The effect of problem-based learning model assisted by pictorial riddle media on critical thinking skills of elementary school students

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ABSTRACT

The Problem-Based learning (PBL) model is a learning approach that emphasizes problem-solving, collaboration, and reflection. This model helps teachers develop students' critical thinking skills during the learning process. This study aims to determine the effect of the PBL model assisted by Pictorial Riddle media in improving students' critical thinking skills. This research method applies a quasi-experimental method with a Non Equivalent Control Group Design class design. This study involved two classes with a total of 40 grade 4 students as the population. From the population, a sample of 20 students from each class was selected. This study shows that the use of the Problem-Based Learning (PBL) model assisted by Pictorial Riddle media has a significant positive impact on the critical thinking skills of elementary school students. Data analysis showed a significant increase in critical thinking skills in the group that used the PBL approach assisted by Pictorial Riddle media compared to the control group that followed conventional learning. This finding indicates that the use of PBL with Pictorial Riddle media can help improve students' ability to solve problems, make decisions, and think critically. This research implies that it provides new insights into the use of innovative learning approaches to improve the critical thinking skills of elementary school students, as well as providing a basis for the development of more effective learning strategies in the future.

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1. Introduction

As global development accelerates, the demand for advancement and creativity in Human Resources (HR) is increasing. With a large labor force in Indonesia, the hope is that education can be more effective in improving its quality. However, the reality is not always in line with these expectations (Febri et al., 2023). One of the steps that can be taken is to improve the quality of education because education is very important as one of the determinants of the quality of human resources. The quality of human resources has a positive contribution to the quality of education. The quality of education is often assessed based on good conditions, proper fulfillment of requirements, and completeness of components in education (Fitrah, 2017). According to Permendikbud Number 22 of 2016, the teaching and learning process in schools must be active, motivate students, create a comfortable learning environment, and encourage student independence according to their abilities, interests, talents, and physical and psychological development (Handayani & Koeswanti, 2021).

Rahmadhani et al. (2022) stated that Indonesia has experienced several curriculum changes, which shows how important the curriculum is in the national education system.

The curriculum has an important role in the field of education as a tool, reference, foundation, and worldview. Along with the development of science and technology, the curriculum continues to be updated to keep up with this (Angga et al., 2022). The Ministry of Education, Culture, Research, and Technology (Kemendikbudristek) has introduced the Merdeka Curriculum as an effort to improve the educational experience for students and teachers. This curriculum gives students the freedom to develop their potential according to their interests (Sulistyosari et al., 2022). In the context of the Merdeka Curriculum, it is expected that educational institutions can develop a curriculum that suits the unique characteristics of schools and individual learning needs. However, challenges remain, with many educational institutions still struggling to fully adapt the curriculum to the needs of diverse students (Evendi et al., 2023). Therefore, educational institutions must provide opportunities for students to hone their abilities, including in changing teaching methods to suit the principles of the Merdeka Curriculum.

In the learning process, every student must be actively involved to achieve the learning objectives. This requires guidance from the teacher to motivate and encourage students to be fully engaged in the learning process. Teachers must have mastery of the subject matter and effective teaching strategies. As a motivator, teachers have the responsibility to inspire students to actively participate in the learning process. If students have difficulty understanding the material, teachers must be proactive in overcoming these learning challenges (Novitasari & Fathoni, 2022). However, many schools still use the lecture method in delivering subject matter without utilizing interesting learning models. Based on observations and interviews with 5th-grade teachers at SDN 6 Ampenan, Mataram City, it was revealed that students' critical thinking skills in learning were still low. This is due to the lecture method which is still dominated by the teacher in learning. The lack of an interactive learning model causes students boredom, thus hindering their understanding of the material being taught. Therefore, teachers are responsible for transforming a boring learning environment into a fun atmosphere and increasing student interest (Yulianti et al., 2022; Kholil, 2021). This shows how important the role of teachers is in supporting students' development to achieve their life goals. Therefore, teachers need to have the necessary skills to ensure that the learning process not only runs smoothly but also provides an enjoyable experience for students (Mahesti & Koeswanti, 2021). To meet this challenge, it is important to use appropriate learning models to motivate students in the teaching-learning process.

