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The Effect of Problem-Based Learning (PBL) on Students' Reflective Thinking Skills in Economics Learning

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ABSTRACT

Reflective thinking skills in economics learning are still relatively low, affecting students' ability to analyze and solve problems systematically. This study aims to analyze the effect of the Problem-Based Learning (PBL) model on students' reflective thinking skills. The study used a quantitative approach with a pre-experimental one-group pre-test–post-test design. The population included all tenth-grade students, while the sample was class X E of SMAN 2 Tangerang Selatan in the 2025/2026 academic year, comprising 32 students selected through cluster random sampling. The research instruments included ATP, teaching modules, student worksheets (LKPD), and essay tests based on reflective thinking indicators, namely reacting, comparing/elaborating, and contemplating, which had been validated. Data were analyzed using normality tests, N-Gain, and a paired-sample t-test. The findings revealed that the data were normally distributed, with an N-Gain score categorized as low. However, pre-test and post-test scores differed significantly, indicating that PBL significantly improved students' reflective thinking skills despite the low level of improvement. This study contributes to developing innovative problem-based learning strategies to enhance reflective thinking skills in economics education.

ARTICLE INFORMATION

Keywords:
economics learning; problem-based learning; reflective thinking

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INTRODUCTION

The rapid advancement of science and technology has significantly affected various aspects of human life in today's modern era. These changes affect not only economic and social fields but also education, which demands continuous adjustment. This condition encourages the younger generation to possess 21st-century competencies relevant to global needs. These competencies include critical thinking, creativity, collaboration, communication, and effective problem-solving skills (Lavi et al., 2021; Upu & Bangatau, 2019; Yohamintin & Widiansyah, 2023). This research is also urgent based on a preliminary study conducted in grade X IPS 1 of SMA Negeri 2 Tangerang Selatan, which consisted of 36 students. Initial observations showed that the school's Minimum Completion Criteria (KKM) for economics was 75. However, the learning evaluation results showed that 22 students (61%) had not achieved the KKM, with an average class score of 68.4. The data indicate that students' ability to understand economics material and solve learning problems remains suboptimal.

Furthermore, observations during the learning process indicate that students tend to be less active in discussions, lack confidence in expressing their opinions, and still rely on peer responses without conducting independent analysis. Even after remedial classes, some students still fail to achieve the required completion standards. This indicates that the learning process does not fully

support the development of students' reflective thinking skills. Therefore, a learning model that can encourage active involvement, analytical skills, and reflection in economics learning is needed. Learning in the modern era no longer emphasizes mastery of material solely but also focuses on developing higher-order thinking skills relevant to the developments of the Industrial Revolution 4.0 and the concept of Society 5.0 (Azrai et al., 2020; Rahman & Nuryana, 2019). This aligns with Indonesia's implementation of the Independent Curriculum, which emphasizes competency-based learning and strengthening student character, including critical thinking and problem-solving skills (Sahnan & Wibowo, 2023).

In education, economics plays a crucial role because it directly relates to everyday life, particularly in decision-making, resource management, and understanding economic phenomena. Economics instruction should train students to think logically, analytically, and systematically when addressing various economic issues. However, classroom learning still relies heavily on conventional methods that emphasize memorizing concepts without connecting them to real-world situations. As a result, students tend to be less active in learning, struggle to understand concepts deeply, and are not accustomed to analyzing and solving economic problems in a structured manner. This situation indicates that the learning process does not fully support the development of students' higher-order thinking skills. One learning model that can address these issues is Problem-Based Learning (PBL). This model places contextual problems as the starting point of learning, encouraging students to seek solutions through independent and group investigation, discussion, and analysis. Thus, PBL not only helps students understand economic concepts but also fosters critical thinking, reflection, and problem-solving skills. Applying the Problem-Based Learning model in economics instruction is expected to create a more active and meaningful learning environment and enhance students' ability to connect concepts to real-life situations. In addition, this model can develop 21st-century skills that will be essential in the future. One thinking skill that plays a crucial role in addressing various learning challenges is reflective thinking. This ability enables students to connect existing knowledge with new information, use different strategies to solve problems, and critically evaluate their thinking processes and outcomes (Adha & Rahaju, 2020; Mukti & Permatasari, 2023; Junaedi et al., 2022; Wahyuni et al., 2018).

