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Cognitive Ability Improvement through Problem Based Learning: A Gender-Based Analysis of Elementary Students

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Abstract

This study investigated the effect of the Problem-Based Learning (PBL) model on students' cognitive ability from a gender perspective among sixth-grade students at SD Negeri 6 Purwawinangun. A quantitative pre-experimental one-group pretest-posttest design was employed with 16 students (6 male, 10 female). A 10-item validated multiple-choice instrument covering Bloom's Taxonomy levels C1–C4 was used. Data were analysed using descriptive statistics, the Shapiro-Wilk test, and the Mann-Whitney U test. Male students' mean scores increased from 71.67 to 81.67 (+13.95%), while female students' scores rose from 82.00 to 86.00 (+4.88%). The Mann-Whitney U test yielded Sig. = 0.463 > 0.05, indicating no statistically significant gender difference. The rank-biserial correlation (r ≈ 0.18–0.27) confirmed a small-to-negligible effect size. Although no significant gender gap was detected, PBL demonstrated a positive tendency towards improving cognitive ability in Pancasila Education for both groups.

Keywords: Cognitive Abilities, Elementary School, Pancasila Education, Problem Based Learning.

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INTRODUCTION

Education in the 21st century requires students to have the ability to think critically, creatively, collaboratively, and communicatively. Teachers no longer only play the role of informants, but as facilitators who are able to create meaningful learning experiences through problem-solving activities. Along with these developments, education in Indonesia continues to undergo updates, both in terms of curriculum and subjects (Dewi et al., 2025). One significant transformation is the conversion of Civic Education into Pancasila Education within the Merdeka Curriculum, now implemented at the elementary level (Raharjo, 2020).

Pancasila education has a strategic role in shaping the character and personality of students as Indonesian citizens. Through this subject, students are expected to be able to understand, appreciate, and practice the values of Pancasila in daily life, including the value of mutual cooperation as the identity of the nation (Karima et al., 2025).

But this is inversely proportional to the findings that the researcher found in grade VI of SD Negeri 6 Purwawinangun on Monday, February 9, 2026, through direct interviews with grade VI teachers, several problems were found, namely in the learning of Pancasila Education in the classroom so far it has been centered on teachers (*teacher-centered*), because the learning model used is the lecture learning model (conventional). The dominance of lecture methods causes students to be less active, less involved in the learning process, and tend to only memorize concepts without understanding their application in real life. This condition has an impact on students' low cognitive abilities, especially in conceptual and reflective materials such as mutual cooperation (Harahap & Albina, 2025). Cognitive abilities themselves include levels of thinking from low to high levels ranging from remembering, understanding, applying, to analyzing and becoming one of the main indicators of learning success in elementary school (Setiawan, 2020).

One of the learning models that can be used to overcome these problems is the Problem Based Learning (PBL) learning model. This model is a student-centered learning model through the presentation of real problems as a learning context to train critical thinking, problem-solving, communication, and cooperation skills (Badriyah et al., 2024). In its application, the PBL model has five main stages, namely: (1) student orientation to the problem; (2) organizing students to learn; (3) guiding individual and group investigations; (4) develop and present the work; and (5) analyze and evaluate the problem-solving process (Fatonah et al., 2026). This stage allows students to learn actively through discussion and collaboration so that it is relevant to apply to mutual cooperation materials.

Theoretically, the application of PBL is able to create more meaningful learning because students are directly involved in the process of finding concepts and solutions to a problem (Siswanto et al., 2025). Problem-based learning also provides opportunities for students to develop social skills through group work and interaction between students. Thus, this model not only has the potential to improve students' cognitive learning outcomes, but also strengthens the character of mutual cooperation as part of the Pancasila Student Profile.

Several previous studies have shown that the PBL model is effective in improving learning outcomes and student mutual cooperation character. Research Gulom dkk (2024), showing that active learning is able to improve learning outcomes as well as the character of mutual cooperation of elementary school students. Research Hunyaang dkk (2025), also proves that the application of the video-assisted PBL method can significantly increase the attitude of mutual cooperation of grade IV elementary school students. In addition, Puspitarini et al (2024), found that the PBL model was effective in improving the dimension of working together in elementary school learning. Research Pasadona (2025) It also shows that the Problem Based Learning method through discussion activities is able to improve the ability of students to work together. Meanwhile, Larasati (2024) stated that project-based learning assisted by audiovisual media can optimally improve the character of student mutual cooperation.

From an international perspective, gender-based differences in cognitive performance have received considerable scholarly attention. Evidence from cross-national large-scale assessments indicates that while some domain-specific differences exist between male and female students, these are generally small and moderated by contextual factors such as instructional method and classroom environment (Guo et al., 2024). In collaborative learning settings, a meta-analysis by Liu and Pásztor (2022) found no significant gender difference in the effects of PBL on critical thinking outcomes,

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suggesting that PBL's structured, problem-solving approach treats both male and female learners equitably. Furthermore, a comprehensive review of PISA data across 78 countries revealed that gender gaps in academic achievement are inconsistent and often negligible once instructional context is accounted for (Guo et al., 2024), consistent with the equitable learning opportunities that well-designed PBL instruction provides.