Problem-Based Learning is a model in which students focus on the presentation of real problems. They are asked to solve the problem and conduct a series of investigations based on the theory, concepts, and principles of impulse and momentum independently or in groups (Sianipar & Purwanto, 2020). Problem-based learning has the potential to link various issues in everyday life, including those that are relevant to students (Faqiroh, 2020). This model assists teachers in developing students' critical thinking skills during the learning process. The syntax of the Problem-Based Learning model includes: (1) directing students to the problem, (2) organizing students for learning, (3) guiding individual/group experiences, (4) developing and presenting results, (5) analyzing and evaluating the problem-solving process (Aprilianingrum, 2021; Astuti, 2019) Selection of appropriate instructional models can create motivation in the learning process. To support these models, the use of instructional media is very important in learning activities.

The implementation of learning media is an appropriate method to improve student understanding (Khalbu & Ulfa, 2023). Integrating learning media in the teaching-learning process is an effort to improve the effectiveness and quality of the learning process, which ultimately improves the quality of student learning outcomes. Judicious use of media can help students in understanding the material being taught (Mufliha et al., 2023). Picture puzzles are a type of media that can improve students' critical thinking skills by presenting visual or text puzzles, with the aim of training students' critical thinking skills (Hidayati et al., 2023). Visual presentation through picture puzzles is intended to stimulate critical thinking, allowing students to solve problems through group discussions (Azizah et al., 2022). Students have critical thinking skills in the learning process, such as asking questions, making hypotheses, classifying, observing, and interpreting (Sarangih, 2019). Critical thinking can stimulate students to solve problems related to learning materials. Critical thinking skills involve the ability to be curious about available information to achieve deep understanding (Supena

et al., 2021). Through visual puzzles, we can improve students' ability to solve problems and cultivate their mindset.

This research is important because it aims to determine the effect of a learning model that has the potential to improve students' critical thinking skills, namely a problem-based learning model assisted by picture puzzle media. Critical thinking skills are important to help students understand information, solve problems, and make wise decisions. Previous research, as stated by Hasriani et al. (2020) explained that the learning outcomes and critical thinking skills of students taught using a problem-based learning model assisted by picture puzzles have shown improvement. From previous research, it appears that the PBL model is effective in improving students' critical thinking skills. However, research examining the effect of the PBL model assisted by pictorial riddle media on the critical thinking skills of elementary school students is still limited. Therefore, this study is important to fill the knowledge gap and provide a deeper understanding of learning approaches that are effective in developing students' critical thinking skills. The purpose of this study is to investigate the effect of a problem-based learning model assisted by pictorial riddle media on the critical thinking skills of elementary school students.

2. Method

This study used a quasi-experimental research method with a Non Equivalent Control Group Design class design. The approach in this research is quantitative research, so it uses inferential statistical data analysis techniques. The subjects in this study were all fifth grade elementary school students with a total of 40 students divided into two classes, namely classes VA and VB with 20 students each. The sampling technique was carried out by group random sampling in which one experimental class and one control class were determined. The experimental class will be treated using a problem-based learning model using pictorial riddle media while the control class uses conventional learning. Data collection was carried out using tests. The instrument used consisted of an essay-type question sheet. The essay-type questions, with a total of 10 items, were used to collect data on students' critical thinking skills. The test given to students consisted of five indicators: formulating problems, providing arguments, deduction, induction, and evaluation. Before testing the students, we conducted instrument validation. This validation process involved two experts. The purpose was to assess the accuracy of the content, relevance to the objectives, and rigor of the question construction. The specification of the testing instrument is presented in Table 1.

Tabel 1. Test Question Specifications

No	Aspects of Critical Thinking Abilities	Indicators	Number of Items
1	Formulating problems	Ability to formulate problems in the form of questions	2
2	Providing arguments	Providing appropriate reasons for each question	2
3	Deduction	Determining conclusions from the general to the specific	2
4	Induction	Determining conclusions from the specific to the general	2
5	Evaluation	Ability to evaluate an argument	2
		Total Items	**10**

The data collected in this study were analyzed using SPSS 24 for Windows to interpret the results of data analysis. The data obtained in this study were then analyzed using descriptive and inferential statistical analysis.