In learning, reflective thinking has several indicators that can serve as a basis for assessment. Several recent studies have grouped reflective thinking skills into three main stages: reacting, comparing/elaborating, and contemplating (Mukti & Permatasari, 2023; Junaedi et al., 2022). The reacting stage involves the initial response to a problem, the comparing/elaborating stage emphasizes analysis and evaluation, and the contemplating stage involves in-depth reflection and critical inquiry (Sihaloho et al., 2020; Wahyuni et al., 2022). Furthermore, reflective thinking skills also play a crucial role in the problem-solving process, as noted by Polya, particularly in the "lookback" stage, which involves reviewing the steps taken to ensure the solution is accurate (Maharani & Robiansyah, 2026). However, international studies such as TIMSS (2015) and PISA (2022) show that Indonesian students' reasoning skills, closely related to reflective thinking, remain relatively low (Lestari et al., 2019; Ningrum & Fauziah, 2021). This condition impacts students' ability to solve problems effectively.

Field findings also indicate a similar situation. Based on observations of Professional Field Practice (PLP) activities at one school, students' reflective thinking skills in economics learning are still suboptimal. This is evident from learning evaluation results, which show that most students have not achieved the established minimum passing grade (KKM). Even after remedial classes, some students still have not achieved the required passing grade. Several factors contribute to this low ability, including students being less active in the learning process, minimal involvement in discussions, and a tendency to rely on friends' answers without conducting independent analysis. This condition indicates that the learning process has not developed students' reflective thinking skills

optimally. This aligns with previous studies that found students' reflective thinking skills in Indonesia remain in the low category (Ashari et al., 2024; Kurniasari & Fauziah, 2022; Mudakir et al., 2020; Ningrum & Fauziah, 2021). Therefore, a learning model is needed to encourage students to think actively, analyze, and reflect on the learning process. One model is Problem-Based Learning (PBL). This model encourages students to actively identify, analyze, and solve real-life problems, thereby enhancing learning independence and reflective thinking skills (Hmelo-Silver, 2004; Savery, 2006; Arends, 2019).

PBL is more effective in economics because economic material is closely related to contextual problems in the community. By presenting real-life problems, students can connect economic concepts to everyday life situations, making learning more meaningful. In addition, this model also encourages students to develop critical and analytical thinking skills, as well as the ability to make rational decisions (Tan & Tee, 2003; Eggen & Kauchak, 2016). The Group Investigation (GI) learning model has also been shown to improve students' reflective thinking skills through collaborative activities and structured group discussions. However, although various innovative learning models have been widely studied, research specifically examining the effectiveness of Problem-Based Learning (PBL) in developing students' reflective thinking skills in economics lessons is still relatively limited. Based on these issues, further research is needed on learning models that encourage active student involvement while also fostering higher-order thinking skills. Therefore, this study aims to analyze the use of the Problem-Based Learning (PBL) model in improving students' reflective thinking skills in economics lessons, particularly in material related to economic problems in everyday life.

METHOD

This study used a quantitative approach with a pre-experimental design in the form of a One-Group Pretest-Posttest Design. This design examined the effect of implementing the Problem-Based Learning (PBL) learning model on students' reflective thinking skills in economics learning. In this design, only one group served as the research subject. The group first took a pre-test to determine students' initial abilities, then received treatment through learning using the PBL model, and finally took a post-test to observe changes in abilities after the treatment. The study compared pre-test and post-test results to determine the extent to which applying the PBL model improved students' reflective thinking skills. This research design follows the quasi-experimental model developed by Campbell and Stanley (1963) as a basic design in educational research. Figure 1 presents the research design schematic.