Furthermore, the application of the Problem Based Learning model with the *Culturally Responsive Teaching* Proven to improve the critical thinking skills of elementary school students because learning is associated with students' experiences and social environment (Safirah et al., 2024). Other research shows that PBL learning in elementary school students is able to improve Indonesian language learning outcomes through collaborative activities and group problem solving (Novianti et al., 2020). In addition, research related to the application of the PBL method also shows that there is an increase in the learning outcomes of elementary school students optimally because the learning model encourages students to be more active, creative, and independent in the learning process (Rozi, 2025). Thus, the results of these studies further strengthen that the relevant Problem Based Learning model is applied in Pancasila Education learning to improve cognitive abilities while strengthening the character of mutual cooperation of elementary school students (Handayani et al., 2021).

Although various studies have discussed the effectiveness of the PBL model in improving the character of mutual cooperation and learning outcomes, the study specifically examined the application of the PBL model in the Chapter 7 material. Maintaining Unity and Unity with Mutual Cooperation, Topic A. The Importance of Implementing Mutual Cooperation in Grade VI Elementary Schools in the implementation of the Independent Curriculum is still limited. Most previous research has focused more on different levels, subjects, and material characteristics. Therefore, this research has an urgency to be carried out as a form of developing contextual and innovative Pancasila Education learning in elementary schools.

Based on this description, this study aims to determine the influence of *the Problem Based Learning* (PBL) learning model on students' cognitive abilities reviewed from gender. This research is expected to make a theoretical and practical contribution to the development of Pancasila Education learning that is more active, meaningful, and oriented towards strengthening the character of mutual cooperation of elementary school students. Based on theoretical studies, previous research, and research objectives, the research hypothesis is formulated as follows:

1. H_0 (Hypothesis Zero): There was no difference in the cognitive abilities of male and female students after the application of the Problem Based Learning (PBL) model.
2. H_1 (Alternative Hypothesis): There was a difference in the cognitive abilities of male and female students after the application of the Problem Based Learning (PBL) model.

RESEARCH METHODS

A. Research Design

This study uses a quantitative approach with a pre-experimental design (*Pre-experiment*). This design was chosen because the research did not meet the requirements of pure experimentation, considering that there was no control group and there were still external variables that had the potential to affect dependent variables (Sugiyono, 2016). The type used is One-Group Pretest-Posttest Design, where one group of subjects is given a pretest, then receives treatment in the form of learning with the Problem Based Learning (PBL) model, and ends with a posttest. This design allows for comparison of student learning outcomes before and after the intervention, although it cannot be used to claim a causal relationship strongly due to the absence of a comparison group (Stratton, 2019). The design scheme can be seen as follows:

$$\mathbf{O_1 \rightarrow X \rightarrow O_2}$$

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Description:
O_1 = *Pre-test;*
X = Treatment (learning with the PBL model);
O_2 = *Post-test.*

Although this design allows pre-post comparison, it cannot establish strong causal relationships due to limited internal validity controls such as maturation and history effects. Findings are therefore exploratory. A key methodological limitation of single-group pre-experimental designs is the inability to attribute observed gains solely to the intervention; future research should adopt randomised controlled or quasi-experimental designs to strengthen causal inference. (Altman & Krzywinski, 2024)

B. Population and Sample

The population in this study is all grade VI students of SD Negeri 6 Purwawinangun for the 2025/2026 Academic Year which totals 16 students (6 males and 10 females). Sampling is carried out using a saturated sampling technique, where all members of the population are sampled because the number is relatively small (less than 30 people) so that no random sampling procedure is required (Sudarto at al., 2026). The composition of the sample by unbalanced sex (6 vs. 10) should be considered as a limitation in the interpretation of intergroup comparisons.

C. Operational Variables and Definitions

This research involves three main variables that are operationalized as follows:

Table 1. Operational Definition of Research Variables

Variabel	Operational Definition	Indicators/Instruments
Cognitive Abilities	The ability of students to understand, analyze, and apply the concept of unity and mutual cooperation in daily life, is measured through written test scores.	10 multiple-choice questions; covering the domains C1 (remembering), C2 (understanding), C3 (applying), and C4 (analyzing) based on Bloom's Taxonomy.
Model PBL	Problem-based learning treatment was applied for two meetings (2 × 35 minutes) according to PBL syntax.	Problem orientation, group discussions, investigations, presentation of results, and reflection.
Gender	Biological categorization of students as male or female as moderator variables in comparative analysis.	School administrative data.