3. Findings and Discussion

3.1. Findings

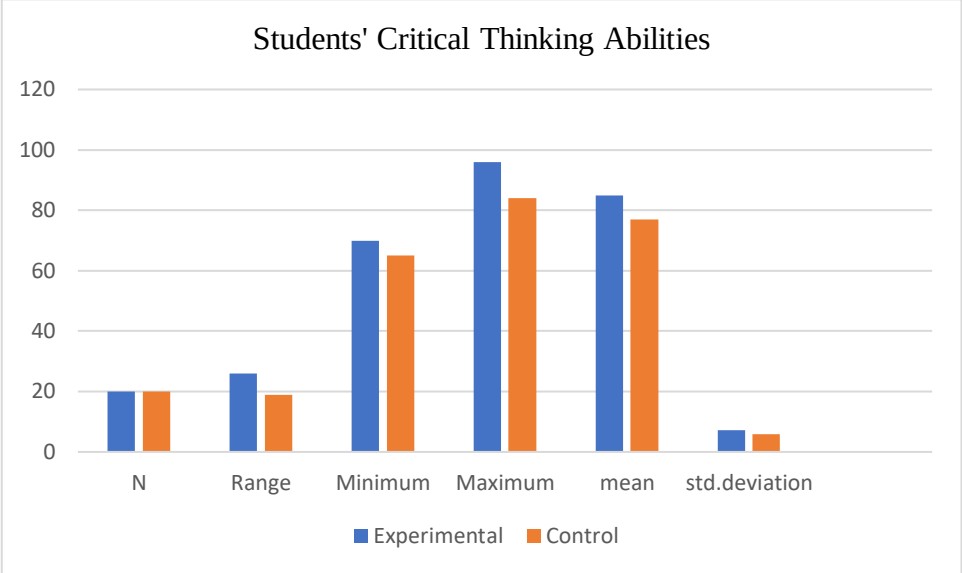

Fig. 1. Descriptive data of experimental and control classes

Based on Figure 1 above, it can be seen that the critical thinking skills of students in the experimental class who were treated using the problem-based learning model assisted by pictorial riddle media showed an increase. The figure above shows the mean value in the experimental class of 85.20 with a range value of 26.00 the minimum value obtained is 70.00 and the maximum value is 96.00 while in the control class, the mean value is 77.55 with a range value of 19.00 the minimum value is 65.00 and the maximum value is 84.00. These results indicate that the experimental class that was treated using the problem-based learning model assisted by pictorial riddle media was more influential in improving students' critical thinking skills. Furthermore, to ensure that the data is normally distributed, a normality test is conducted.

Based on the data in both classes using the Kolmogorov-Smirnov normality test, it is known that the significance value of amp.Sig (2-tailed) of 0.09 is greater than 0.05. then by the basis for decision making in the normality test, it can be concluded that the data is normally distributed. While the homogeneity test obtained a sig value of 0.60> 0.05 so that the data has the same variant or homogeneous. Based on the results of the analysis requirements test, the average difference test of the two classes was carried out with the t-test according to the results of the independent t-test, inferential statistical calculation in the experimental class and control class showed that there was a significant difference between the two classes. The results of the t-test "independent samples test" show the value of Sig. (2-tailed) of 0.001 <0.05, then as the basis for decision-making in the independent sample t-test, it can be concluded that Ho is rejected and Ha is accepted, which means that there is a difference in the average student learning outcomes between the experimental class and the control class. The t-test results are shown in Table 2.

Tabel 2. t-Result Independent samples test

Data	Mean difference	Std. Error Difference	t	Df	Sig.
Critical Thinking Abilities	7.65	2.078	3.680	38	0.001

3.2. Discussion

Based on the results of data analysis using SPSS, the calculation of the t-test in the experimental class and control class with a t value of 3.680 and a Sig value. 0.001 which means there is a difference in the average student learning outcomes between the experimental class and the control class. In the experimental class that applied the problem-based learning model assisted by pictorial riddle media, the mean value in the experimental class was 85.20 with a range value of 26.00 the minimum value was 70.00 and the maximum value was 96.00. while in the control class, the mean value was 77.55

with a range value of 19.00 the minimum value was 65.00 and the maximum value was 84.00. Based on these results, it is proven that the application of problem-based learning models assisted by pictorial puzzles is more effective in improving students' critical thinking skills compared to conventional learning.

The use of a problem-based learning model with the help of pictorial riddle media proves that it can improve students' critical thinking skills. This success is influenced by various factors, including the effectiveness of the structured and student-focused syntax of the learning model. In general, the problem-based learning model includes five stages: orientation to the problem, arrangement of learning situations, guidance on individual and group investigations, presentation of student findings, and analysis and evaluation of problem (Setyaningsih, 2022; Halim, 2020; Ginting, 2020). Problem-based learning is a method in which learning occurs through problem-solving. The problems used are related to real-world situations faced by students. This approach is in line with Darmawan (2023) view that this learning model relies on real-world situations. In problem-based learning, students work together in groups to identify and solve problems. This method allows students to evaluate the process of investigating real-world problems, increasing their engagement, interest, and critical thinking skills. This is reinforced by research from Ariyanto et al. (2020), which states that this approach not only improves critical thinking skills through problem-solving but also encourages students to present arguments based on strong and rational evidence. In the application of PBL, students work together in groups to find information and solve problems given by the teacher. The teacher acts as a motivator and facilitator, encouraging students to be active and develop critical thinking skills (Habibah et al., 2022). Discussions in groups help students to practice their critical thinking skills indirectly.

