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# THE EFFECT OF PROBLEM-BASED LEARNING-BASED FLASHCARDS ON CRITICAL THINKING SKILLS

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***ABSTRACT***

*This study aims to determine the effect of using flashcards in the Problem-Based Learning (PBL) model on the critical thinking skills of eighth-grade students in social studies at MTs PSM Tanen Rejotangan Tulungagung. This study employed a quantitative approach with a quasi-experimental design. The sample consisted of 58 students divided into an experimental class (VIII-B, 29 students) that received PBL instruction with the aid of flashcards, and a control class (VIII-A, 29 students) that used conventional methods. Data collection was conducted through pre- and post-tests of critical thinking skills. Analysis results showed that the average posttest score for the experimental class (79.83) was higher than that of the control class (65.57). The Independent Sample T-Test yielded a significance value of 0.000 < 0.05, indicating a significant effect. Cohen's d test yielded a value of 1.798 with a percentage effect of 96%, falling into the high category. Thus, the use of flashcards in the PBL learning model has been proven effective in improving students' critical thinking skills in social studies learning.*

*Keywords: flashcard; problem-based learning; critical thinking; social science.*

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## INTRODUCTION

Education plays a vital role in national development because it enables a country to cultivate high-quality human resources capable of adapting to the changing times. Effective and sustainable education also requires sound planning and implementation of educational policies. Educational policies serve as the primary driving force for managing education systems across various countries. The developments of the 21st century have brought about significant changes in human life, particularly due to the rapid advancement of technology and the transformation occurring across nearly all aspects of life. These conditions demand that the education sector not only emphasize mastery of subject matter but also equip students with relevant skills(Iswahyudi et al., 2023). 21st-century skills are often summarized under the 4C framework—critical thinking, communication, collaboration, and creativity—which are considered essential to help students compete and participate in a global society. Changes in the 21st century have had a significant impact on human life, particularly due to rapid technological advancements and the transformation of nearly all aspects of life. This situation compels the education sector to focus not only on mastery of subject matter but also on equipping students with appropriate skills. 21st-century skills are typically summarized under the 4Cs: critical thinking, communication, collaboration, and creativity, which are considered essential for helping students compete and participate in a global society (Widodo et al., 2020). These skills form the foundation for learning that emphasizes higher-order thinking activities and active student engagement.

Various policies to improve education in Indonesia have been implemented, but many schools still rely on traditional methods. The most common approach involves teacher-led lectures focused on mastering subject matter and rote memorization. Students are rarely given the opportunity to explore ideas, express their opinions, or actively engage in problem-solving. As a result, students' critical, analytical, and reflective thinking skills—which should be core competencies in 21st-century learning—have not developed to their full potential. Students' low critical thinking skills are also reflected in the results of international studies such as PISA (Programme for International Student Assessment), which indicate that Indonesian students' ability to solve problems and reason is still relatively low compared to many other countries (Crato, 2021). These findings suggest that learning in schools should be directed toward methods that are more relevant and can hone higher-order thinking skills.

Robert H. Ennis argues that critical thinking is a process of articulating goals supported by clear reasons regarding a belief and actions that have been taken (Ennis, 1985). Critical thinking skills encompass five main indicators: elementary clarification (providing a simple explanation), basic support (determining the basis for decision-making), inference (drawing conclusions), advanced clarification (providing further explanation), and strategies and tactics (determining strategies and tactics). These indicators demonstrate that critical thinking does not meraely provide answers to questions but also encompasses the ability to analyze data, formulate arguments, draw conclusions, and plan approaches to solve problems. A common challenge in Social Studies (IPS) education is that students struggle to connect the subject matter with the social conditions around them. For your information, social studies should facilitate students' understanding of social issues, sharpen their sensitivity to phenomena in society, and develop their critical thinking skills in analyzing social problems. If social studies instruction continues to be conducted in a manner that is overly theoretical and monotonous, the development of students' critical thinking skills will be hindered.