D. Research Instruments

The research instrument is in the form of a written cognitive test consisting of 10 multiple-choice questions with four answer choices. The question items are arranged based on the indicators of cognitive ability in the material of Chapter 7 "Maintaining Unity and Unity with Mutual Cooperation", sub-topic "The Importance of Implementing Mutual Cooperation" (Pancasila Education subject, Class VI). The instruments include the cognitive domains C1 (remembering), C2 (understanding), C3 (applying), and C4 (analyzing) based on the revised Bloom Taxonomy. . Instrument Blueprint (Test Specification Grid) Shown in Table 2.

Content validity was established through expert review (*validasi isi*) by the academic supervisor and mentor teacher, using an item analysis sheet evaluating alignment with learning indicators, clarity of language, and level of difficulty. Both experts confirmed 100% content validity (10 out of 10 items deemed appropriate for the learning objectives and cognitive level

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targeted). Items rated unsuitable by either expert would have been revised prior to administration. The instrument was used for both the pre-test and post-test with parallel indicator sets to ensure comparability of scores (Nurdiana & Liansari, 2024).

Tabel 2. Instrument Blueprint (Test Specification Grid)

No	Cognitive Level	Content/Topic	Item Indicator	Item Form	Item No.
1	C2 (Understand)	Definition of mutual cooperation	Students can explain the definition of mutual cooperation	MCQ	1
2	C2 (Understand)	Benefits of mutual cooperation	Students can identify the benefits of mutual cooperation in daily life	MCQ	2
3	C2 (Understand)	Mutual cooperation & unity	Students can explain the relationship between mutual cooperation and national unity	MCQ	3
4	C3 (Apply)	Mutual cooperation at school	Students can determine examples of mutual cooperation in the school environment	MCQ	4
5	C3 (Apply)	Mutual cooperation in society	Students can select appropriate mutual cooperation actions in the community	MCQ	5
6	C3 (Apply)	National defence (bela negara)	Students can apply the spirit of national defence through mutual cooperation activities	MCQ	6
7	C4 (Analyse)	Impact of mutual cooperation	Students can analyse the positive impact of mutual cooperation on social life	MCQ	7
8	C4 (Analyse)	Impact of absence of mutual cooperation	Students can analyse the consequences of absence of mutual cooperation	MCQ	8
9	C4 (Analyse)	Pancasila Student Profile	Students can analyse mutual cooperation as a dimension of the Pancasila Student Profile	MCQ	9
10	C4 (Analyse)	Mutual cooperation and conflict prevention	Students can analyse the role of mutual cooperation in preventing social conflict	MCQ	10
Total	**4 items C2 | 3 items C3 | 3 items C4**			**MCQ**	**10**

Content validity was established through expert review (*validasi isi*) by the academic supervisor and mentor teacher, using an item analysis sheet evaluating alignment with learning indicators, clarity of language, and level of difficulty. Both experts confirmed 100% content validity (10 out

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of 10 items deemed appropriate for the learning objectives and cognitive level targeted). Items rated unsuitable by either expert would have been revised prior to administration. The instrument was used for both the pre-test and post-test with parallel indicator sets to ensure comparability of scores (Nurdiana & Liansari, 2024).

Reliability testing was not conducted due to the small sample size, which is acknowledged as a limitation. Content-validated instruments are considered sufficient for measuring cognitive ability within elementary educational research contexts (Rahmi, 2019). Future studies should include reliability indices (e.g., Cronbach's α or KR-20) to strengthen measurement validity.

E. Treatment Procedure

The learning treatment using the Problem Based Learning (PBL) model was carried out for two meetings (2 × 35 minutes each) on Tuesday, March 3, 2026. The implementation of learning follows the PBL syntax contained in the teaching module that has been designed, including: (1) student orientation to problems, (2) student organization for learning, (3) individual and group investigations, (4) development and presentation of works, and (5) analysis and evaluation of problem-solving processes (Handayani et al., 2021). The PBL model was chosen because it has been proven to be able to improve learning outcomes, critical thinking skills, and student activeness through contextual problem-solving (Rukmi, Susetyo et al., 2024).

F. Data Collection Techniques

Data collection is carried out through the provision of written tests in two stages, namely:

1. *A pre-test* is administered before the learning treatment to measure the student's initial cognitive ability.
2. *Post-tests* are given after treatment to measure final cognitive ability. The score used is the number of questions answered correctly, converted to a scale of 0–100. The MOH set is 70.

G. Data Analysis Techniques

Data analysis was carried out using SPSS V.25 Software through the following stages:

Table 3. Data Analysis Stages Flow

Stages	Test/Analysis	Purpose & Decision Criteria
1	Descriptive Statistics	Calculate mean, max/min value, standard deviation, and variance per sex group.
2	Normality Test (*Shapiro-Wilk*)	Testing the distribution of data for each group (n < 30). Normal if Sig. > 0.05.
3	Homogeneity Test (*Levene's Test*)	Testing the equivalence of variance between groups. Homogeneous if Sig. > 0.05.
4	Comparative Tests of Different Groups	If normal & homogeneous → *Independent Samples T-Test*. If one or both of them are abnormal → *Mann-Whitney U*. Significant if Sig. < 0.05.
5	Gender Descriptive Analysis	Describe the pattern of increase (raw *gain* = *posttest* − *pretest*) per sex group as an exploratory analysis; not used for causal claims.

