

The Influence of Problem Based Learning on Critical Thinking Skill Reviewed From Gender

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Abstract

This research highlights the need for the application of learning models that can improve critical thinking skills. The model that is believed to be able to improve critical thinking skills is Problem Based Learning (PBL). The purpose of this study was to determine 1) the effect of PBL learning model on critical thinking ability; 2) the effect of gender differences on critical thinking ability; 3) the effect of PBL learning model on critical thinking ability in terms of gender differences. The purpose of this study was to determine the difference and effect of problem-based learning and conventional learning models on critical thinking ability in terms of gender. This research used quantitative approach with quasi experiment design. This research instrument used an essay test of 5 questions. The data analysis used was normality test, homogeneity test, and 2-way anova test. The results showed that 1) PBL model has an effect on students' critical thinking skills; 2) there is an effect of gender on students' thinking skills; 3) there is no effect of PBL learning model on critical thinking skills in terms of gender differences.

Keywords: Problem Based Learning, Critical Thinking, Gender

1. INTRODUCTION

Amidst the complex dynamics of society and the rapid evolution of technology, modern education highlights the importance of high critical thinking skills. Critical thinking enables individuals to manage information from various sources, including social media and the internet, with the aim of making decisions based on facts and logic (Herman et al., 2024).

Critical thinking skills will encourage the acquisition of high student learning outcomes. This is key in shaping individuals who are able to make a positive contribution to society (Pattiran et al., 2024). Through positive social interactions, students can learn to collaborate, show empathy, and understand the needs of others (Han et al., 2024; McMahon & Isik, 2023; Roth & Peng, 2024; Sudariyanto, 2020). In addition, it can develop skills to resolve conflicts constructively, build healthy relationships, and appreciate diversity in society (Istianah, Maftuh, & Malihah, 2023).

High critical thinking ability is not only the key to success in academia, but also an indispensable skill to face complex challenges in personal and professional life. Therefore, education needs to emphasize the development of this aspect through student-focused learning approaches, collaborative learning, and learning experiences relevant to real life (Musyafak

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& Subhi, 2023; Suyuti et al., 2023). As such, individuals will be prepared to face the ever-changing and dynamic demands of the modern world.

In fact, the critical thinking skills of students in Indonesia are still in the low category. This is evidenced by the PISA (Program for International Student Assessment) survey initiated by the OECD (Organization for Economic Cooperation and Development) in 2022 for critical thinking skills ranked 72 out of 78 countries (OECD, 2022). This proves that students' critical thinking skills are still far from average. Despite the available evidence, most educators and managers of educational institutions in Indonesia are reluctant to apply available Learning models or methods. In fact, instead of implementing learning that activates critical thinking, educators in Indonesia tend to do the opposite. Mayasari et al. (2016) reported that most Indonesian educators prefer traditional rote methods and direct teaching approaches over student-centred methods.

Therefore, it is necessary to apply a learning model that can improve critical thinking skills. The model that is believed to be able to improve critical thinking skills is Problem Based Learning (PBL). Slavin (2015) explained that the PBL model has several advantages, including 1) stimulating students' abilities and giving satisfaction to discover new knowledge; 2) increasing students' activities; 3) helping how to transfer their knowledge to understand problems in real life; 4) helping participants gain new knowledge and be responsible for the learning they do; and 5) encouraging students to think critically by adjusting the new knowledge gained.

There are many studies related to the effect of PBL learning models. Some studies show that PBL models/methods affect students' critical thinking skills, especially junior high school students (Aswan, Lufri, & Sumarmin, 2018; Yolanda, 2019). Although there are several predictors that influence the PBL model such as age, gender, academic achievement, and educational background, there are several predictors that influence the PBL model (Darmaji, Astalini, Kurniawan, & Putri, 2022).

Problem-Based Learning (PBL) is a learning method that emphasizes the development of critical thinking skills through solving real-life and relevant problems (Sholihah & Lastariwati, 2020). This method encourages students to think analytically, make decisions, and work in groups to solve given problems (Schmidt. Et al., 2011). PBL is believed to improve critical thinking skills because it encourages students to be more active in the learning process, seek information, and consider multiple perspectives when solving problems (Zabit, 2010). Therefore, PBL is widely applied in various educational contexts to improve the quality of student learning.

