Implementing Problem-based Learning to Develop Students' Critical and Creative Thinking Skills

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A B S T R A K

Pembelajaran Berbasis Masalah (PBL) adalah pendekatan pendidikan inovatif yang menghadapkan siswa pada masalah kehidupan nyata, mendorong pemikiran kritis, pemecahan masalah, dan kerja tim melalui metode praktis. Penelitian ini membahas tentang efektivitas Pembelajaran Berbasis Masalah (PBL) dalam meningkatkan keterampilan kritis dan kreatif siswa. Pembelajaran berbasis masalah (PBL) adalah pedagogi yang berpusat pada siswa yang berfokus pada pengembangan keterampilan kritis dan kreatif. Penelitian ini menggunakan desain penelitian deskriptif untuk mengumpulkan fenomena penerapan Pembelajaran Berbasis Masalah di kelas. Pengumpulan data dilakukan dengan melakukan wawancara dan angket kepada siswa yang terpilih sebagai sampel dalam penelitian ini dan wawancara semi terstruktur terhadap guru terpilih. Kuesioner menunjukkan terdapat 59,10% jawaban sangat setuju; 38,97% jawaban setuju; 1,93% dari mereka yang ragu-ragu; tanggapan dan tidak ada satupun tanggapan yang menunjukkan tidak setuju dan tidak setuju. Hasil penelitian menunjukkan bahwa Pembelajaran Berbasis Masalah merupakan metode pengajaran yang efektif untuk meningkatkan keterampilan berpikir kreatif dan hasil belajar siswa. Penelitian ini menyiratkan bahwa guru hendaknya meningkatkan penerapan Pembelajaran Berbasis Masalah untuk membantu siswa mengembangkan keterampilan berpikir kritis dan kreatif.

A B S T R A C T

Problem-Based Learning (PBL) is an innovative approach to education that exposes students to real-life problems, promoting critical thinking, problem-solving, and teamwork through practical methods. This study analyzes the effectiveness of Problem-based learning (PBL) in improving students' critical and creative skills. Problem-based learning (PBL) is a student-centered pedagogy that focuses on developing critical and creative skills. This study used a descriptive research design to gather the phenomena of implementing Problem-Based Learning in the classroom. The data were collected by conducting interviews and questionnaires to the students who were selected as the sample in this study and semi-structured interviews with the selected teachers. The questionnaire showed that there were 59.10% of strongly agreed responses; 38.97% of agreed responses; 1.93% of the undecided; responses and none of the responses showed disagreed and disagreed. The study results showed that Problem-Based Learning is an effective teaching method to improve creative thinking skills and student learning outcomes. This study implies that teachers should increase the implementation of Problem-Based Learning to help students develop critical and creative thinking skills.

1. INTRODUCTION

Learning is helping students obtain information, ideas, skills, values, ways of thinking, and ways of learning how to learn. The learning process must pay attention to student involvement. So far, learning activities in secondary schools still emphasize changing thinking skills at the primary level, not maximizing students' higher-order thinking skills. Higher-order thinking skills are also essential for mental development and changes in students' mindsets, so the learning process is expected to succeed. Critical and creative thinking skills are higher-order thinking skills that can be used to solve a problem (Sari et al., 2021; Sasson et al., 2018).

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Educators have tried to emphasize critical and creative thinking skills, but such curriculum content makes teachers prioritize other aspects, such as only understanding concepts. Generally, learning does not provide opportunities for students to find answers or ways different from what the teacher has taught. Critical and creative thinking is rarely emphasized in learning because the learning strategies tend to be oriented towards developing analytical thinking with routine problems (Prafitasari et al., 2021; Suhirman et al., 2021). The ability to think critically and creatively is needed considering that today science and technology are developing very rapidly and allow anyone to obtain information quickly and easily with abundance from various sources and anywhere (Plotnikova & Strukov, 2019; Widiastuti et al., 2019).