Specifically for comparative analysis based on sex, the selection of statistical tests follows a conditional flow: if all groups are normally distributed and homogeneous, then an Independent Samples T-Test is used; if one of the groups is not normally distributed, a *nonparametric Mann-Whitney U* test is used at a significance level of α = 0.05. Descriptive analyses by gender (*raw gain*

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per group) are exploratory and are not intended to make causal claims regarding the influence of gender on cognitive ability, given the limitations of the study design and the small sample size.

RESULTS AND DISCUSSION

A. Results

1. Descriptive Statistics of Student Learning Outcomes

This research was conducted on Tuesday, March 3, 2026 in the subject of Pancasila Education, in chapter 7 Maintaining Unity and Unity with Mutual cooperation, topic A. The Importance of Implementing Mutual cooperation to determine the influence of the PBL learning model on students' cognitive abilities based on gender. The results of *pre-test* and *post-test data* consisting of 10 multiple-choice questions were then processed and analyzed using descriptive statistics with the help of *SPSS V.25 Software*. This analysis aims to describe the research data obtained, including the amount of data, maximum value, minimum value, average, standard deviation, and variance based on gender group. The following table of data analysis results according to gender grouping:

Table 4. Summary of Cognitive Learning Outcomes: Pre-test and Post-test

	N	***Min.***	***Max.***	***Mean***	***Standar Deviation***	***Variance***
Pre-test (Male)	6	30	90	71,67	23,17	536,67
Post-test (Male)	6	60	90	81,67	11,69	136,67
Pre-test (Women)	10	40	100	82,00	19,32	373,33
Post-test (Women)	10	70	100	86,00	10,75	115,56

Based on Table 4 above, it can be concluded that there was an increase in the average score of male students from 71.67 after being given treatment, the average *post-test* score increased to 81.67. Thus, there was an increase of 10.00 points or 13.95%. Meanwhile, the average score of female students increased from 82.00 in the *pre-test* to 86.00 in *the post-test*, resulting in an increase of 4.00 points or 4.88%.

Furthermore, the data obtained must be distributed normally, so it is necessary to carry out a normality test first based on gender, following the results of the normality test that the researcher has carried out with the help of *SPSS V.25 Software*:

Table 5. Normality Test Results (Shapiro-Wilk)

	Groups	***Shapiro Wilk***			
		Statistic	***df***	***Say.***	***Interpretasi***
Nilai *Pre-test*	*Pre-test* Male	0,823	6	0,094	Normal. > 0.05
	Post-test Male	0,773	6	0,033	Abnormal < 0.05
	Pre-test Women	0,852	10	0,061	Normal. > 0.05
	Post-test Women	0,892	10	0,177	Normal. > 0.05

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It can be concluded from the table above that there is an abnormal distribution of the normality test, namely in *the post-test* data of Men by obtaining *a sig value.* 0.033 due to the value of *Sig.* <.05.

Furthermore, the researcher conducted a homogeneity test to find out whether the data had homogeneous variation or not, in this study the researcher conducted a homogeneity test using *Levene's Test for Equality of Variance* with the help of *SPSS V.25 Software* , which can be seen in Table 6:

Table 6. Homogeneity Test Results (Leven's Test)

Groups	*Levene Statistic*	*df1*	*df2*	*Say.*
Male	1,667	1	10	0,225
Women	0,064	1	18	0,803

So it can be concluded from the table above, the results of the homogeneity test for men obtained a Sig. of 0.225 which stated *Sig.* > 0.05, then the value obtained was said to be homogeneous. In the results of the homogeneity test, women obtained *Sig.* 0.803 which states *that Sig.* > 0.05, the value obtained is declared homogeneous.

Because in the normality test there is data that is not normally distributed, the next data analysis uses *the Nonparametric* Test, namely the *Mann–Whitney U Test*, although the results of the homogeneity test show that all data are homogeneous. This test is used to find out the differences in students' cognitive abilities based on gender. Table 7 shown the results of *the Mann-Whitney U test* with the help of *SPSS V.25 Software:*

Table 7. *Mann-Whitney U* Test *Rankings for Grade VI Students*

Groups	*N*	*Mean Rank*	*Sum of Ranks*
Male	6	7,17	43,00
Women	10	9,30	93,00
Total	16		

Table 8. *Mann-Whiteney U Test* for Class VI Students

Statistics	Value
Mann–Whitney U	22,000
Wilcoxon W	43,000
Z	-0,734
Asymp. Sig. (2-tailed)	0,463

Based on Table 7 above, it shows that the group of female students has a *mean rank* 9.30, higher than the group of male students of 7.17. Descriptively, these results show that the final assessment scores of female students tend to be higher than those of male students. However, based on the test results *Mann-Whitney U* A significance value of 0.463 > 0.05 was obtained, so the difference was not statistically significant (Table 8). Thus, the null hypothesis (H_0) is accepted and the alternative hypothesis (H_1) is rejected. Because the condition for a significant difference is if the significance value (Sig.) < 0.05.(Listalia et al., 2026).

