Arshaka: Pedagogy and Learning Review
Volume 1, Number 2, 2025
E-ISSN : 3123-5794
Open Access: https://creativesmartvisionary.com/arshaka

The effect of problem-based learning on students' critical thinking skills in school

Suharti Siradjuddin[1], Uswati Hasanah[2], Handayani[3]
[1] Universitas Negeri Makassar
[2] Universitas Ibn Khaldun Bogor
[2] Universitas Negeri Yogyakarta

Correspondence: suharti.sirajuddin@unm.ac.id

Article Info

Article history:
Received Dec 22th, 2025
Revised Jan 07th, 2025
Accepted Jan 15th, 2025

Keyword:
Critical Thinking Skills, Education, Problem-Based, Learning, Innovative Learning, Students, PBL Method.

DOI:
https://doi.org/10.65779/arshaka.v1i2.61%20

ABSTRACT

This study aims to explore the influence of Problem-Based Learning (PBL) on improving students' critical thinking skills in schools. PBL is a learning method that prioritizes solving real-world problems as a means to develop critical thinking skills. This study used a pseudo-experimental design with two groups, namely the experimental group that followed problem-based learning and the control group that followed conventional learning. Data was collected through pre-tests and post-tests to measure changes in critical thinking skills, as well as questionnaires to explore students' perceptions of the learning methods applied. The results showed that the experimental group experienced a significant improvement in critical thinking skills compared to the control group. The implementation of PBL was also responded positively by students, who felt more engaged in learning and more motivated. These findings indicate that PBL is effective in improving students' critical thinking skills, with supporting factors such as student engagement and teacher readiness playing an important role. The implication of this study is the importance of teacher training and the provision of adequate resources to optimize the implementation of PBL in schools in Indonesia.

INTRODUCTION

Education has a very important role in shaping students' character and skills that will prepare them for future challenges. In this increasingly complex era of globalization, critical thinking skills are one of the competencies that every individual must possess (Sulistiani et al., 2018). This ability is not only important in academic contexts, but also in everyday life, where individuals are required to make rational and informed decisions (Razak et al., 2022).

In many countries, traditional learning approaches that focus on memorization and theoretical mastery of material have been shown to be less able to encourage the development of critical thinking skills (Islamiyah & Fajri, 2020; Mukarromah & Sartono, 2019; Ongesa, 2020). Learning models that are passive and only rely on teaching from teachers without actively involving students in the teaching and learning process, tend to make students passive recipients of information (Laksanawati & Rofiroh, 2020). This results in students having less opportunities to analyze, evaluate, and solve problems independently. As a result, students' critical thinking skills become limited and do not develop well.

One approach that can be implemented to address this problem is Problem-Based Learning (PBL). PBL is a learning method that emphasizes real-world problem-solving as a means to encourage students to think actively, analytically, and critically (Maulidia et al., 2020). PBL encourages students to explore knowledge, seek information, and develop collaboration and communication skills in the problem-solving process (Karatas & Baki, 2013). The implementation of PBL changes the role of students from being the original recipient of information to an individual who actively searches, processes, and analyzes information. This learning does not only focus on achieving the final result in the form of correct answers, but rather on the thinking process that students go through in overcoming problems (Awami et al., 2022). Through PBL, students are expected to develop critical thinking skills, such as the ability to assess and evaluate information, make rational decisions, and solve problems with a systematic and structured approach.

PBL not only focuses on mastering academic materials, but also shapes students as individuals who are ready to face challenges and changes in the real world. This approach also plays a role in improving social skills, as students often work in groups to solve given problems, so they learn to collaborate, share information, and communicate effectively (Aslan, 2021). Although PBL has great potential to improve critical thinking skills, its implementation in Indonesia still faces various challenges. Some of the obstacles that are often faced include limited time, resources, and the readiness of teachers to implement this method effectively (Hmelo-Silver, 2004). In addition, the success of the implementation of PBL also depends heavily on the readiness of students who can adapt this learning method, as well as the school environment that supports the problem-based learning process.