Figure 1. One-Group Pretest-Posttest Research Design

This research was conducted at SMAN 2 Tangerang Selatan during the odd semester of the 2025/2026 academic year. The population in this study was all 10th-grade students across several classes. The sample was determined using cluster random sampling, based on the results of the homogeneity test of End-of-Year Summative Assessment (ASAT) scores at the previous level. The homogeneity test used data from all 10th graders, and Levene's test assessed equality of variance between classes. Based on the results, one class showed sufficient homogeneity to serve as the research sample. The sample for this study was 32 10th-grade students at SMAN 2 Tangerang Selatan in the 2025/2026 academic year. The study collected data through several techniques, including

observing the learning process, administering pre-tests and post-tests to measure students' reflective thinking skills, and using documentation as supporting data. The primary instrument used was a five-item essay test structured around reflective thinking skill indicators, including reacting, comparing/elaborating, and contemplating.

Before use, experts conducted content validity testing and empirical validity testing, confirming the instrument's suitability for the study. In addition to the test instrument, the study also used non-test instruments, including the Learning Objective Flow, teaching modules, and Student Worksheets. The researchers validated all non-test instruments using content validity testing with Aiken's V index. The assessment results from three validators indicated that all instruments were valid and suitable for use in the research process. The researchers analyzed the data quantitatively in several stages. The first stage was a normality test to assess the data distribution. The next stage was calculating the N-Gain score, which aims to determine the level of improvement in students' reflective thinking skills based on the criteria set out in Table 1.

Table 1. N-Gain Category

N-Gain	Category
g > 0,7	High
0,3 ≤ g ≤ 0,7	Medium
0,3 ≤ g ≤ 0,7	Low

The next step was to conduct a paired-sample t-test to determine whether there was a significant difference between the pre-test and post-test results. This test examined the treatment's effect on changes in students' reflective thinking skills. Next, further analysis identified students' levels of reflective thinking skills based on post-test scores. The results were then classified into three categories: high, medium, and low. The categories were determined based on the mean (α) and standard deviation (SD) of the overall data. Table 2 presents the grouping criteria in detail.

Table 2. Criteria for the Level of Reflective Thinking Ability

Percentage Score (P)	Category
$P \geq \bar{x} + SD$	High
$\bar{x} - SD \leq P < \bar{x} + SD$	Medium
$P < \bar{x} - SD$	Low

RESULTS AND DISCUSSION

This research was conducted on 32 students of class X E of SMAN 2 Tangerang Selatan in the odd semester of the 2025/2026 academic year. However, the analysis included data from only 30 students because two students did not participate in the post-test. This study aims to analyze the application of the Problem-Based Learning (PBL) model in improving students' reflective thinking skills. Data collected in this study include pre-test results, post-test results, and documentation during the learning process. Pre-test and post-test data were analyzed quantitatively to determine increases in ability, test for significant differences, and determine students' reflective thinking skill level. Meanwhile, documentation data supported the description of learning implementation in the classroom.

The selection of class XE as the research sample was based on several considerations, including recommendations from economics teachers who teach several X classes and the results of the researcher's initial observations. These considerations included students' readiness to learn, the

availability of adequate classroom facilities and infrastructure, the characteristics of students classified as regular, and their relatively homogeneous academic ability level in the moderate category. Furthermore, the material used in this study was economics relevant to the contextual problems and aligned with the learning schedule at the beginning of the semester. With the supervising teacher's approval, the researcher adjusted the learning flow so the research could proceed according to the planned schedule. Therefore, Class X E was selected as the sample because it best met the established criteria. The learning process in this study took place over seven meetings. The activity stages began with a pre-test in the first meeting, continued with learning activities using the Problem-Based Learning (PBL) model in the second to sixth meetings, and ended with a post-test in the final meeting. In the second to sixth meetings, learning was carried out by applying PBL syntax in stages, starting from problem presentation, organizing students, guiding the investigation, developing and presenting results, and evaluating the problem-solving process.

The results showed an increase in students' reflective thinking skills after participating in the learning. The average pre-test score of 46.37 increased to 53.22 on the post-test, with an average N-Gain value of 0.27, which falls in the low category. This indicates that implementing the Problem-Based Learning (PBL) learning model contributed to improved students' reflective thinking skills, although the improvement remained relatively low. To determine whether the increase was statistically significant, we conducted a paired-sample t-test. However, before conducting the test, we first conducted a normality test as a prerequisite for parametric analysis. We conducted the normality test using IBM SPSS Statistics with the Shapiro-Wilk method. The decision-making criteria in the normality test are that the null hypothesis (H_0) is accepted if the significance value (Sig.) is greater than 0.05. Table 3 presents the normality test results for the pre-test and post-test data.