However, although PBL has been proven effective in improving critical thinking skills, its impact on these skills can vary depending on certain factors, one of which is gender (Masek & Yamin, 2011). Several studies have shown differences in how males and females approach problem-solving and critical thinking. These differences may be due to sociocultural factors, educational experiences, and differing approaches to communication and collaboration. Therefore, it is important to explore how gender influences the outcomes of implementing PBL methods in developing critical thinking skills.

The role of gender has an influence on critical thinking skills, although this influence may vary depending on other factors such as social environment, parenting, and learning methods

applied. According to some experts, gender is considered to have an influence on emotional growth, a person's critical abilities, interests and learning outcomes (Isslamiyah & Wijayanti, 2022). Research conducted by Mawaddah et al. (2018) mentioned that female students' critical thinking skills are better than male students. In addition, research conducted by Hafidz (2019) that female students' learning outcomes are better than male students. However, there are other studies that contradict these results such as those conducted by Rodzalan & Saat (2015) and Ro & Knight (2016) which resulted in the critical thinking skills of male students being higher than female students. These studies show that the critical thinking skills of male students are different from female students. This states that male and female students have different critical thinking skills (N.-Y. Liu, Hsu, Hung, Wu, & Pai, 2019; Rød & Calafato, 2023).

Research related to the application of PBL learning models in terms of gender has been conducted by several researchers. Tanaka (2023) In his research, he explained the relationship between PBL learning model with learning motivation and self-conceptual in terms of gender. Furthermore, research conducted by Hirshfield & Koretsky, (2017) and Pambudi et al., (2021) explaining interaction and communication skills in terms of gender through the PBL learning model. Then the research conducted by Ajai & Imoko (2015) and Patmawati et al. (2023) conducted research on student learning outcomes based on gender using the PBL learning model.

However, although several studies have been conducted on the application of the Problem-Based Learning (PBL) model in improving critical thinking skills, research that specifically assesses the impact of PBL based on gender on social problems material has never been found by researchers. Therefore, a more in-depth and comprehensive research is needed to identify how PBL affects critical thinking skills by considering gender differences. This research should include a more detailed analysis of how students of different genders respond and interact with the PBL model in the context of social problems. With a better understanding of the influence of gender in the application of PBL, it is hoped that more effective strategies can be found to improve students' critical thinking skills more fairly and equitably. This study aims to 1) determine the effect of PBL learning model on critical thinking skills. 2) Knowing the effect of gender differences on critical thinking skills. 3) To find out the effect of PBL learning model on critical thinking skills in terms of gender differences.

2. METHOD

This research uses a quantitative approach with a quasi experiment design. Quasi experiment is an experiment with elements of treatment, pre and post test but does not take random samples (Wulandari & Surjono, 2013). The research location is at the Social Studies Education Study Programme, State University of Malang. This material used social problem. The research subjects consisted of two classes, namely classes A and B, where class A consisted of 42 students and class B consisted of 40 students. Class A is an experimental class by applying a problem-based learning model and class B applies a conventional learning model.

The research design used a 2x2 factorial design (Febriani, Tawil, & Sari, 2021). There are three variables in this study, namely the independent variable, dependent variable, and moderator variable (Lestari, 2021). There are two independent variables, namely the problem-based learning model (A1), and the conventional learning model (A2), the dependent variable

is critical thinking skills, while the moderator variables are male and female gender. More details, this research design can be seen in table 1.

Table 1. Research Design

Gender (B)	Learning Model (A)	
	Problem Based Learning (A ₁)	Conventional Learning (A ₂)
Male (B ₁)	Y [A ₁ B ₁]	Y [A ₂ B ₁]
Female (B ₂)	Y [A ₁ B ₂]	Y [A ₂ B ₂]
Σ	Y [A ₁ B ₁] + Y [A ₁ B ₂]	Y [A ₂ B ₁] + Y [A ₂ B ₂]

The data collection technique in the study used a test instrument. The test technique was used to determine the achievement of critical thinking skills. The test prepared was a written description test totaling 5 questions. The test of test instruments in this study includes validity, reliability, difficulty level of questions, and differentiating power of questions. The results of the question validity test can be seen in table 2.