The rank-biserial correlation was calculated as follows:

$$r = 1 - \frac{2U}{n_1 n_2}$$
$$= 1 - \frac{2 \times 22}{6 \times 10}$$
$$= 1 - \frac{44}{60}$$
$$= 1 - 0.733$$
$$= 0.267$$

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However, as the test was two-tailed and the Z-value was −0.734, the conventional interpretation of:

$$|r| = \frac{|Z|}{\sqrt{N}}$$
$$= \frac{|-0.734|}{\sqrt{16}}$$
$$= \frac{0.734}{4}$$
$$= 0.184$$ is also appropriate.

Applying the formula: $r = 1 - \frac{2U}{n_1 n_2}$ directly yields r ≈ 0.27; however, with the small N = 16, both estimates indicate a small-to-negligible effect size. Using benchmarks for non-parametric effect sizes (|r| < 0.1 = negligible; 0.1–0.3 = small; 0.3–0.5 = medium; > 0.5 = large), the obtained effect size falls in the *small* range, confirming that the gender-based difference, while not statistically significant, also carries limited practical significance. (Peres, 2025)

B. Discussion

This research was carried out involving only one class, namely grade VI of SD Negeri 6 Purwawinangun. This study aims to determine the influence of the PBL Learning model on students' cognitive abilities reviewed from gender. In this case, the researcher will describe in detail the results that the researcher has obtained from the research.

The results of the study show that the application of the *Problem Based Learning* (PBL) in learning Pancasila Education material Chapter 7 Maintaining Unity and Unity with Mutual cooperation Topic A. The Importance of Implementing Mutual cooperation does not show a statistically significant difference between male and female students. Because the test results *Mann-Whitney* 0.463 > 0.05 confirming acceptance of H_0: no statistically significant difference exists between the cognitive abilities of male and female students after PBL implementation. The effect size analysis (r ≈ 0.18–0.27, small range) further corroborates this finding, indicating that the observed gender gap carries limited practical significance. (Listalia et al., 2026).

Descriptively, male students demonstrated a larger absolute gain (+10.00 points; 13.95%) compared to female students (+4.00 points; 4.88%). This pattern is consistent with the ceiling effect: female students entered the post-test with a substantially higher baseline mean (82.00) than their male counterparts (71.67), leaving less statistical room for improvement. This interpretation aligns with Indrawati et al. (2025), who noted that PBL fosters higher-order thinking through contextual problem-solving, and with Rahmadana et al. (2023), who emphasised that PBL's effectiveness is maximised when students engage in reflective problem exploration. The narrowing of within-group variance (male SD: 23.17 → 11.69; female SD: 19.32 → 10.75) further suggests that PBL instruction tended to homogenise performance within each gender group, reducing the gap between higher- and lower-performing students.

The absence of significant gender difference is consistent with international evidence. A meta-analysis by Liu and Pásztor (2022) found no significant gender difference in PBL's effect on critical thinking, confirming that PBL benefits students irrespective of gender. (Guo et al., 2024) similarly found that gender gaps in academic achievement across 78 countries were largely inconsistent and weak, suggesting that instructional approach and learning context are far stronger determinants of outcomes than gender alone. These findings support the view that PBL may function as an equitable instructional strategy that mitigates gender-based disparities in cognitive learning.

From a cognitive ability perspective, both groups showed improvement across the targeted Bloom's Taxonomy domains (C1–C4), from conceptual recall to analytical thinking. The instrument blueprint (Table 2) confirms that the test assessed not only lower-order recall (C2: 40% of items) but also application (C3: 30%) and analysis (C4: 30%), aligning with PBL's design to promote higher-order

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engagement. The improvement in post-test scores across both groups therefore reflects genuine cognitive development across multiple thinking levels, not merely factual recall gains.

The non-significant findings are likely attributable to multiple study limitations: the small and unequal sample sizes ($n_1 = 6$, $n_2 = 10$) resulting in low statistical power; the short intervention period (two sessions); and the pre-experimental single-group design without a control group. Future research is recommended to adopt quasi-experimental or true experimental designs, use larger and gender-balanced samples, include reliability testing (KR-20) for instruments, and extend the intervention period.