These resulted in rapid changes in the order of life and global changes in life. Students must be equipped to think critically and creatively to process, assess and retrieve the information needed to face these challenges (Mantra et al., 2022; Sumarni & Kadarwati, 2020). The ability to think critically and creatively is essential in life. Creativity cannot be influenced by learning, and creative work is more a sudden occurrence than a long process to completion, as is done in school. Creativity is generally a process of understanding a problem, looking for possible solutions, drawing hypotheses, testing and evaluating, and communicating the results to others (Liyanage et al., 2021; Nugroho & Nasionalita, 2020).

Critical and creative thinking skills can be trained through learning that requires students to explore, inquire, discover and solve problems (Siburian et al., 2019; Tofade et al., 2013). Learning that can lead students to develop or overcome critical and creative thinking can be assumed to use a problem-based learning model. Students are given a problem which is a problem, and through this learning model, students are expected to be able to investigate, investigate, and solve it. This model also requires students to be active in the learning process and have the opportunity to find and or apply students' ideas. Students demand the critical thinking skills of trained students to determine whether the knowledge obtained is correct or how to solve problems by checking the steps (Hanipah et al., 2018; Yusuf et al., 2020).

Problem-Based Learning (PBL) is an innovative and practical approach to education that emphasizes critical thinking, problem-solving, and teamwork. Unlike traditional teaching methods that rely heavily on lecture-style instruction, PBL places students at the centre of the learning process, challenging them to work collaboratively to solve real-world problems (Heong et al., 2020; Widya et al., 2021). This approach has been shown to have many benefits, including increased student engagement, improved retention of knowledge, and the development of essential skills such as communication, collaboration, and critical thinking. In today's rapidly changing world, where the ability to solve complex problems is becoming increasingly important, PBL is emerging as a valuable tool for preparing students for success in the 21st-century workforce (Dwi et al., 2020; Haatainen & Aksela, 2021).

The problem-based learning model is a learning model that involves dominant student activity, and the teacher acts as a facilitator. Problem-based learning applied to students can improve critical thinking skills (Nurtanto et al., 2019; Samsudin et al., 2021). This problem-based learning begins with a problem to be solved, so students are directed to have the ability to think critically and creatively. Some of the weaknesses of problem-based learning: (a) the time required for learning is more extended period; (b) Constraints with the teacher factor, which is difficulty in changing orientation from teacher teaching to student learning; (c) The difficulty of designing problems that meet problem-based learning standards (Mantra et al., 2021; Ulger, 2018).

The success of the learning process must be connected to the ability of teachers to develop learning models that are oriented towards increasing the intensity of student engagement effectively in the learning process (Handayani & Mantra, 2022; Vavropa et al., 2012). In order to be able to develop effective learning models, each teacher must have sufficient knowledge regarding the concept and ways of implementing those models in the learning process. A teacher's lack of understanding of these various conditions causes the model developed by the teacher to be unable to increase the student's role in learning optimally and ultimately unable to make a significant contribution to the achievement of student learning outcomes (Handayani et al., 2023; Sutarto et al., 2020).

Based on the results of observations and interviews with teachers at the school where this research was carried out, in learning, the teacher only focuses on improving students' cognitive abilities and has not empowered students' critical and creative thinking abilities so that students have low critical and creative thinking skills. Creative thinking is essential to one's success in carrying out life activities. Creative thinking determines the superiority of a nation. The progress of a nation is no longer determined by how many resources that nation has, but is determined by how creative the people in that nation are. Students are the successors of the nation who will determine the existence of the nation in the future.

Studies have shown that PBL can significantly improve students' critical thinking skills (Aswan et al., 2018; Hussin et al., 2018; Vlasenko et al., 2020). In PBL, students are required to analyze and evaluate information, make decisions, and solve problems. By working collaboratively and engaging in discussions, students are exposed to different perspectives and encouraged to think critically about the problem. PBL

provides a platform for students to explore new ideas and perspectives, which enhances their ability to generate creative solutions (Octafianellis et al., 2021; Zhou, 2012). Studies have shown that PBL can significantly improve students' creative thinking skills and ability to apply them to real-world problems.

