Jupiter: Jurnal Pendidikan Terapan
Homepage : https://journal.diginus.id/jupiter/index
Email: jurnalpendidikanterapan@gmail.com

p-ISSN : 2985-3214; e-ISSN : 2964-3171
Jupiter, Vol. 4, No. 4, September 2026
Page 342-351

Effectiveness of Project Based Learning and Problem Based Learning Assisted by VIP Matter – Media on the Critical Thinking Skills of Elementary School Students

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ARTICLE INFO

Article history:
Submitted: May 02, 2026
Final Revised: July 01, 2026
Accepted: July 06, 2026
Published: September 30, 2026

Keywords:
Project-Based Learning; Problem-Based Learning; PowerPoint; Critical Thinking Skills; Quasi-Experiment

ABSTRACT

Purpose: Critical thinking skills are a crucial competency for elementary school students to face the demands of 21st-century learning. However, students' critical thinking skills remain relatively low due to the teacher-centered learning process, which provides limited opportunities for students to actively engage in problem-solving. Therefore, innovative, student-centered learning models, such as Project-Based Learning (PjBL) and Problem-Based Learning (PBL), are needed, supported by the use of engaging learning media such as PowerPoint. This study aims to determine the effectiveness of Project Based Learning and Problem Based Learning models assisted by Vidio Interactive PowerPoint matter - media on the critical thinking skills of elementary school students **Methods**: This study aims to determine the effectiveness of Project Based Learning and Problem Based Learning models assisted by Vidio Interactive PowerPoint on the critical thinking skills of elementary school students. This study used a quantitative approach with a quasi-experimental method with a nonequivalent control group design. The study population was elementary school students, with samples selected using a purposive sampling technique. Data collection was carried out through critical thinking ability tests given before (pretest) and after (posttest) the treatment. The data were analyzed using descriptive and inferential statistical tests to determine differences in the improvement of critical thinking skills between groups. **Findings**: The results of this study are expected to demonstrate a difference in effectiveness between Project-Based Learning and PowerPoint-assisted Problem-Based Learning models on students' critical thinking skills **Research Implications**: The results of this study are expected to demonstrate a difference in effectiveness between Project-Based Learning and PowerPoint-assisted Problem-Based Learning models on students' critical thinking skills. **Originality**: This research is expected to contribute to teachers' selection of effective learning models and media to improve elementary school students' critical thinking skills.

Doi: https://doi.org/10.61255/jupiter.v4i4.1665

INTRODUCTION

21st-century developments require students to possess various essential skills, one of which is critical thinking skills. This ability is necessary for students to analyze information, solve problems, and make decisions logically and rationally. At the elementary school level, developing critical thinking skills is an essential foundation for successful learning at subsequent levels of education. However, in reality, the learning process in elementary schools is still dominated by lecture methods and routine assignments, resulting in students tending to be passive and lacking critical thinking skills. According to Suteja et al. (2022), one effort to improve critical thinking skills is to implement a student-centered learning model, the *Project Based Learning* (PjBL) *model and Problem-Based Learning* (PBL) is a learning model that emphasizes active student involvement in solving real-world problems and producing products or solutions. Through both project and problem-solving activities, students are encouraged to analyze, evaluate, and draw conclusions, thus optimally developing critical thinking skills.

Based on the results of initial observations in elementary schools, students' critical thinking skills are still relatively low. This can be seen from observations conducted in elementary schools of 25 students and interviews with several teachers obtained results of students' low ability to express opinions, analyze problems, and provide reasons for the answers given. In addition, interviews with several teachers showed that some teachers still use conventional methods. Therefore, research is needed to test the effectiveness of learning models that can improve these abilities. This study aims to determine the effectiveness of *Project Based Learning* and *Problem Based Learning* assisted by *Vip - Matter media* on the critical thinking skills of elementary school students. The study was conducted using a quantitative approach with a quasi-experimental method**,** so that the influence of the two learning models can be compared objectively on improving students' critical thinking skills. The results of this study are expected to contribute to teachers in choosing effective learning models and media, as well as being a reference in efforts to improve the quality of learning in elementary schools. Critical thinking skills are one of the higher-order thinking skills (HOTS) that are very important in 21st-century learning. According to Wijnia et al. (2024), critical thinking includes the ability to analyze, evaluate, interpret, and draw logical conclusions about a problem. In the context of elementary education, the development of critical thinking skills needs to be facilitated through learning that emphasizes exploration activities, problem solving, and active student involvement. Various studies in the last decade have shown that problem-based and project-based learning models are effective in improving critical thinking skills. Research by Wei et al. (2024), Williamson et al. (2023) showed that the application of *Problem-Based Learning* can improve students' critical thinking skills because learning is focused on solving real-world problems that require analysis and reasoning. Similarly, Fitriani & Hidayat (2018) found that students who learn using the PBL model have higher critical thinking skills than those who learn using conventional learning.