The main issue in this study focuses on students' low critical thinking skills. The lack of student engagement and the dominance of conventional teaching methods are considered contributing factors to this situation, although they were not included as primary variables in the analysis. One alternative that can be adopted to improve students' critical thinking skills is to implement an innovative, student-centered learning model. A learning model suitable for achieving this goal is Problem-Based Learning (PBL). Nurhadi explains that Problem-Based Learning is an approach that utilizes real-world problems as a context for students to practice critical thinking, solve challenges, and gain useful knowledge (Nasir, 2016). Problem-Based Learning places students at the center of the learning process because students are required to identify problems, search for information, discuss solutions, and present the results of the problem-solving process. The Problem-Based Learning model is considered effective because learning begins with problems that are relevant to students' lives, so that students not only understand concepts but also become accustomed to using those concepts to analyze real-world issues. Through group discussion processes, students can also develop communication and collaboration skills. This is in line with the demands of 21st-century learning, which emphasizes critical thinking skills and the ability to collaborate.

The implementation of the Problem-Based Learning method is more effective when supported by learning materials that can capture students' attention and help them understand concepts. One such material is the flashcard. Flashcards are learning tools in the form of cards featuring images. The images on flashcards present a series of information accompanied by explanations on the back. The functions of these illustrated cards include helping students review previously learned material, providing learning stimuli, eliciting student responses, and offering immediate feedback (Nugraha et al., 2017). The integration of flashcards into the PBL model can enhance learning effectiveness, particularly in Social Studies (IPS). Flashcards help students visually grasp complex concepts, support information exploration within problem-based learning contexts, group discussions, and presentations of problem-solving outcomes. Students not only retain the material but also develop critical thinking skills such as analysis and evaluation (Nur, 2022).

Flashcards can help identify problems, explain concepts, and spark group discussions. When used in Problem-Based Learning scenarios, flashcards can help students recall key terms, connect facts and concepts, and construct arguments based on visual information. This method is highly effective for social studies lessons that require an understanding of social issues and higher-order thinking skills. Students who use flashcards in Problem-Based Learning demonstrate significant improvements in critical thinking and communication skills, making learning more interactive and enhancing the quality of students' thinking processes (Alifvia et al., 2024). Critical thinking is the ability to think effectively and efficiently to analyze, solve problems, evaluate, and make decisions in order to arrive at the correct final outcome. The Problem-Based Learning model is one of the learning models that prioritizes active learning processes, where the teacher acts as a facilitator and mediator to help students construct their knowledge effectively (Hotimah, 2020). Meanwhile, as explained by Gerlach and Ely and cited by Arsyad, flashcards are graphic tools that serve to organize and reprocess information both verbally and visually, making them a useful tool to support problem-based learning (Masna, 2022).

## RESEARCH METHODS

This study employs a quantitative approach aimed at demonstrating the methods used in data collection and analysis, thereby ensuring that the research can be conducted effectively and efficiently in accordance with the established objectives. This approach also enables the presentation of results in the form of numerical data. This study employs a quasi-experimental research design. The quantitative approach is a method that utilizes statistical-based instruments and data analysis to test hypotheses (Sugiyono, 2015). The researcher chose to use a quasi-experimental design because it is one of the research categories with a high level of accuracy. Through this approach, the researcher can clearly identify and determine the cause-and-effect relationship between the variables under study (Yusuf, 2014).

This research design, known as a quasi-experimental design—also referred to as a quasi-experiment—is a research method aimed at evaluating the effect of an independent variable on a dependent variable. The study was conducted on a sample consisting of an experimental group and a control group. Subsequently, both groups underwent a posttest (O). The procedure involved dividing the subjects into two groups; the experimental group was provided with stimulation, while the control group was not. This study involved two sample groups: an experimental class that received instruction using flashcards in a Problem-Based Learning (PBL) model, and a control class that followed conventional instruction. Both groups were given a pretest to determine their initial conditions and a posttest to measure their abiliaties after the treatment (Verinica & dkk, 2022).

The population in this study consisted of all eighth-grade students for the 2025/2026 academic year at MTs PSM Tanen Rejotangan Tulungagung, comprising 3 classes with a total of 78 students. This location was selected based on the results of preliminary observations conducted on September 17–18, 2025, which found that the social studies learning process at the school remained conventional, resulting in low levels of critical thinking skills among students. Sampling was conducted using purposive sampling. Purposive sampling is a method applied by researchers when specific criteria guide the selection of the sample (Asrulla et al., 2023). The selection criteria included: (1) classes with relatively uniform academic ability based on the previous semester's social studies grades; (2) a relatively equal number of students across classes to allow for comparable instructional treatments; and (3) the social studies teacher instructing the same classes to minimize differences in teaching styles. Based on these criteria, two classes were selected as research samples: Class VIII-A as the control group (29 students) and Class VIII-B as the experimental group (29 students).