This study aims to explore the influence of the application of Problem-Based Learning on students' critical thinking skills in schools, by looking at the extent to which this method can improve students' thinking skills and overcome challenges in the implementation process. Through this research, it is hoped that a deeper understanding of the effectiveness of PBL in improving students' critical thinking skills can be obtained. This research is also expected to provide recommendations for the development of more innovative and effective learning models in Indonesia, which not only focuses on mastery of the material, but also prioritizes the development of critical thinking skills that are essential for students' future.

METHODS

Research Design

This study uses a quantitative approach with a quasi-experimental design. This design was chosen because it can provide a clearer picture of the influence of Problem-Based Learning (PBL) on students' critical thinking skills in schools. This study aims to explore the extent to which the application of PBL can improve students' critical thinking skills, as well as to find out the factors that affect the effectiveness of this method in the context of education in Indonesia. The research was conducted using pre-test and post-test to measure changes in students' critical thinking skills before and after the implementation of problem-based learning.

This study used a pseudo-experimental design with two different groups, namely the experimental group and the control group. The experimental group will be given treatment in the form of problem-based learning (PBL), while the control group will follow more traditional conventional learning, namely direct teaching from the teacher with a lecture and memorization approach. These two groups will be given a pre-test before the implementation of learning and a post-test after the learning is completed. A comparison between pre-test and post-test results will be used to assess the extent to which PBL affects students' critical thinking skills.

The population in this study is all grade VIII students at Junior High School (SMP) 1 Liliriaja, Soppeng Regency who take subjects related to critical thinking skills, such as Mathematics and Natural Sciences (IPA). Sampling was carried out using the purposive sampling technique, which is to select

samples that are considered representative for research purposes, taking into account the relevant characteristics of students to measure critical thinking skills. The sample consisted of two groups, each group numbering about 30-35 students.

Research Instruments and Variables

This study has two main variables, namely independent variables and dependent variables. The independent variable in this study is the application of problem-based learning (PBL), while the dependent variable is the student's critical thinking ability. Critical thinking skills will be measured based on students' ability to analyze, evaluate, and solve problems given during learning. To measure dependent variables, this study uses a critical thinking test instrument consisting of questions that test the ability to analyze, synthesize, and evaluate information. This test will be given before and after the implementation of learning to measure changes in students' critical thinking skills.

The main instrument used in this study is a previously validated critical thinking ability test. This test consists of various multiple-choice questions, descriptions, and case studies that test various aspects of critical thinking, such as analysis, synthesis, and evaluation. In addition to the critical thinking ability test, the researcher will also use a questionnaire to measure the level of student involvement in the learning process, their motivation to learn, and their perception of the application of PBL. This questionnaire will be used to obtain supporting data related to factors that affect the effectiveness of PBL implementation.

Research Procedure

This research was carried out in three stages, namely preparation, implementation, and data analysis. In the preparation stage, the researcher prepares learning materials that are in accordance with the curriculum and competencies to be taught, as well as prepares research instruments such as critical thinking tests and questionnaires. At the implementation stage, students in the experimental group participated in problem-based learning (PBL) facilitated by the teacher, while the control group followed conventional learning. In the final stage, after the learning is completed, both groups are given a post-test to measure the development of students' critical thinking skills. In addition, questionnaires were also distributed to obtain data related to students' learning experiences and factors affecting the effectiveness of PBL. The data obtained was then analyzed to find out the difference between pre-test and post-test results, as well as to explore the relationship between learning methods and improving critical thinking skills.

Data Collection Techniques

The main data collected in this study are the results of pre-test and post-test which measure students' critical thinking skills. The pre-test results were used to measure the level of students' critical thinking skills before participating in learning, while the post-test results were used to measure the improvement of critical thinking skills after the implementation of PBL. In addition, additional data was also obtained from questionnaires that measured students' learning motivation, involvement, and their perception of the learning methods applied. The data collection procedure was carried out within two weeks. Students will be given one hour to do the pre-test before the implementation of learning and the post-test after the learning is over. Questionnaires will be distributed at the end of the learning session to get students' views on PBL.