In recent years, research has also emphasized the importance of integrating technology and learning media in supporting the effectiveness of learning models. According to Williamson et al. (2023)**,** explaining that the use of visual media such as PowerPoint can improve conceptual understanding because it combines elements of text, images, and animation in a structured manner. Research by Zhang et al. (2023) shows that the use of interactive PowerPoint in problem-based learning can improve student engagement and learning outcomes. Research conducted by According to Williamson et al. (2023); Wijayanto et al. (2023), shows that the application of *the Problem Based Learning* (PBL) model can increase student active involvement in the learning process. Through problem-solving activities, students are encouraged to think analytically, discuss, and express opinions, so that higher-order thinking skills develop optimally. The results of the study also showed a significant increase in student learning outcomes after the application of the PBL model. In addition, Suteja et al. (2022), explained that problem-based learning can create a more meaningful learning atmosphere because students are faced with real problems that are relevant to everyday life. This condition encourages students to develop critical thinking skills, problem solving, and independence in learning.

According to Rahman et al. (2023), it is also explained that the characteristics of PBL which places real problems as a learning context are able to create meaningful and challenging learning. The active involvement of students in discussions and problem solving has been proven to contribute to improving higher-order thinking skills, especially critical thinking skills. Thus, the *Problem Based Learning model* can be used as an alternative effective learning strategy to develop critical thinking skills in the learning process. Research conducted by According to Suradika et al. (2023), shows that the application of *the Project Based Learning (PjBL)* model supported by PowerPoint multimedia is effective in improving student learning outcomes. Through project-based learning, students are actively involved in the process of planning, implementing, and presenting project results, so that learning becomes more meaningful and student-centered. According to Samadun et al. (2022); Song et al. (2024)**,** The use of PowerPoint multimedia helps present material visually and systematically, thus facilitating conceptual understanding and increasing student interest and motivation in learning. The results of the study indicate that the combination of the PjBL model and PowerPoint media has a positive influence on student engagement in learning and significantly improves learning outcomes. Thus, the implementation of *Project Based Learning* assisted by PowerPoint multimedia can be an effective learning alternative to create an active, engaging learning atmosphere and support the development of students' higher-order thinking skills.

Research conducted by Samadun et al. (2022) shows that the application of the *Problem Based Learning* (PBL) model combined with interactive PowerPoint media is effective in improving the critical thinking skills of elementary school students. Problem-based learning provides opportunities for students to be actively involved in identifying problems, analyzing information, discussing, and formulating solutions systematically. The use of interactive PowerPoint helps present material and problems in a visual and engaging manner, thus facilitating student understanding and increasing attention and motivation to learn. The results of research by Suradika et al. (2023) show that the combination of the PBL model and Vidio interactive *PowerPoint media* has a significant effect on improving

students' critical thinking skills compared to conventional learning. Thus, a problem-based learning model assisted by visual media can be an effective alternative in developing high-level thinking skills in elementary school students.
The main problems of elementary school students' critical thinking skills include low ability to analyze, evaluate information, and solve problems, which are often caused by teacher - *centered learning methods*, lack of interactive media, and learning that only focuses on memorization. As a result, students have difficulty thinking independently. Factors causing critical thinking skills in elementary school are: Despite high curiosity, students tend to be weak in planning problem-solving strategies and evaluating decisions. Teachers often use conventional methods (lectures), lack variety in media, and are only fixated on textbooks or worksheets. Low learning motivation, anxiety, egocentrism (self-centered thinking), and lack of learning independence hinder students. Minimal exposure to real problems and limited infrastructure