Table 3. Results of Normality Test for Pre-test and Post-test Data

Data	Sig.	α	Criteria
Pre-test	.82	.05	Normally Distributed
Post-test	.96	.05	Normally Distributed

Table 3 shows that the significance value for both pre-test and post-test data is greater than 0.05, indicating that the data in this study are normally distributed so that further testing can use parametric statistical tests, namely paired sample t-tests. The paired t-test was conducted to determine whether there is a significant difference between the average pre-test and post-test scores after implementing the STEM-based inquiry learning model. The testing criteria are that H1 is accepted if the Sig. (2-tailed) value is < 0.05, (2-tailed) value is < 0.05, (2-tailed) value is <0.05, meaning there is a significant difference between the average pre-test and post-test scores. Table 4 presents the results of the paired t-test for the pre-test and post-test scores.

Table 4. Results of *Paired Sample T-Test*

Paired Differences							
			95% Confidence Interval of the Difference				
Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2- tailed)
-16,733	11,509	2,284	-20,504	-12,162	-6,933	29	< ,001

Based on the results of the paired t-test in Table 4, the significance value (Sig. 2-tailed) was obtained as less than 0.001. This value is smaller than the 0.05 significance level. Therefore, the null

hypothesis (H_0) is rejected, and the alternative hypothesis (H_1) is accepted. These results indicate a significant difference between students' pre-test and post-test scores. This difference indicates a change in ability after being given the learning treatment. Thus, the learning model used impacts student learning outcomes. This finding also supports that the applied learning process can statistically improve student abilities. Therefore, this study's results can serve as a basis for developing more effective learning strategies.

The average difference of 16.733 indicates an increase in students' reflective thinking skills after implementing the Problem-Based Learning (PBL) learning model. This increase shows a fairly clear change between the conditions before and after learning. This indicates that students developed their reflective thinking skills. Thus, implementing the PBL model can provide a more meaningful learning experience. This model encourages students to analyze and evaluate problems actively. In addition, the learning process becomes more interactive and student-centered. Based on these results, the PBL model significantly improves students' reflective thinking skills. This finding also shows that the right learning strategy can improve the quality of learning outcomes. Although the N-Gain value remains in the low category, the statistical test results show a significant increase. This value indicates a change in student abilities after the learning process. This change is evident from the increase between pre-test and post-test scores. This indicates that the learning provided continues to have a positive impact. However, the level of improvement is not yet considered high. Various factors can influence this condition in the learning process. One is students' adaptation to the new learning model. Therefore, the PBL model remains effective in developing students' reflective thinking skills, although the improvement is not optimal.

These findings also align with previous studies suggesting that problem-based learning can improve students' higher-order thinking skills. These studies generally used a pre-experimental design with a one-group pretest-posttest model, where N-Gain values tended to be low, but t-test results still showed significant differences between pre- and post-learning conditions. Several factors influenced the study's results. First, students were not yet accustomed to implementing the Problem-Based Learning (PBL) model, which requires active involvement in higher-order thinking processes, such as analyzing problems and independently formulating solutions. Second, limited learning time meant students had limited opportunities for in-depth exploration, discussion, and reflection on the problems presented. Third, differences in students' initial abilities meant that not all students could adapt quickly to the applied learning model.

Furthermore, students' basic skills in performing simple calculations related to economic concepts remain suboptimal, affecting analysis and problem-solving. Although the increase in reflective thinking skills, as indicated by the N-Gain value, is still relatively low, the statistical test results indicate a significant change. This indicates that implementing the PBL model continues to contribute positively to improving students' reflective thinking skills. Therefore, continuous habituation and application are needed so that students' reflective skills can develop more optimally in the learning process. Furthermore, the post-test analysis showed that most students fell into the moderate category. Of the 30 students, 18 fell into the moderate category, 6 into the high category, and 6 into the low category. These findings illustrate the distribution of students' reflective thinking ability levels after participating in the learning process, as presented in Figure 2.