## RESULTS AND DISCUSSION

This study was conducted at MTs PSM Tanen Rejotangan Tulungagung from February 14 to March 11, 2026, with a population consisting of all 76 eighth-grade students in the 2025/2026 academic year. The research sample used purposive sampling, namely eighth-grade class A (29 students) as the control class and eighth-grade class B (29 students) as the experimental class. The experimental class received instruction using the Problem-Based Learning (PBL) model supported by flashcards, while the control class used a conventional lecture-based method. The data collected consisted of pretest and posttest scores used to measure students' critical thinking skills. The descriptive statistics for the pretest and posttest results of critical thinking skills for students in both classes are presented in the following table:

**Table 1. Descriptive Statistics of Students' Critical Thinking Skills: Pre-test and Post-test**

| Statistics | | | | | |
|---|---|---|---|---|---|
| | | **Pretest Kontrol** | **Postest Kontrol** | **Pretest Eksperimen** | **Postest Eksperimen** |
| N | Valid | 29 | 29 | 29 | 29 |
| | Missing | 0 | 0 | 0 | 0 |
| Mean | | 51.207 | 65.569 | 61.924 | 79.834 |
| Median | | 50.000 | 67.500 | 60.000 | 80.000 |
| Mode | | 50.0 | 67.5 | 60.0 | 80.0 |
| Std. Deviation | | 4.9380 | 9.2241 | 8.2943 | 7.6922 |
| Variance | | 24.384 | 85.084 | 68.796 | 59.169 |
| Range | | 20.0 | 32.5 | 30.0 | 27.5 |
| Minimum | | 40.0 | 47.5 | 47.5 | 65.0 |
| Maximum | | 60.0 | 80.0 | 77.5 | 92.5 |

The data in the table above show that the pretest and posttest scores in the control class exhibit greater variation compared to those in the experimental class. This is evident from the higher standard deviation in the control class, which was 4.85 on the pretest and 8.15 on the posttest, whereas in the experimental class, the standard deviation was 9.06 on the pretest and 7.56 on the posttest. Furthermore, the results of the statistical analysis also indicate a difference in mean scores between the control class and the experimental class, both on the pretest and the posttest. Thus, it can be concluded that there is a significant difference in learning outcomes between the control class and the experimental class.

The increase in pretest and posttest scores in the experimental and control classes can be determined through the N-Gain test. This test aims to determine the extent of changes in students' critical thinking skills after they received instruction. The results are then categorized into specific levels of improvement. The N-Gain test also helps demonstrate how effective flashcards are in the Problem-Based Learning method in the experimental class compared to the control class, which employed conventional teaching methods. The N-Gain calculation is performed by comparing the average pretest and posttest scores, then adjusting them based on the maximum score achievable on the test. Through this calculation, the observed improvement becomes clearer and more measurable. The N-Gain test has the following score categories:

**Table 2. N-Gain Test Results**

| Kelas | N-Gain | Kategori |
|---|---|---|
| kontrol | 0.2943 | rendah |
| Eksperimen | 0.4704 | sedang |

The table above shows that the use of flashcards with the problem-based learning method in the experimental class resulted in a more significant improvement compared to the control class, which used conventional learning; this indicates that the intervention in the experimental class had a positive impact on students' critical thinking skills. Based on these criteria, the experimental class's N-Gain score of 0.4704 falls into the moderate category, while the control class's N-Gain score of 0.2943 falls into the low category. Thus, the use of flashcards in the Problem-Based Learning model has been proven to yield a greater improvement in critical thinking skills compared to conventional methods.