Table 2. Validity Test Results

	Item	Total	Conclusion
P1	Pearson Correlation	.522**	Valid
	Sig. (2-tailed)	.003	
	N	30	
P2	Pearson Correlation	.576**	Valid
	Sig. (2-tailed)	.001	
	N	30	
P3	Pearson Correlation	.643**	Valid
	Sig. (2-tailed)	.000	
	N	30	
P4	Pearson Correlation	.812**	Valid
	Sig. (2-tailed)	.000	
	N	30	
P5	Pearson Correlation	.543**	Valid
	Sig. (2-tailed)	.002	
	N	30	

The validity test showed that the five question instruments were valid with value bigger than T table (0,204). Then, the results of the question reliability test can be seen in table 3.

Table 3. Reliability Test Results

Cronbach's Alpha	N of Items	Conclusion
.601	5	Reliable

The reliability test results show that the five questions can be declared reliable with value 0,601. Then, the results of the test of the level of difficulty of the questions can be seen in Table 4.

Table 4. Test Results of the Level of Difficulty

		P1	P2	P3	P4	P5
N	Valid	30	30	30	30	30
	Missing	0	0	0	0	0
Mean		2.20	2.83	2.77	2.30	2.43
Maximum		4	4	4	4	4
Category		Good	Good	Good	Good	Good

In the level of difficulty test results, all five questions are categorized as good. Then, the results of the test of the differential power of the questions can be seen in Table 5.

Table 5. Differentiated Test Results

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Category
P1	10.33	10.437	.289	Low
P2	9.70	9.734	.312	Low
P3	9.77	9.220	.405	Quite
P4	10.23	7.220	.616	High
P5	10.10	9.679	.206	Low

In the results of the test of the differential power of questions, 3 questions have low differences in numbers 1, 2, and 3. Then in question number 3 is categorized as quite. Question number 4 is categorized as high.

Data analysis in this study consisted of normality test, homogeneity test, and two-way ANOVA test. The data analysis test is based on the research hypothesis, which is as follows.

Hypothesis 1:

Ho1: there is no effect of PBL learning model on critical thinking skills.

Ha1: there is an effect of PBL learning model on critical thinking skills.

Hypothesis 2:

Ho2: there is no effect of gender difference on critical thinking ability.

Ha2: there is an effect of gender differences on critical thinking skills.

Hypothesis 3:

Ho3: there is no effect of PBL learning model on critical thinking ability in terms of gender differences.

Ha3: there is an effect of PBL learning model on critical thinking ability in terms of gender differences.

3. RESULT AND DISCUSSION

The results of the average value of critical thinking ability of experimental class (class with problem-based learning model) and control class (class with conventional model) can be seen in Figure 1.

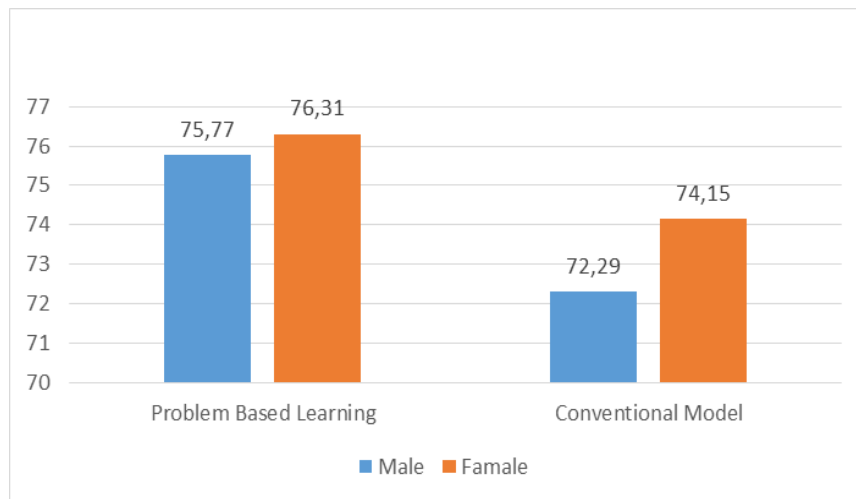


Figure 1. Average Value of Critical Thinking Ability

Students with female gender when implementing learning with problem-based learning model have an average critical thinking ability of 76.31. While when the application of learning with the conventional model has an average critical thinking ability of 74.15. Meanwhile, male students when applying the problem-based learning model had an average critical thinking ability of 75.77, and when applying conventional model of 72.29.

Based on these data, it can be stated that: 1) the average critical thinking skills of both male and female students when learning with problem-based learning models are higher than when learning with conventional model; 2) there is no difference in the average critical thinking skills of male and female students both when applying problem-based learning and conventional model. The results of the data normality test in this study can be seen in Table 6 below.