However, the difference in increase cannot be used as a basis for concluding the influence of gender on students' cognitive abilities because the results of statistical tests show that there is no significant difference. This is likely influenced by the relatively small number of study samples so that the variation in data between groups has not shown statistically strong differences. In addition, the initial ability of female students who were already higher at the time of the pretest caused their room for improvement to be more limited than that of male students. This is in accordance with Indrawati view that PBL fosters high-level thinking skills through contextual problem-solving activities (Indrawati et al., 2025). In addition, other studies also state that the effectiveness of PBL in improving critical thinking skills and learning outcomes will be maximized if students are used to exploring problems independently and reflectively (Rahmadana et al., 2023).

In addition, the results of this study are in line with the opinion that the Problem Based Learning (PBL) model is able to create more active, collaborative, and contextual learning so that it can help improve students' thinking skills through the problem-solving process (Handayani et al., 2021). Through the stages of problem orientation, group discussion, investigation, and presentation of results, students have the opportunity to understand the material more deeply and relate it to daily life. Therefore, the application of the PBL model still shows a positive tendency towards improving the cognitive abilities of primary school students, although differences by gender have not been shown to be statistically significant.

In addition, the results of this study show that the application of the Problem Based Learning (PBL) model not only focuses on improving cognitive learning outcomes, but also helps students develop the ability to collaborate, discuss, and express opinions in the learning process. In the mutual cooperation material, students look more active when given contextual problems related to daily life. This condition shows that problem-based learning can create a more meaningful learning atmosphere and encourage direct student involvement in the learning process.

Although the results of the improvement have not been statistically significant, the increase in average grades and learning completeness shows that the PBL model has the potential to be applied in Pancasila Education learning in elementary schools. The low significance value is thought to be influenced by the limitations of the study, such as the small sample count, short treatment time, and the design of a one-group pretest-posttest study that has not yet involved a control group. Therefore, further research is recommended to use a more robust experimental design with a larger sample size so that the results can provide a more accurate picture of the influence of the PBL model on students' cognitive abilities based on gender.

CONCLUSION

Based on the results of the research, the application of *the Problem Based Learning* (PBL) model in the learning of Pancasila Education in Chapter 7. Maintaining Unity and Unity with Mutual cooperation, Topic A. The Importance of Implementing Mutual cooperation, shows that there is an improvement in the cognitive ability of grade VI students of SD Negeri 6 Purwawinangun. Male students' mean scores increased from 71.67 to 81.67 (+10.00 points; 13.95%), and female students' scores rose from 82.00 to 86.00 (+4.00 points; 4.88%). The Mann-Whitney U test (Sig. = 0.463 > 0.05) indicated no statistically significant gender-based difference. The effect size analysis (rank-biserial r ≈

0.18–0.27) confirmed a small, practically negligible gender gap, consistent with the statistical non-significance.

These gender-based differences in learning gain are descriptive in nature and cannot be generalised beyond the specific sample and context of this study. The findings are exploratory, constrained by a small and unequal sample, the absence of a control group, and a brief intervention period. Nevertheless, PBL demonstrated a positive tendency towards improving students' cognitive ability through active, collaborative, and problem-based learning across Bloom's Taxonomy levels C1–C4.

Future studies are strongly recommended to: adopt randomised or quasi-experimental designs; employ larger gender-balanced samples; include instrument reliability testing (KR-20 or Cronbach's α); report effect sizes; and extend the intervention period to obtain more robust and generalisable findings.

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REFERENCES

Altman, N., & Krzywinski, M. (2024). Understanding p-values and significance. *Laboratory Animals*, *58*(5), 443–447. https://doi.org/10.1177/00236772241247106

Badriyah, S., Hartika, Z., & Gusmanelli. (2024). Analisis Keterampilan Berpikir Kritis Siswa Setelah Menerapkan Model Pembelajaran PBL (Problem Based Learning). *Jurnal Budi Pekerti Agama Islam*, *3*(1), 01–09. https://doi.org/10.61132/jbpai.v3i1.829

Dewi, R. S. I., Nurlaili, A. I., Khasanah, K., Andini, F. W., Khusniah, N., Islami, K. A., Rufiana, I. S., Faizah, S., Kusumaningrum, S. R., & Herawati, M. (2025). Pemanfaatan Magic School untuk Pelatihan Peningkatan Kompetensi Guru Sekolah Dasar dalam Merancang Modul Ajar Kurikulum Merdeka berbasis Pendekatan Deep Learning. *Jurnal ABDINUS : Jurnal Pengabdian Nusantara*, *10*(1), 268–281. https://doi.org/10.29407/ja.v10i1.27264

Fatonah, Juriah, & Siburian, J. (2026). Literatur Review: Efektivitas Model Pembelajaran Problem Based Learning (PBL) dalam Mengembangkan Literasi Sains dan Higher Order Thinking Skills (Hots) Peserta Didik. *Jurnal Pendidikan MIPA*, *23*(3), 45–57. https://doi.org/10.37630/jpm.v16i1.3625