Moreover, previous studies have shown that PBL positively impacts academic performance (Amin et al., 2020; Jailani et al., 2017; Khoiriyah & Husamah, 2018). Students develop a deeper understanding of the subject matter by engaging in active learning and problem-solving. This understanding translates into improved academic performance. Studies have shown that students who engage in PBL perform better on exams and achieve higher grades than those who do not. PBL has been shown to increase student engagement. By providing students with real-world problems to solve, PBL makes learning more meaningful and relevant. Students are more likely to be engaged in the learning process (Putri et al., 2020; Sajidan et al., 2022).

Based on the findings of the previous studies and phenomenon described above, PBL is an educational strategy that allows students to learn while actively participating in a given open topic. Students are given the opportunity to work together to solve difficulties. Problem-based learning is student-cantered, as opposed to traditional learning, which is teacher-cantered and focused on memorization. Students are directly involved in the problem-solving process in this technique, which fosters autonomous learning habits. It is, however, PBL has not yet been implemented optimally at schools due to various perceptions and knowledge of the teachers related with the PBL implementation. Therefore, teachers are required to improve students' ability to think critically and creatively. Problem-Based learning is implemented in this research to improve students' critical and creative thinking skills. Problem-Based learning is learning that is carried out by exposing students to real problems in everyday life, so students can construct their knowledge in solving problems, seeking various solutions, and encouraging students to think.

2. METHOD

This study used a descriptive research design to reveal the natural phenomena of implementing problem-based learning to improve students' critical and creative thinking skills (Nassaji, 2015; Wahab et al., 2018). There were 40 teachers participated in this study. The instruments were questionnaire, interview guide and interview questions. All teachers who participated in this study were asked to answer the questionnaire, and five teachers were selected to be interviewed. They were interviewed through google meet and conducted in a very relaxed situation to ensure teachers provided the appropriate information about the natural phenomena. The quantitative data were collected through administrating questionnaire to all participants to collect data related to implementing problem-based learning to improve students' critical and creative thinking skills. The data analysis was done descriptively and carried out interactively and continuously until precise data were established. Data analysis was started by doing a reduction process which means summarizing, choosing the primary data, focusing on the essential things, looking for themes and patterns, and discarding unnecessary ones. The presentation of data was done in the form of brief descriptions to make it easier to understand the phenomenon. Data verification is carried out where the researcher tries to find patterns, themes, relationships, similarities, things that often arise, and the data obtained to conclude the findings. The data that have been concluded were verified during the research. Verification is an examination of the veracity of a report to ensure its validity. In this study, the data validation technique used was triangulation with sources. Triangulation with sources means comparing and double-checking the degree of trustworthiness of information obtained through an online survey and interviews.

3. RESULT AND DISCUSSION

Result

The interview excerpts described teachers' positive perceptions of the importance of Problem-Based Learning. Teachers' positive perception of the importance of problem-based learning is show in Table 1.

Table 1. Teachers' Positive Perceptions of the Importance of Problem-based Learning

Teachers	Interview Excerpts	Analysis
Teacher A	*"In my classroom, I always implemented problem-based learning to improve students' critical and creative thinking skills. My students find that problem-based learning is a very*	The excerpt reflects a teacher's commitment to providing a learning environment that develops critical and creative thinking skills through problem-based learning.

Teachers	Interview Excerpts	Analysis
	suitable learning model because they have a lot of opportunities to solve the problems"	
Teacher B	*"I found problem-based learning is the most effective learning model to improve students' critical and creative thinking skills. My students enjoyed discussing all the problems in their group and presenting the results to the class"*	The excerpt reflects the teacher believes the effectiveness of problem-based learning for improving critical and creative thinking skills, as well as their experience of using this approach in the classroom with positive student results.
Teacher C	*"I often implemented problem-based learning to improve students' critical and creative thinking skills because this learning model allows my students to share the problems with other students and they could discuss the solution in groups"*	The excerpt reflects a teacher's belief in the effectiveness of problem-based learning for improving critical and creative thinking skills, as well as the experience of using this approach in their classroom to promote collaboration and communication skills among their students.
Teacher D	*"Well, I found problem-based learning is very popular nowadays, I implemented it in the classroom most of the time. This learning model provides a lot of chances for the students to discuss the answers to the problems in the group. Moreover, students are allowed to present their answers to other groups, too"*	The excerpt reflects a teacher's consideration of the benefits of problem-based learning for promoting active student engagement, collaboration, and the development of critical thinking and communication skills.
Teacher E	*"I like implementing problem-based learning because my students are always active in discussing the problems in their groups and they enjoyed the class. Moreover, they could find more appropriate solutions to the problems"*	The excerpt reflects a teacher's positive experience with implementing problem-based learning in their classroom and the experience of using it to enable students to solve various problems