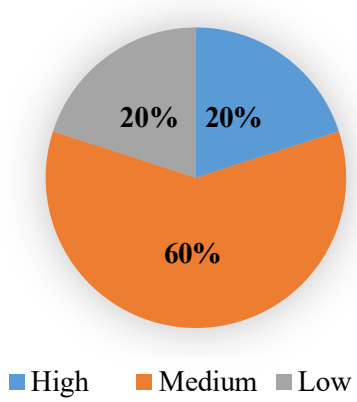

Figure 2. Students' Reflective Thinking Ability Levels

Based on Figure 2, 20% of students fall into the high and low categories (6 out of 30 students). Meanwhile, the medium category dominates, at 60% or 18 out of 30 students. These results indicate that most students fall into the moderate reflective thinking ability category. These findings indicate an increase in reflective thinking abilities after implementing the STEM-based inquiry learning model. This also shows that students can better understand and solve problems related to the pressure material as their reflective thinking abilities increase. This contributes to improving students' reflective thinking abilities, even though achievement is not evenly distributed across indicators. The indicator with the highest achievement is reaction, namely students' ability to recognize important information from a problem, determine what is known and asked, and relate it to relevant economic concepts (Rahmi et al., 2020). High achievement in this indicator is influenced by the PBL model's characteristics, which encourage students to understand and respond to the problems presented actively. In the initial stages of learning, students are presented with contextual problems related to everyday life, encouraging them to observe, identify important information, and formulate problems independently or through group discussions. This aligns with the initial stage of PBL, namely problem orientation, where students are guided to understand the situation and relate it to previously learned concepts. This process improves students' reaction skills compared to other indicators.

In the problem formulation stage, students can identify their prior knowledge and relate it to the given economic problem. This activity reflects a reflective thinking process, as students rearrange existing knowledge to adapt to new situations (Dewey, 1933). Furthermore, learning that requires active involvement in constructing knowledge has also been shown to improve reasoning skills (Moon, 1999). Meanwhile, achievement in the comparing/elaborating indicator, which includes the ability to develop problem-solving strategies, compare alternative solutions, and organize information systematically (King et al., 1998), remains in the moderate category at 46.87%. This indicates that students' ability to link economic concepts with problem-solving steps has begun to develop but is not yet fully structured. This aligns with the stages of the Problem-Based Learning (PBL) model, particularly the investigation and solution development process, where students are expected to analyze possible answers. However, in practice, some students still rely on teacher-provided examples and fail to develop ideas or solutions independently. In line with this, group discussion activities in problem-based learning can generate various ideas that enable students to exchange opinions, integrate information, and produce more comprehensive solutions (Hmelo-Silver, 2004). Therefore, efforts are needed to improve skills in this indicator by habituating reflective activities, such as providing provocative questions and assignments that encourage students to compare various alternative answers. This also aligns with Savery's (2006) view that problem-based learning can

develop higher-order thinking skills when students can explore problems and formulate solutions independently. Furthermore, the contemplating indicator, which describes students' ability to review the problem-solving process, assess the accuracy of answers, and draw reflective conclusions (King et al., 1998), showed low achievement at 25.80%. This finding suggests that students have not used the evaluation and conclusion stages effectively to reflect more deeply. One contributing factor is students' limited experience in evaluating their thinking processes. This stage plays a crucial role in helping students strengthen their ability to draw conclusions and evaluate problem-solving outcomes, deepen conceptual understanding, and improve communication and collaboration skills (Slavin, 2015; Eggen & Kauchak, 2016). However, most students still focus on the final result without reviewing the process they have gone through.

However, implementing the Problem-Based Learning (PBL) model, which requires students to present their results and draw conclusions, has allowed them to practice these reflective skills. This aligns with Hmelo-Silver (2004) and Yew & Goh (2016), which state that the reflection stage in PBL can improve students' evaluative skills, which are closely related to the contemplating indicator. Thus, low achievement on this indicator indicates that students' ability to systematically formulate answers, communicate results, and evaluate the correctness of solutions still needs improvement. Therefore, teachers can strengthen the reflection stage by asking prompting questions such as "Why was this strategy chosen?" or "What if the problem conditions change?" so students become accustomed to reviewing their thinking processes rather than focusing solely on the final result.