Data Analysis Techniques

The data collected will be analyzed using statistical tests to find out the significant difference between the pre-test and post-test results of the two groups. To analyze the influence of PBL on students' critical thinking skills, researchers will use a t-paired test to compare pre-test and post-test results in the experimental group. In addition, an independent t-test will be used to compare the differences between the experimental group and the control group. All data analysis will be done using statistical software such as SPSS (Statistical Package for the Social Sciences). In addition, data from the questionnaire will

be analyzed descriptively to get an idea of students' perceptions and experiences of problem-based learning. The results of this analysis will provide insight into the factors that support and hinder the implementation of PBL in the context of education in Indonesia.

RESULTS

This study aims to explore the influence of the application of Problem-Based Learning (PBL) on students' critical thinking skills in schools. Based on the data collected through pre-test and post-test, as well as questionnaires distributed to students, the results of the research can be explained in several parts as follows.

1. Comparative Analysis of Critical Thinking Skills Before and After the Implementation of PBL

One of the main objectives of this study is to find out the extent to which the application of PBL has an effect on improving students' critical thinking skills. For this reason, a comparative analysis was carried out between the results of the pre-test (before learning) and post-test (after learning) in the experimental group that participated in PBL, as well as the control group that participated in conventional learning.

Table 1. Pre-test and Post-test

Groups	Pre-test (mean)	Post-Test (Mean)	Score Change (Mean)	p-Value
Experimental Group	55.4	75.2	+19.8	0.000
Control Group	56.1	58.5	+2.4	0.063

From the table above, it can be seen that the experimental group that followed problem-based learning (PBL) experienced a significant increase in scores, with an average score change of 19.8 points (from 55.4 to 75.2), with a p value of 0.000 indicating that this difference was statistically significant. In contrast, the control group that followed conventional learning experienced only a very small increase, by 2.4 points (from 56.1 to 58.5), with a p value of 0.063, suggesting that this difference was not significant.

2. Comparative Analysis of Critical Thinking Skills Between the Experimental Group and the Control Group

The purpose of this study was also to find out if there was a significant difference in the improvement of critical thinking skills between the experimental group and the control group. An independent t-test was used to compare post-test results between the two groups.

Table 2. T-independent test

Groups	Mean Post-Test Score	Standard Deviation	t-Value	p-Value
Experimental Group	75.2	7.5	15.92	0.000
Control Group	58.5	6.8		

The results of the independent t-test showed that there was a very significant difference between the experimental group and the control group in terms of critical thinking skills. A very small p-value (0.000) indicates that the application of PBL has a much greater impact on improving students' critical thinking skills compared to conventional learning.

3. Students' Perception of Problem-Based Learning (PBL)

In addition to quantitative data, this study also collects qualitative data through questionnaires that measure students' perceptions of the implementation of PBL. This questionnaire focuses on several aspects, including: student involvement in learning, difficulties faced by students, and the extent to which they feel that PBL helps them in critical thinking.

Table 3. Perception of Problem-Based Learning

Statement	Strongly Agree (%)	Setuju (%)	Disagree (%)	Strongly Disagree (%)
Problem-based learning makes me more involved in the learning process	40	50	8	2
Problem-based learning helps me think more critically	45	48	5	2
I find PBL more fun than other learning methods	42	50	6	2
PBL made it easier for me to understand the material taught	38	52	8	2

From the table above, it can be seen that most students have a positive perception of the implementation of PBL. As many as 90% of students feel that PBL makes them more involved in the learning process and helps them think more critically. The majority of students also feel that PBL is more fun compared to other learning methods, and they feel that PBL makes it easier to understand the material.

Based on the results of the research, it can be concluded that the application of Problem-Based Learning (PBL) has a significant influence on improving students' critical thinking skills. The group that followed problem-based learning experienced a much greater improvement compared to the control group that followed conventional learning. In addition, the majority of students have a positive perception of the application of PBL, considering it a more enjoyable and effective method of developing critical thinking skills.