Base on Table 1 reflect the positive perceptions and beliefs of teachers about the effectiveness of problem-based learning for improving critical and creative thinking skills and promoting active student engagement, collaboration, and communication skills. The teachers also emphasize the importance of providing opportunities for students to solve real-world problems and to work in groups to find solutions. These excerpts suggest that problem-based learning is a valuable teaching approach that can enhance students' learning experiences and prepare them for success in the real world.

Table 2 indicates that problem-based learning is implemented in the classroom because it promotes students' critical thinking and works collaboratively in groups to solve complex problems. Moreover, students practised thinking independently and sharing their knowledge with their groups.

Table 2. Teachers' Implementation of Problem-based Learning in the Classroom

Teachers	Interview Excerpts	Analysis
Teacher A	*"I implement problem-based Learning in the classroom because it promotes critical thinking skills by requiring students to analyse information and apply it to real-world problems. It also promotes creative thinking skills by encouraging students to generate new ideas and solutions to these problems. By engaging in PBL, students develop the ability to think independently, collaborate with others, and apply their knowledge to solve complex problems"*	the excerpt reflects the teacher's effective implementation of problem-based learning for promoting various essential skills and abilities, including critical and creative thinking, collaboration, and independent problem-solving. The teacher implemented PBL because it is a useful teaching model to engage students in learning
Teacher B	*"I implemented Problem-based Learning for one unit, it was very successful and now I often implement "Problem-Based learning in my classroom because it promotes students' critical*	The excerpt reflects the teacher's implementation of problem-based learning for promoting active student engagement, collaboration, and the

Teachers	Interview Excerpts	Analysis
	and creative thinking skills. My class is always successful because PBL enables students to think critically about a real-world problem, collaborate with their peers, and apply their knowledge in a meaningful way"	development of critical and creative thinking skills. The teacher's positive experience with implementing PBL and commitment to promoting meaningful and active learning
Teacher C	*"I implemented Problem-based learning because it prepares students for success in the real world by teaching them to think critically and creatively about complex problems. In today's rapidly changing world, employers are looking for individuals who can think independently, solve problems, and work collaboratively with others. PBL helps students develop these skills by providing them with opportunities to engage in authentic, real-world problem-solving experiences"*	The excerpt reflects the teacher's implementation of problem-based learning to promote essential skills and abilities for students' future success. The teacher's emphasis is on the practical relevance of PBL and its ability to prepare students for the real world. The teacher considered PBL promotes student-centred learning
Teacher D	*"I carry out the PBL into my teaching practice by designing the learning activities that revolve around a central problem. I guide students through the process of solving the problem by providing them with resources and scaffolding their thinking. One challenge I face is ensuring that all students are engaged and contributing equally to the group"*	The excerpt reflects a teacher's implementation of problem-based learning to promote active student engagement and critical thinking through PBL. The teacher's practical approach to incorporating PBL into their teaching practice and awareness of the importance of promoting equity and inclusion in the classroom.
Teacher E	*"I implemented PBL in my classroom because it is a teaching method that involves presenting students with a complex, real-world problem and guiding them through the process of solving it. It benefits students by promoting critical thinking skills, such as analysing and evaluating information, and creative thinking skills, such as generating new ideas and solutions. Through implementing PBL, students can develop the ability to think deeply about complex problems and apply their knowledge in meaningful ways*	The excerpt reflects a teacher's commitment to promoting active student engagement and critical thinking through PBL. The teacher's practical approach to incorporating PBL into their teaching practice and awareness of the importance of promoting equity and inclusion in the classroom suggest a student-centred approach to teaching and a willingness to adapt teaching practices to meet students' needs.