Table 6. Data Normality Test Results

Kolmogorov-Smirnov ^a		
Statistic	df	Sig.
.048	89	.200

Based on table 6 of the normality test results, it is known that the significance value of the critical thinking variable is 0.200 which shows the results of critical thinking > 0.05 . So the critical thinking ability data is normally distributed. Furthermore, the results of the data homogeneity test in this study can be seen in Table 7 below.

Table 7. Data Homogeneity Test Results

F	df1	df2	Sig.
1.138	3	85	.338

In table 7, the obtained value of critical thinking of students has a significance value of $0.338 > 0.05$, which means that the data has the same variance or homogeneous data. The results of the normality test and homogeneity test show that the prerequisite test for 2-way anova analysis is fulfilled, so that the hypothesis test can be carried out two-way anova test. The results of the two-way ANOVA test can be seen in Table 8 below.

Table 8. Two-Way ANOVA Test Results

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	696.193 ^a	3	232.064	5.040	.003
Intercept	6199.808	1	6199.808	134.660	.000
Model Pembelajaran	446.974	1	446.974	9.708	.003
Jenis Kelamin	189.658	1	189.658	4.119	.046
Model Pemb. * Gender	4.515	1	4.515	.098	.755
Error	3913.448	85	46.041		
Total	13291.000	89			
Corrected Total	4609.640	88			

Based on table 8, the results of the analysis of the problem-based learning model on students' critical thinking have a significance value of $0.003 < 0.05$, which means H_01 is rejected and H_{a1} is accepted. This means that the PBL model affects the critical thinking skills of students. Furthermore, the results of the analysis of gender on the critical thinking skills of students have a significance value of $0.046 > 0.05$ which means H_{a2} is accepted while H_{o2} is rejected. This means that there is an effect of gender on the thinking ability of students. For the PBL learning model on critical thinking skills in terms of gender differences, has a significant value

of $0.755 > 0.05$ which means H_03 is accepted and H_a3 is rejected. This means that there is no effect of PBL learning model on critical thinking skills in terms of gender differences.

Students' critical thinking skills are higher when applying the problem-based learning model than conventional learning because this method requires students to be more actively involved in the learning process. In Problem-Based Learning, students are faced with real situations that require in-depth analysis, problem identification, and the search for creative and logical solutions. This process encourages students to think critically independently, explore various sources of information, and work collaboratively with their peers to complete the task. The success of any learning model depends largely on how it is applied and therefore must be adapted to the characteristics of students, instructors, and available resources (Pinto, 2023).

In PBL learning to improve critical thinking skills, there is no need to separate groups based on gender because gender differences do not determine one's critical thinking skills. Although there are differences in the way male and female students approach problems and communicate, these are more related to individual preferences than cognitive abilities. Therefore, the main focus of problem based learning is to create an equitable and inclusive learning environment, where every student, whether male or female, has an equal opportunity to develop, actively engage and contribute to collaborative problem solving. Students who are female or male do not have differences in critical thinking skills because this critical thinking ability is not determined by gender factors.

Critical thinking skills are more influenced by factors Critical thinking skills are more influenced by factors such as: 1) psychological factors which include intellectual, motivation, anxiety and physiological factors which include physical, learning independence, interaction with others (Dores et al., 2020; Sutriyanti & Mulyadi, 2019; Liu et al., 2024); 2) education and knowledge (Sitio, Setiawan, & Rusdhianti, 2022); 3) learning environment (Xu, Wang, & Wang, 2023). Critical thinking skills involve the ability to provide simple explanations, build basic skills, make inferences, make further explanations, and organise strategies and tactics. (Suciono, Rasto, & Ahman, 2021).

4. CONCLUSION

Based on the results of data analysis, it can be concluded that 1) PBL model affects the critical thinking ability of students. The results of the analysis of the problem-based learning model on students' critical thinking have a significance value of $0.003 < 0.05$. 2) Gender affects the thinking ability of students. The results of the analysis of gender on the critical thinking ability of students have a significance value of $0.046 > 0.05$. 3) PBL learning model has no effect on critical thinking skills in terms of gender differences. The results of the analysis of the PBL learning model on critical thinking skills in terms of gender differences have a significant value of $0.755 > 0.05$. Recommendations for further research to conduct research related to problem-based learning models in terms of student learning styles.

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