Gulom, Yanti, D., & Astuti, A. (2024). Peningkatan Hasil Belajar dan Karakter Mutual cooperation Siswa Kelas 2 SDN 07 Panjang. *Prosiding Seminar Nasional Pendidikan Dan Agama*, *5*(2), 2570–2594. https://doi.org/10.55606/semnaspa.v5i2.2264

Guo, J., Marsh, H. W., Parker, P. D., & Hu, X. (2024). Cross-Cultural Patterns of Gender Differences in STEM: Gender Stratification, Gender Equality and Gender-Equality Paradoxes. *Educational Psychology Review*, *36*(2), 37. https://doi.org/10.1007/s10648-024-09872-3

Handayani, S. L., Budiarti, I. G., Kusmajid, & Khairil. (2021). Problem Based Instruction Berbantuan E-Learning: Pengaruhnya Terhadap Kemampuan Berpikir Kritis Peserta Didik Sekolah Dasar. *Jurnal Basicedu*, *3*(2), 524–532. https://doi.org/10.31004/basicedu.v5i2.795

Harahap, I. I., & Albina, M. (2025). Analisis Efektivitas Penerapan Metode Ceramah Sebagai Strategi Pembelajaran. *Jurnal Ilmiah Pengkajian Dan Penelitian Pendidikan Islam*, *8*(1), 62–75.

Hunyaang, M., & Hartutik. (2025). Penerapan Metode PBL Berbantuan Video Meningkatkan Gotong - Royong Fase B Kelas IV SDN Nanga Bulik 4 Lamandau yang sesuai dengan karakteristik dan minat peserta didik , serta menekankan pendekatan Dalam pembelajaran materi Menghayati Perintah Allah dalam. *Prosiding Seminar Nasional Pendidikan Dan Agama*, *6*, 545–559. https://doi.org/10.55606/semnaspa.v6i1.2965

Indrawati, E. S., Yessari, M., & Afia, B. (2025). TRANSFORMASI PEMBELAJARAN SAINS DI SEKOLAH DASAR MELALUI PENDEKATAN INKUIRI, PBL, PjBL, DAN STEM DALAM MENUMBUHKAN KETERAMPILAN ABAD KE-21. *Pendas : Jurnal Ilmiah Pendidikan Dasar*, *10*, 257–268. https://doi.org/10.23969/jp.v10i04.39804

Karima, M. K., Romadhon Hafild, M. N., Putri, T. P., Damayanti, F. I., Andini, D., & Wulansari, S. D. (2025). Pembelajaran Pendidikan Pancasila Kurikulum Merdeka pada Fase A: Sebuah Analisis. *Lentera: Jurnal Ilmiah Kependidikan*, *18*(1), 9–18. https://doi.org/10.52217/lentera.v18i1.1613

Larasati, W. (2024). Peningkatan Mutual cooperation Siswa melalui Model Project Based Learning Berbantuan Media Audiovisual di Fase B Kelas 3 SDN Sumber 3 Surakarta. *Prosiding Seminar Nasional Pendidikan Dan Agama*, *5*(2), 1382–1397. https://doi.org/10.55606/semnaspa.v5i2.2190

Listalia, H., Susanti, L., & Ginanjar, S. (2026). Jurnal Ilmu Manajemen Dan Pendidikan Studi Komparatif Kinerja Guru Senior dan Guru Junior dalam Pengelolaan Pembelajaran pada SMP Negeri Kecamatan Padang Utara Jurnal Ilmu Manajemen Dan Pendidikan. *Jurnal Ilmu Manajemen Dan Pendidikan*, *03*(01), 102–106. https://doi.org/10.62379/jimp.v3i1.1746

Liu, Y., & Pásztor, A. (2022). Effects of problem-based learning instructional intervention on critical thinking in higher education: A meta-analysis. *Thinking Skills and Creativity*, *45*(May). https://doi.org/10.1016/j.tsc.2022.101069

Novianti, A., Bentri, A., & Zikri, A. (2020). PENGARUH MODEL PROBLEM BASED LEARNING (PBL) TERHADAP AKTIVITAS DAN HASIL BELAJAR SISWA PADA PEMBELAJARAN TEMATIK TERPADU DI KELAS V SEKOLAH DASAR. *Jurnal Basicedu*, *5*(5), 194–202. https://doi.org/10.31004/basicedu.v4i1.323

Nurdiana, D. E., & Liansari, V. (2024). Pengaruh Penggunaan Media Big Book terhadap Kesulitan Membaca Permulaan Peserta Didik Sekolah Dasar. *Dawuh Guru: Jurnal Pendidikan MI/SD*, *4*(1), 103–116. https://doi.org/10.35878/guru.v4i1.1095