Base on Table 2 all five teachers implemented Problem-based Learning and share a positive view of problem-based learning (PBL) as a teaching method for promoting critical and creative thinking skills in students. They highlight PBL's ability to encourage independent thinking, collaboration, and the application of knowledge to solve complex real-world problems. They also acknowledge the challenge of ensuring equal participation from all students in group work. Overall, they view PBL as an effective way to prepare students for success in the real world by providing authentic, problem-solving experiences that promote critical and creative thinking skills.

The questionnaire consisted of ten statements that were administered to the students to find out the degree of their agreement with the implementation of Problem-based Learning in enhancing their critical and creative thinking skills as well their learning competence. Moreover, the results of the questionnaire were analysed by using a rating scale of 5 to 1. The summary of the results of the questionnaire was presented in Table 3.

Table 3. The Summary of the Results of the Questionnaire

Option Selected	Rating Scoring Result	Conversion in Percentage
Strongly Agree	825	59.10%
Agree	544	38.97%
Undecided	27	1.93%
Disagree	0	0%

Strongly Disagree	0	0%
Total	**1396**	**100%**

Based on the tabulation of the questionnaire in Table 3, the questionnaire results showed that there were strongly agreed responses: 825, agree responses: 544; undecided responses: 27, and there was no student provided disagreed and strongly disagree responses. Consequently, the total number of responses was 1396. The responses were then converted into percentages and the results of the questionnaire showed that there were 59.10% of the strongly agreed responses; 38.97% of the agreed responses; 1.93% of the responses undecided; and none of the responses showed disagreed and disagreed strongly.

Discussion

The excerpts concerning teachers' positive perceptions of Problem-Based Learning and teachers' implementation of Problem-based Learning showed that teachers perceived problem-based learning as beneficial for the students. Teachers thus implemented Problem-based learning (PBL) is renowned among teachers because it encourages active and engaged learning since students are encouraged to find answers to complicated problems involving real-world situations. Since they are actively applying their knowledge to actual circumstances, it can help students retain the information better. All of the teachers had a favourable opinion of problem-based learning (PBL) and concurred that it encourages students to think critically and creatively. Additionally, they emphasized how crucial it is for students to learn how to apply their knowledge to real-world issues and foster teamwork. Teacher A emphasized how PBL promotes teamwork, independent thought, and the capacity to tackle complicated challenges. Teacher B has had success with PBL and highlighted the advantages of students being able to collaborate with peers and apply information in a meaningful way to challenges in the real world. PBL, in the opinion of Teacher C, was implemented PBL because it integrates students in problem-solving and relates the solution to the real world.

Moreover, students are trained to work in a team. Similarly, teacher D conducted PBL in the classroom due to some major issues, fostering students' critical thinking, and recognizing the difficulty of assuring equitable participation in group projects. Last but not least, Teacher E carried out PBL in the teaching-learning processes because PBL has the capacity to foster critical and creative thinking. The findings confirmed a study conducted by previous study which revealed that PBL is an effective way to promote critical thinking, creativity, collaboration, and problem-solving skills in students, and they all strive to incorporate it into their teaching practice (Widiastuti et al., 2019). This is in line with the study conducted (Mantra et al., 2022).

Additionally, based on the excerpts of the interviews related to the implementation of problem-based learning, it was found that teachers recognized the benefits of implementing problem-based learning (PBL) in the classroom, including promoting critical and creative thinking skills, developing independent thinking, collaborating and apply knowledge to solve complex problems. However, there are some differences in how they implement PBL. Teacher A emphasizes the importance of PBL in promoting critical and creative thinking skills as well as developing independent, collaborative thinking and applying knowledge to solve problems in the world (Heong et al., 2020; Purnamasari et al., 2020). Teacher B has successfully implemented PBL for a lesson and now applies it regularly in the classroom. This finding is line with the findings of the study conducted (Handayani & Mantra, 2022).