Overall, the research showed that students found it easier to identify initial information (reacting) but still struggled with the analysis (comparing/elaborating) and in-depth reflection (contemplating) stages. This finding aligns with Moon (1999), which states that high-level reflection skills require continuous practice and cannot develop instantly. Various factors influenced suboptimal achievement in each reflective thinking indicator, such as differences in student learning styles, their level of mastery of basic economic concepts, and their experience reflecting during the learning process. Furthermore, during the learning activities, it was apparent that not all students participated actively and consistently. During group work, some students tended to be passive or less than fully engaged in discussions and problem-solving. This situation is further exacerbated by students' inattentiveness in reading instructions and supporting materials in worksheets, often leading to difficulties when completing assignments. Some students are not yet accustomed to independent learning through reading or summarizing material, making it difficult for them to determine problem-solving steps. Another obstacle is students' limited basic numerical skills in performing simple calculations related to economic concepts. This also impacts their ability to analyze and solve problems accurately. This finding aligns with Jonassen (2011), who found that mastery of basic knowledge and supporting skills strongly influence problem-solving ability.

The application of the PBL model in economics learning in this study also shows that contextual problems can increase students' motivation to learn. When students face real-world problems, they tend to be more interested in finding solutions and more actively involved in the learning process. This aligns with Tan and Tee (2003), who state that PBL helps students connect concepts to real-life situations through investigative and collaborative activities. However, the results indicate that the average N-Gain score remains in the low category, even though the statistical test shows a significant difference between the pre-test and post-test scores. This finding suggests that while PBL is statistically effective, the improvements achieved are not yet optimal in practice. Several study limitations may have influenced this outcome, including students' lack of preparedness for problem-based learning, limited implementation time, and the absence of a comparison group. Furthermore, the instrument's validity and reliability can influence the accuracy of the research results. In line with Creswell (2018), using valid and reliable instruments is crucial for producing accurate data so the

results reflect actual conditions and provide a strong basis for conclusions. Furthermore, the lack of a control group limits confidence in the results. This is because the improvement in students' reflective thinking skills cannot be compared with that of a non-treated group, making it difficult to determine whether the changes are entirely due to implementing the Problem-Based Learning (PBL) model. Consistent with Creswell (2018), a comparison group in an experimental design is crucial for strengthening internal validity and helping researchers identify treatment effects more precisely, beyond statistical analysis alone. Overall, the PBL model significantly impacts students' reflective thinking skills, although the improvement remains in the low category. Therefore, further research should include a control group and more in-depth instrument validation to ensure more accurate results and describe the learning model's effectiveness more comprehensively. Furthermore, although the PBL model has helped develop students' reflective thinking skills, additional supporting strategies are still needed to optimize learning outcomes. These strategies can include scaffolding, reflective trigger questions, and broader discussion spaces, so students' reflective thinking skills can develop more evenly to the contemplating stage.

CONCLUSION

Based on the research results and discussion presented, applying the Problem-Based Learning (PBL) model significantly improved the reflective thinking skills of tenth-grade students at SMAN 2 Tangerang Selatan in economics in the 2025/2026 academic year. Although the average N-Gain score of 0.26 is in the low category, the pre-test and post-test results indicate a statistically significant increase in reflective thinking skills. Students' reflective thinking skills are predominantly in the moderate category, with the reacting indicator achieving the highest achievement, while comparing/elaborating and contemplating still need improvement. These findings indicate that the PBL model effectively encourages students to actively identify information, connect economic concepts to real-world problems, and develop evaluative skills. However, supporting strategies are still needed to deepen students' reflection processes.

DECLARATION OF GENERATIVE AI

The authors declare that no generative AI or AI-assisted technologies were used in the writing process of this manuscript.

CONFLICTING INTEREST STATEMENT

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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