A normality test is used to determine whether the data collected by the researcher follows a normal distribution. The Shapiro-Wilk normality test was conducted using SPSS version 22. The

results of the normality test for the pretest and posttest scores of critical thinking skills among students in the control and experimental classes are as follows:

**Table 3. Output of the normality test results**

**Tests of Normality**

| | Kelas | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
|---|---|---|---|---|---|---|---|
| | | Statistic | df | Sig. | Statistic | df | Sig. |
| Hasil | Pretest (Kelas Kontrol) | .148 | 29 | .103 | .967 | 29 | .489 |
| | Post test (Kelas Kontrol) | .135 | 29 | .191 | .953 | 29 | .225 |
| | Pretest (Kelas Experimen) | .178 | 29 | .020 | .949 | 29 | .177 |
| | Post test (Kelas Eksperimen) | .129 | 29 | .200* | .957 | 29 | .275 |

**. This is a lower bound of the true significance.*

*a. Lilliefors Significance Correction*

The results of the normality test above indicate that the pretest and posttest data on the critical thinking skills of students in the experimental and control classes show an Asymp.Sig. (2-tailed) ≥ 0.05; therefore, it can be concluded that both datasets are normally distributed. Following the normality test, a homogeneity test was conducted to determine whether the samples used have equal variances (are homogeneous) or not. The data can be considered homogeneous if the significance value is > 0.05. Conversely, if the significance value is < 0.05, the data is deemed non-homogeneous. The results of the homogeneity test can be seen in the following table:

**Table 4. results of the homogeneity test**

Pretest Homogeneity Test Results

**Test of Homogeneity of Variance**

| | | Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|---|---|
| Critical Thinking Skills | Based on Mean | 1.521 | 1 | 74 | .221 |
| | Based on Median | 1.272 | 1 | 74 | .263 |
| | Based on Median and with adjusted df | 1.272 | 1 | 72.978 | .263 |
| | Based on trimmed mean | 1.469 | 1 | 74 | .229 |

Post-test Homogeneity Test Results

**Test of Homogeneity of Variance**

| | | Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|---|---|
| Critical Thinking Skills | Based on Mean | 1.170 | 1 | 56 | .284 |
| | Based on Median | .777 | 1 | 56 | .382 |
| | Based on Median and with adjusted df | .777 | 1 | 52.620 | .382 |
| | Based on trimmed mean | 1.175 | 1 | 56 | .283 |

The results of the homogeneity test above show that the significance values (sig.) for the pretest and posttest of students' critical thinking skills in the experimental and control classes were 0.221 and 0.284, respectively. These significance values are greater than 0.05; therefore, it can be concluded that the data from both classes are homogeneous. After meeting the normality and homogeneity prerequisites, hypothesis testing was conducted using the Independent Sample T-Test. This test was chosen because the data came from two unpaired groups, namely the experimental class and the control class. The hypotheses tested were:

$H_0$ : There is no significant effect of the use of flashcards in the Problem-Based Learning model on the critical thinking skills of eighth-grade students in social studies at MTs PSM Tanen Rejotangan Tulungagung.

$H_1$ : There is a significant effect of using flashcards in the Problem-Based Learning model on the critical thinking skills of eighth-grade students in social studies at MTs PSM Tanen Rejotangan Tulungagung.

**Table 5. Results of the Test of Students' Critical Thinking Skills**

**Group Statistics**

| | kelas | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Nilai Postest | Kelas Kontrol | 29 | 65.569 | 9.2241 | 1.7129 |
| | Kelas Eksperimen | 29 | 79.834 | 7.6922 | 1.4284 |

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | | Lower | Upper |
| Nilai Postest | Equal variances assumed | 1.170 | .284 | 6.396 | 56 | .000 | -14.2655 | 2.2303 | -18.7334 | -9.7977 |
| | Equal variances not assumed | | | 6.396 | 54.249 | .000 | -14.2655 | 2.2303 | -18.7365 | -9.7945 |

Based on the results of the t-test, a t-value of 6.396 was obtained with a significance level (Sig., 2-tailed) of 0.000. When compared to the significance level of 0.05, this value is clearly smaller (0.000 < 0.05). This means that the test results indicate a significant difference between the two groups. Therefore, the null hypothesis (H0) is rejected. This indicates that the use of flashcards in the Problem-Based Learning (PBL) method yields significantly different results compared to conventional learning. It can be concluded that there is a significant difference between the experimental class, which used flashcards in the Problem-Based Learning (PBL) method, and the control class, which used conventional learning.