Similarly, teacher C implemented the PBL to prepare students for real-world success by teaching them to think critically and creatively about complex problems. The teacher emphasized the importance of developing skills that employers seek, such as independent thinking, problem-solving, and collaboration (Heong et al., 2020; Yazar Soyadı, 2015). Moreover, teacher D integrated PBL into the teaching practice by designing lessons around a central issue. The teacher-guided students through the problem-solving process by providing resources and supporting their thinking. Similarly, teacher E also implemented PBL because it has the capacity to arouse students' critical thinking and creative thinking skills. Teacher E describes PBL as a teaching method that involves presenting students with a complex, real-world problem and guiding them through the process of solving it (Monalisa et al., 2019; Purnamasari et al., 2020). Problem based learning can be utilized to teach various topics of learning and it enables teachers to engage the students in critical and creative thinking activities. PBL can also be combined with other learning strategy to maximize students' participation in learning (Shanks et al., 2017; Ulger, 2018). This suggests that they implemented PBL by structuring it around a central problem and providing support to students during the process (Mantra et al., 2022; Widiastuti & Saukah, 2022). However, all of their approaches involve guiding students through the process of solving complex problems and developing critical and creative thinking skills.

The findings of this study clearly showed that problem-based learning (PBL) is an effective learning method to be implemented in the classroom in this millennium era. All teachers in this study considered that PBL encourages student collaboration and communication. By working in groups to solve problems, students develop teamwork and social skills essential for success in the real world. Moreover, PBL promotes critical and creative thinking skills, which are increasingly important in a rapidly changing world nowadays. Students are challenged to analyse information, synthesize ideas, and develop innovative solutions to complex problems. Additionally, previous study state PBL can help prepare them for future careers and leadership roles because critical thinking and creative thinking skills are really essential skills to be mastered by the students (Utami et al., 2020). Moreover other study state teachers should continually assess students' progress and provide feedback (Widiastuti & Saukah, 2022).

For supporting data, researchers conducted questionnaires to learn students' responses to implementing problem-based learning to improve students' critical and creative thinking skills. Questionnaire percentages were 59.10%, 38.97%, 1.93%, 0%, and 0% of respondents who responded strongly, agree, do not agree, disagree, or strongly disagree, respectively. These figures indicated that the students responded positively to implementing problem-based learning to improve students critical and creative thinking skills. In other words, most teachers agreed that implementing problem-based learning could improve students' critical and creative thinking skills. Previous study state implementing problem-based learning could improve their writing skills (Susanti et al., 2020). Moreover, teachers' questionnaire responses indicated that implementing problem-based learning improves students' critical and creative thinking skills (Anazifa & Djukri, 2017; Rustam et al., 2017).

All teachers in this study implemented the PBL because it promotes a student-centred learning environment where students are encouraged to take responsibility for their own learning, ask questions, and seek out information. One of the most important benefits of PBL is that it promotes learning. When students engage in problem-solving, they are more likely to remember what they have learned and understand it on a deeper level. PBL also helps students develop essential skills such as critical thinking, problem-solving, collaboration and communication. These skills are essential to succeed in the 21st-century workforce, where employers are increasingly looking for employees who can work effectively in teams, be creative, and solve problems. This study implies that problem-based learning should be more intensified in the classroom to improve students' critical thinking and creative skills. These skills are highly essential nowadays to prepare students to compete in the globalization era.

4. CONCLUSION

This study discusses the effectiveness of Problem-based learning (PBL) in improving students' critical and creative skills. Problem-based learning (PBL) is a student-centred pedagogy that focuses on developing critical and creative skills. This study found that PBL is an effective method for engaging students in learning and increasing learning motivation. PBL also encourages students to take ownership of their learning and actively participate in the process. Teachers can develop their teaching skills by providing various learning activities, making PBL crucial for enhancing students' competence. The success of PBL in enhancing students' critical and creative skills has been experienced by all teachers in this study. Problem-based learning (PBL) is a very effective teaching method for developing students' creative and critical thinking skills. Based on the discussion above, it can be concluded that problem-based learning can help in developing skills students' critical and creative thinking skills.

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