Pasadona, B. K. (2025). Meningkatkan Kemampuan Mutual cooperation dengan Metode Problem-Based Learning (PBL) Memakai Diskusi pada Materi Membangun Hidup yang Bermartabat Fase F Kelas XI SMA Saint John ' s Catholic School BSD Benedictus Kaneka Pasadona Berdasarkan hal tersebut guru. *Prosiding Seminar Nasional Pendidikan Dan Agama*, *6*, 215–228. https://doi.org/10.55606/semnaspa.v6i1.2941

Peres, Fiel, F. (2025). Effect sizes for nonparametric tests. *Biochemial Medica*, *36*(1), 335–347. https://doi.org/10.11613/BM.2026.010101

Puspitarini, I. M., Wuriningsih, F., & Hartana, B. (2024). Meningkatkan Dimensi Bermutual cooperation dalam Belajar PAK-BP dengan Model PBL Materi Pribadi Yang Tumbuh dan Berkembang Fase B Kelas IV SDN 16 Panoalatn. *Prosiding Seminar Nasional Pendidikan Dan Agama*, *5*(2), 662–676. https://doi.org/10.55606/semnaspa.v5i2.2150

Raharjo. (2020). Pengaruh Penggunaan Wordwall terhadap Hasil Belajar IPAS Siswa Kelas IV SDN 02 Kota Salak. *PKn Progresif: Jurnal Pemikiran Dan Penelitian Kewarganegaraan*, *15*, 63–82. https://doi.org/10.20961/pknp.v15i1.44901

Rahmadana, J., Khawani, A., & Roza, M. (2023). Penerapan Model Problem Based Learning untuk Meningkatkan Kemampuan Berpikir Kritis Peserta Didik Sekolah Dasar. *Jurnal Basicedu*, *5*(5), 3(2), 524–532. https://doi.org/10.31004/basicedu.v7i1.4278

Rahmi, A. (2019). Peningkatan Hasil Belajar Siswa Dengan Model Problem Based Learning Di Sekolah Dasar. *Jurnal Basicedu*, *3*(4), 2113–2117. https://doi.org/10.31004/basicedu.v3i4.242

Rozi, A. (2025). Penerapan Metode Problem Based Learning Untuk Meningkatkan Hasil Belajar Siswa Sekolah Dasar. *Jurnal Indonesia Pendidikan Profesi Guru*, *2*(3), 155–164. https://doi.org/10.64420/jippg.v2i3.371

Rukmi, Susetyo, A., Istiq'faroh, N., Azizah, Nur, A., Pramudita, P. A., Aprilia, V., & Tien-Hsiang, Lin, M. (2024). Model Problem Based Learning. *Model Problem Based Learning (PBL) Terhadap Hasil Belajar Tematik Sekolah Dasar*, *7*(2), 35–36. https://doi.org/10.26740/eds.v7n2.p132-142

Safirah, A. D., Ningsih, Y. F., Suhartiningsih, S., Masyhud, M. S., & Hutama, F. S. (2024). Model Problem Based Learning dengan Pendekatan Culturally Responsive Teaching terhadap Keterampilan Berpikir Kritis Siswa SD. *Jurnal Review Pendidikan Dasar : Jurnal Kajian Pendidikan Dan Hasil Penelitian*, *10*(2), 87–96. https://doi.org/10.26740/jrpd.v10n2.p87-96

Setiawan, A. R. (2020). PEMBELAJARAN TEMATIK BERORIENTASI LITERASI SAINTIFIK. *Pembelajaran Tematik Berorientasi Literasi Saintifik*, *4*(1), 51–69. https://doi.org/10.31004/basicedu.v4i1.298

Siswanto, E., Rahayu, W., & Meiliasari, M. (2025). Optimalisasi Kemampuan Pemecahan Masalah Matematika melalui Implementasi Pembelajaran Problem Based Learning (PBL): Systematic

p-ISSN 2407-4489
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Literature Review. *SJME (Supremum Journal of Mathematics Education)*, *9*(1), 181–195. https://doi.org/10.35706/sjme.v9i1.185

Stratton, S. J. (2019). Quasi-Experimental Design (Pre-Test and Post-Test Studies) in Prehospital and Disaster Research. *Prehospital and Disaster Medicine*, *34*(6), 573–574. https://doi.org/10.1017/S1049023X19005053

Sudarto, S., & Shabir, Achmad, N. A. (2026). PENGARUH METODE EKSPERIMEN BERBASIS LINGKUNGAN SEKITAR TERHADAP HASIL BELAJAR IPA SISWA KELAS V SDN 35 DUMME KABUPATEN SINJAI. *Didaktik : Jurnal Ilmiah PGSD FKIP Universitas Mandiri*, *12*, 173–179. https://doi.org/10.36989/didaktik.v12i01.11710

Sugiyono. (2016). *METODE PENELITIAN PENDIDIKAN PENDEKATAN KUANTITATIF, KUALITATAIF DAN R&D*. ALFABETA CV.