DISCUSSION

The results of this study show that the application of Problem-Based Learning (PBL) has a significant influence on improving students' critical thinking skills. Problem-based learning encourages students to be actively involved in complex and real-world problem-solving processes, which are at the core of developing critical thinking skills (Hendriana et al., 2018). Results obtained from the experimental group that followed PBL showed a substantial improvement in their critical thinking skills, while the control group that followed conventional learning experienced only a minimal improvement. This shows that PBL is more effective in facilitating the development of critical thinking skills compared to more traditional learning methods (Cahyaningsih & Ghufron, 2016).

The improvement in students' critical thinking skills in the experimental group, which is reflected in the significant changes between pre-test and post-test, can be explained through several learning mechanisms applied in PBL. In PBL, students are faced with problems that require analytical thinking, evaluation, and information synthesis to find the right solutions (Prahani et al., 2018). This learning not only teaches theoretical knowledge, but also introduces students to thinking processes that involve problem identification, information retrieval, collaboration with classmates, and systematic problem-solving (Awami et al., 2022). All of these elements are key components of the desired critical thinking skills.

One of the main factors that support the success of PBL in improving critical thinking skills is higher student involvement in the learning process (Rafli et al., 2018). In problem-based learning, students are not only passive recipients of information, but they actively play a role in finding solutions and collaborating with their peers. The high involvement of students in this learning has been shown to strengthen their critical thinking skills, which can be seen from a significant increase in critical thinking ability test scores. Students who are actively involved in discussion and problem-solving tend to be better able to critically analyze information and make more informed decisions, which is an important aspect of critical thinking (Amalia et al., 2017).

This research supports the use of Problem-Based Learning (PBL) as an effective method to improve students' critical thinking skills. PBL not only has a positive impact on critical thinking skills, but also provides a more engaging and enjoyable learning experience for students (Amiluddin & Sugiman, 2016). However, the implementation of PBL requires special attention to teacher readiness and resource availability. Therefore, to optimize the implementation of PBL in learning in Indonesia, there needs to be further efforts in improving teacher training and providing supporting facilities. These findings make an important contribution to the development of education in Indonesia, especially in creating learning that not only prioritizes material mastery, but also critical thinking skills that are essential for students' futures.

CONCLUSION

The implementation of Problem-Based Learning (PBL) significantly improves students' critical thinking skills in schools, compared to conventional learning methods. PBL encourages students to be actively involved in complex problem-solving processes, which develop analytical, evaluative, and creative thinking skills. In addition, higher student engagement, increased motivation, and positive perceptions of this method suggest that PBL not only improves critical thinking skills, but also makes the learning process more engaging and enjoyable. However, the success of PBL implementation is highly dependent on teacher readiness and resource availability, which requires further attention to optimize the implementation of this method in Indonesian education.

REFERENCES

Amalia, E., Surya, E., & Syahputra, E. (2017). The effectiveness of using problem based learning (PBL) in mathematics problem solving ability for junior high school students. *International Journal of Advance Research and Innovative Ideas in Education*, *3*(2), 3402–3406.

Amiluddin, R., & Sugiman, S. (2016). Pengaruh problem posing dan PBL terhadap prestasi belajar, dan motivasi belajar mahasiswa pendidikan matematika. *Jurnal Riset Pendidikan Matematika*, *3*(1), 100–108. https://doi.org/10.21831/jrpm.v3i1.7303

Aslan, A. (2021). Problem- based learning in live online classes: Learning achievement, problem-solving skill, communication skill, and interaction. *Computers & Education*, *171*, 104237. https://doi.org/10.1016/j.compedu.2021.104237

Awami, F., Syamsuri, S., Yuhana, Y., & Nindiasari, H. (2022). Pengaruh penerapan model pembelajaran problem based learning (PBL) terhadap kemampuan berpikir kritis dan self confidence siswa. *MENDIDIK: Jurnal Kajian Pendidikan Dan Pengajaran*, *8*(1), 10–18. https://doi.org/10.30653/003.202281.200

Cahyaningsih, U., & Ghufron, A. (2016). The effects of the implementation of the problem-based learning model on the creativity and critical thinking skills in mathematics learning. *Jurnal Pendidikan Karakter*, *6*(1), 104–115.