METHOD

Research Design

This research uses a quantitative approach with a quasi-experimental design method. By administering pretests and posttests, the researchers aimed to obtain an overview of students' initial and final abilities after receiving the learning treatment. Therefore, this study aimed not only to observe improvements but also to analyze the differences in effectiveness between the Project-Based Learning model and Vidio Interactive PowerPoint-assisted Problem-Based Learning model in developing students' critical thinking skills. The results of this study are expected to contribute to the selection of appropriate learning models to improve the quality of learning in elementary schools. The population in this study were fourth-grade students in the Kembang Joyo Cluster in Pati District, Pati Regency who were implementing Natural Sciences (IPA) learning in the even semester of the 2025/2026 academic year. This population was chosen because fifth-grade students already have relatively mature logical thinking skills and cognitive abilities to participate in problem-based and project-based learning processes, and are able to demonstrate the development of critical thinking skills according to the demands of 21st-century learning (Ennis, 2018; Anderson & Krathwohl, 2019). The population in this study consisted of several Public Elementary Schools that have relatively homogeneous characteristics in terms of curriculum (Independent Curriculum), learning facilities, and the number of students in one class. This research uses the technique purposive sampling (purposeful sampling) by considering the suitability of school and student characteristics to research needs.

Relationship between Variables

In this study, the researcher used two variables, namely the independent variable (X), namely the Effectiveness of Project Based Learning and Problem Based Learning Assisted by Vidio Interactive Power Point*, and* the dependent variable (Y), namely Critical Thinking Skills. The following is a picture of the relationship between variables:

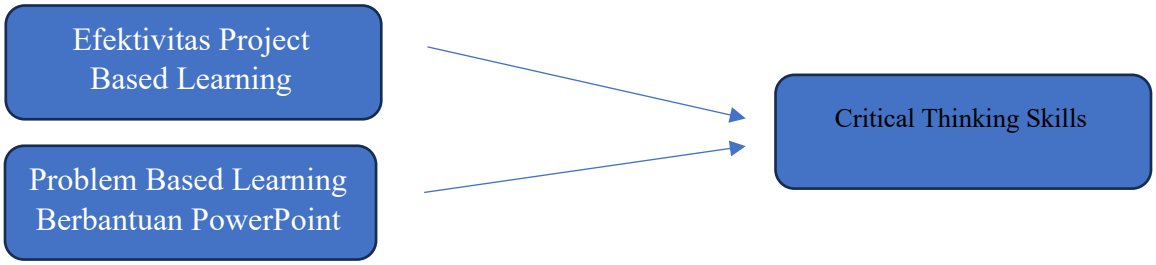


Figure 1. Relationship between variables

Population

The research population was fifth grade students in the Kembang Joyo Cluster in Pati District, Pati Regency, which consists of 10 elementary schools under their guidance, namely Pati Kidul 03 Elementary School, Pati Kidul 05 Elementary School, Blaru Elementary School, Panjunan Elementary School, Pati Wetan Elementary School, Semampir Elementary School, Geritan Elementary School, Dengkek Elementary School, Muhammadiyah 01 Elementary School, Pati, implementing Natural Sciences (IPA) learning in the even semester of the 2025/2026 academic year . The population was chosen because fourth grade students have relatively mature logical thinking skills and cognitive abilities to participate in problem-based and project-based learning processes, and are able to demonstrate the development of critical thinking skills according to the demands of 21st century learning (Ennis, 2018; Anderson & Krathwohl, 2019). The population in this study consisted of several public elementary schools that have relatively homogeneous characteristics in terms of curriculum (Independent Curriculum), learning facilities, and the number of students in one class.

Sample

This study used a purposive sampling technique, considering the suitability of school and student characteristics to the research needs. This technique was chosen because not all schools have the conditions that allow for the consistent implementation of PBL and PJBL models based on deep learning within the same research period. The sample size was determined based on the principles of effectiveness and population representativeness. Because this study used a descriptive approach, quasi-experiment *(quasi experiment),* the sample size for each group must be at least 25 students to meet the requirements for conducting parametric statistical tests (Sugiyono, 2020). Thus, the total sample size for this study was 30 students from two different elementary schools with relatively comparable ability levels, namely: Experimental Group 1 (PBL Model based on Deep Learning) one class (30 students). Experimental Group 2 (Deep Learning-Based PJBL Model) one class (30 students).

