunities. This aligns with Zuliyawati and Agustin (2024), who note that learning environments that encourage creativity and exploration foster more independent and critical learners.

The implications of these findings are substantial for teachers and elementary schools. First, teachers should consider integrating PjBL and PBL into regular instruction to strengthen 21st-century competencies. Second, schools should provide productive learning environments, such as collaborative spaces, learning materials, and opportunities for project exhibitions. Third, teachers need ongoing professional development to effectively implement these models, ensuring that authentic problems, investigative activities, and reflective feedback are well integrated. Additionally, character education should be embedded within instruction to strengthen psychological attributes like self-confidence, which support long-term academic development.

Overall, the interrelationship among self-confidence, problem-solving ability, and learning outcomes suggests that these variables reinforce one another. Enhancing self-confidence increases students' willingness to engage in problem-solving, while improved problem-solving ability strengthens conceptual understanding and promotes higher learning performance. PjBL and PBL, grounded in active and inquiry-based learning, effectively build this positive synergy, demonstrating that both models promote not only academic success but also essential psychological attributes needed for elementary-level learners.

CONCLUSION

The implementation of Project-Based Learning (PjBL) and Problem-Based Learning (PBL) significantly contributes to strengthening self-confidence, improving problem-solving skills, and enhancing learning outcomes among elementary school students in Arjawinangun District. Both models create active learning environments that foster intellectual and emotional engagement, although PjBL shows the greatest impact across all variables. Through hands-on project experiences, students develop a stronger sense of competence, become more willing to try new strategies, and construct deeper meaning from learning activities, resulting in improved retention and understanding. While PBL also enhances analytical and reasoning skills, its abstract problem structure creates higher cognitive demands for some students. The findings affirm the strong interrelationship among self-confidence, problem-solving skills, and learning outcomes, demonstrating that strengthening one variable positively influences the others. This study underscores the importance of constructivist learning strategies in achieving 21st-century competencies and encourages teachers to integrate collaborative, investigative, and reflective activities to support the balanced cognitive and psychological development of elementary school students.

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