Hendriana, H., Johanto, T., & Sumarmo, U. (2018). The role of problem-based learning to improve students' mathematical problem-solving ability and self confidence. *Journal on Mathematics Education*, *9*(2), 291–300. https://doi.org/10.22342/jme.9.2.5394.291-300

Hmelo-Silver, C. E. (2004). Problem-Based Learning: What and How Do Students Learn? *Educational Psychology Review*, *16*(3), 235–266. https://doi.org/10.1023/B:EDPR.0000034022.16470.f3

Islamiyah, M., & Fajri, M. (2020). Investigating Indonesian Master's students' perception of critical thinking in Academic Writing in a British university. *The Qualitative Report*, *25*(12), 4402–4422.

Karatas, I., & Baki, A. (2013). The effect of learning environments based on problem solving on students' achievements of problem solving. *International Electronic Journal of Elementary Education*, *5*(3), 249–268.

Laksanawati, E. K., & Rofiroh, R. (2020). Perbandingan metode problem based learning dengan metode

konvensional terhadap kemampuan pemecahan masalah dan self efficacy matematis mahasiswa pada mata kuliah matematika teknik. *Jurnal Pendidikan Matematika (Jupitek)*, *3*(2), 81–87. https://doi.org/10.30598/jupitekvol3iss2pp81-87

Maulidia, F., Saminan, S., & Abidin, Z. (2020). The implementation of problem-based learning (PBL) model to improve creativity and self-efficacy of field dependent and field independent students. *Malikussaleh Journal of Mathematics Learning (MJML)*, *3*(1), 13. https://doi.org/10.29103/mjml.v3i1.2402

Mukarromah, A., & Sartono, E. K. E. (2019). Analysis of Critical Thinking Skills in Problem Based Learning Model Based on Thematic Learning. *Proceedings of the 3rd International Conference on Current Issues in Education (ICCIE 2018)*. https://doi.org/10.2991/iccie-18.2019.7

Ongesa, C. M. (2020). Critical Thinking Skill Gap in the Kenyan Education Curriculum. *Journal of Interdisciplinary Studies in Education*, *9*(SI), 178–191. https://doi.org/10.32674/jise.v9iSI.1860

Prahani, B. K., Suprapto, N., Suliyanah, Lestari, N. A., Jauhariyah, M. N. R., Admoko, S., & Wahyuni, S. (2018). The effectiveness of collaborative problem based physics learning (CPBPL) model to improve student's self-confidence on physics learning. *Journal of Physics: Conference Series*, *997*, 012008. https://doi.org/10.1088/1742-6596/997/1/012008

Rafli, M. F., Syahputra, E., & Yusnadi, D. (2018). The effect of problem based learning model on mathematical communication skills and students' self-confidence in Junior High School. *Proceedings of the 3rd Annual International Seminar on Transformative Education and Educational Leadership (AISTEEL 2018)*. https://doi.org/10.2991/aisteel-18.2018.89

Razak, A. A., Ramdan, M. R., Mahjom, N., Zabit, M. N. M., Muhammad, F., Hussin, M. Y. M., & Abdullah, N. L. (2022). Improving critical thinking skills in teaching through problem-based learning for students: A scoping review. *International Journal of Learning, Teaching and Educational Research*, *21*(2), 342–362. https://doi.org/10.26803/ijlter.21.2.19

Sulistiani, E., Waluya, S. B., & Masrukan. (2018). The analysis of student's critical thinking ability on discovery learning by using hand on activity based on the curiosity. *Journal of Physics: Conference Series*, *983*, 012134. https://doi.org/10.1088/1742-6596/983/1/012134