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$$d = \frac{\bar{x}_t - \bar{x}_c}{\sqrt{\frac{(n_t-1)s_t^2 + (n_c-1)s_c^2}{n_t+n_c}}}$$

$$= \frac{79.834 - 65.596}{\sqrt{\frac{(29-1)(6.6922)^2 + (29-1)(9.2241)^2}{29+29}}}$$

$$= \frac{14.238}{\sqrt{\frac{(28)(44.7855)+(28)(85.0840)}{58}}}$$

$$= \frac{14.238}{\sqrt{\frac{3636.346}{58}}}$$

$$= \frac{14.238}{\sqrt{62.6956}}$$

$$= \frac{14.238}{7.918}$$

$$= 1.798$$

**Figure 1. Results of Cohen's Test**

Based on these calculations, it was concluded that the effectiveness of using flashcards in the problem-based learning model on the thinking skills of eighth-grade students at MTs PSM Tanen Rejotangan Tulungagung was 1.798. According to the interpretation of Cohen's d, this corresponds to a 96% effect size. This indicates that the study falls into the high-effect-size category.

Research findings indicate that the use of flashcards in the Problem-Based Learning (PBL) model has a significant impact on the critical thinking skills of eighth-grade students in Social Studies at MTs PSM Tanen Rejotangan in Tulungagung. This significant impact occurs because the PBL model transforms students' learning patterns from passive to active. Students do not merely receive information; they are trained to understand problems, seek relevant information, analyze data, construct arguments, and draw conclusions. In the lesson on the people's resistance against the Dutch East Indies government, conventional teaching that relies on lectures often leads students to merely memorize the sequence of events without understanding their logical connections. In contrast, the PBL approach positions students as problem-solvers, training them to explain why the resistance occurred, the strategies employed, and its impacts.

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This study aligns with Nurhadi's view, which describes Problem-Based Learning as a teaching method that focuses on real-world issues to help students learn to think critically, improve their problem-solving skills, and gain essential knowledge from the material being (Nasir, 2016). Through the use of flashcards as a tool that presents information in a concrete way, students do not merely passively receive the material but actively identify problems, discuss them in groups, and devise solutions based on the data they uncover. This study is also consistent with Robert H. Ennis's theory of critical thinking, which states that critical thinking is the process of articulating goals accompanied by clear reasons regarding a belief or action taken (Ennis, 1985).

Based on the above discussion, it can be concluded that the use of flashcards in the Problem-Based Learning model has been shown to have a significant impact on improving students' critical thinking skills. The Problem-Based Learning process, which focuses on problem-solving and group discussions, engages students more deeply in critical thinking, analysis, and drawing conclusions. Meanwhile, the use of flashcards supports this process by presenting information in a clear and engaging manner, enabling students to grasp the material more easily and construct logical arguments.

## CONCLUSIONS

This study aligns with Nurhadi's view, which describes Problem-Based Learning as a teaching method that focuses on real-world issues to help students learn to think critically, improve their problem-solving skills, and gain essential knowledge from the material being studied (Nasir, 2016). Through the use of flashcards as a tool that presents information in a concrete way, students do not merely passively receive the material but actively identify problems, discuss them in groups, and devise solutions based on the data they uncover. This study is also consistent with Robert H. Ennis's theory of critical thinking, which states that critical thinking is the process of articulating goals accompanied by clear reasons regarding a belief or action taken (Ennis, 1985).Based on the research findings and discussion, it can be concluded that the use of flashcards in the Problem-Based Learning (PBL) model has a significant effect on the critical thinking skills of eighth-grade students in social studies at MTs PSM Tanen Rejotangan Tulungagung. This is evidenced by the results of the Independent Sample T-Test, which showed a significance value of 0.000 < 0.05, so that $H_0$ was rejected and $H_1$ was accepted. The improvement in the critical thinking skills of the experimental class was reflected in the posttest mean score of 79.83, which was significantly higher than that of the control class at 65.57. The N-Gain test results also showed that the experimental class fell into the moderate category (0.47), while the control class only reached the low category (0.29). Furthermore, Cohen's d test yielded a value of 1.798 with a percentage effect of 96%, which falls into the very high category. These findings indicate that integrating flashcards into the PBL model is capable of transforming students' learning patterns from passive to active, encouraging students to identify problems, analyze information visually,

engage in discussion, and draw logical conclusions. Thus, the combination of flashcards and PBL is an effective learning alternative for enhancing students' critical thinking skills in social studies at the junior high school level.

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