Based on research conducted by Hasriani et al. (2020) obtained the results that (1) the cognitive learning outcomes of science XI grade students on the subject matter of elasticity and Hooke's Law taught using a problem-based learning model assisted by pictorial riddle increased where in cycle I obtained an average score of 74.71 while in cycle II obtained an average score of 79.83. and (2) the critical thinking skills of science XI grade students taught using a problem-based learning model assisted by pictorial riddle increased. In addition, according to Hikmah (2022), the results show that there is a significant difference between critical thinking skills in the PBL learning model through hybrid learning is more effectively applied to human reproductive system material to improve critical thinking skills obtained from the N-Gain percent of 64.78% compared to the reciprocal teaching-learning model through hybrid learning which is only 44.28%. Based on the results of the research that has been conducted by researchers, the findings of this study are consistent with several previous studies which show that the PBL model approach can improve students' critical thinking skills.

The findings indicate that the use of problem-based learning methods can train students in solving problems, which results in improved critical thinking skills. The implementation of the Problem-Based Learning model with the help of pictorial riddles in the learning process can significantly improve learners' understanding, thus facilitating the development of critical thinking skills. Pictorial riddle media is a visual representation of problem situations encountered in the surrounding environment (Darfia et al., 2020) and is a form of visual media that relies on the sense of sight (Syukri et al., 2022). By using picture puzzles as a tool in learning, it is hoped that it will make it easier for users to understand and express the material. The selection of jigsaw puzzles as a means to improve student's critical thinking skills is an effective and reliable approach. The purpose of the problem-based learning model with the help of jigsaw puzzle media in this study is to stimulate students' analytical thinking through the use of jigsaw puzzle media that requires deep thinking, careful interpretation, and analytical skills to solve problems appropriately. Picture puzzle media can also make learning more interesting and encourage students to think more actively, thus improving students' critical thinking skills (Septiasari et al., 2020). Third, working in small groups allows students to learn together, communicate, and respect the opinions of others. These abilities are very important in everyday life and can help students face future challenges.

The findings of this study are supported by previous studies. According to Darfia et al. (2020) showed that the use of problem-based learning with picture puzzles can improve cognitive learning outcomes and critical thinking skills. This finding is in line with the results of research by Nurlaeli et al. (2018) who found that problem-based learning has a positive effect on students' critical thinking skills compared to conventional learning methods. In addition, Kiranadewi and Hardini (2021) found that a problem-based learning approach is more effective in improving critical thinking skills in the

context of civic education when compared to a problem-solving approach. This finding provides a new perspective on effective learning approaches to improve critical thinking skills at the basic education level. The implications of this study include (1) educators can pay more attention to developing learning models that emphasize active learning, where students are invited to identify, analyze, and solve problems independently or in groups, (2) it is important for teachers to enrich students' learning experiences by utilizing various interactive media, including images, videos, and other digital technologies, (3) Educators can consider integrating more problem-based activities and interactive media in daily learning to improve learning effectiveness. Therefore, educators and curriculum developers can use these findings as guidelines to design more engaging and effective learning experiences for primary school students, which in turn will strengthen the quality of education at the primary level and help students develop their critical thinking skills early on.

4. Conclusion

Based on the results of data analysis, it can be concluded that the problem-based learning model assisted by pictorial puzzle media has a more significant effect in improving students' critical thinking skills in elementary school compared to conventional learning, this is evidenced by a higher mean value. The findings highlight the need for the integration of innovative teaching methods to stimulate critical thinking, creativity, and experimentation with new ideas. In addition, the implication of this study is to develop students' ability to think critically, and creatively, reflect on models and theories, introduce and test new ideas, and encourage them to have confidence in presenting their ideas and gain self-confidence. For future research, it is necessary to consider exploring additional variables such as students' learning styles, motivation levels, and environmental factors. This will help in gaining a more comprehensive understanding of learning strategies that are effective in developing students' critical thinking skills. By considering these factors, future research can make an important contribution to our understanding of best practices in improving students' critical thinking skills.

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