Table 1. Design Study *Non-equivalent Control Group Design*

Group	*Pretest*	Variables Free	*Posttest*
Group Experiment 1	0_1	X_1	0_2
Group Experiment 2	0_3	X_2	0_4

Comparative Analysis

In this study, a comparative analysis was conducted to determine whether there is a difference in effectiveness between the Project Based Learning (PjBL) model and Problem Based Learning (PBL) assisted by PowerPoint on the critical thinking skills of elementary school students. Because the research used a quantitative method with a quasi-experimental design, a comparison was made between two groups, each of which was given different treatments.

In the initial stage, both groups were given a pretest to determine the students' initial critical thinking abilities before the treatment was given. Afterward, each group received learning according to the specified model: PjBL for the first group and PBL for the second, both using PowerPoint. After the learning process was completed, students were given a posttest to measure their critical thinking skills after the treatment. A comparative analysis was conducted by comparing the posttest results of the two groups. However, before conducting the difference test, the prerequisite analysis tests were first carried out, namely the normality test and the homogeneity test. The normality test aims to determine whether the data is normally distributed, while the homogeneity test aims to ensure that the variances of the two groups are equal. If the data meets both requirements, then the difference test is carried out using the Independent Sample t-test. If one of the requirements is not met, a non-parametric test such as the Mann-Whitney test is used.

In addition to comparing posttest mean scores, this study also analyzed improvements in critical thinking skills using the N-Gain calculation. This calculation is used to see how much the students' abilities have improved from pretest to posttest in each group. In this way, researchers not only know whether there are differences or not, but can also determine which learning model is more effective in improving critical thinking skills.

RESULTS

The class division was divided randomly into 2 groups in one class, where the learning treatment carried out was different, namely the first experimental group used the Problem Based Learning model and the second experimental group used the Project Based Learning model. The results of processing the project report data in this study showed a difference in the average value of students' critical thinking skills in the first experimental group which was influenced by using the Problem Based Learning learning model and the second experimental group which was influenced by using the Project Based Learning learning model. The results of data processing were obtained through student worksheets when implementing the learning process, which were then measured by indicators of critical thinking skills. The total number of samples in this study was 30 students from two different elementary schools who had relatively comparable levels of ability, namely: Experimental Group 1 (PBL Model based on Deep Learning) one class (30 students). Experimental Group 2 (Deep Learning-based PJBL Model) one class (30 students).

Table 2. Distribution Frequency Results Ability Think Critical Group Experiment 1

Range mark	Frequency (F)	Criteria	Percentage (%)
76 - 100	15	Very Tall	50 %
51 - 75	11	Tall	37 %
26 - 50	4	Low	13 %
0 - 25	-	Very Low	-
Amount	30		100 %
	Average Score		**79**

Based on Table 2 show that there are 15 students on range score 76 - 100 or 50 % of all students with very high criteria, 11 students in the score range 51 - 75 or 37% of all student with criteria tall. 4 students on range score 26 - 50 or 13 % from overall students with low criteria. The average critical thinking ability results of experimental group 1 were 79. Based on the results of the critical thinking skills of experimental group 1 with an average of 79 can concluded that group experiment 1 with high criteria.

Table 3. Distribution Frequency Results Ability Think Critical Group Experiment 2

Range mark	Frequency (F)	Criteria	Percentage (%)
76 - 100	18	Very Tall	60 %
51 - 75	10	Tall	33 %
26 - 50	2	Low	7 %
0 - 25	-	Very Low	-
Amount	30		100 %
	Average Score		83

Based on Table 3 show that there are 18 students on range score 76 - 100 or 60 % of all students with very high criteria, 10 students in the score range 51 - 75 or 33% of all student with criteria tall. 2 students on range score 26 - 50 or 7 % from overall students with low criteria. The average critical thinking ability results of experimental group 1 were 83. Based on the results of the critical thinking skills of experimental group 1 with an average of 83 can concluded that group experiment 1 with high criteria.

Based on chart on can seen that there is difference between groups experiment 1 and experimental group 2. Based on the results of critical thinking skills, it can be concluded that the group experiment 1 with model learning Problem Based Learning on level thinking ability critical more low from on group experiment 2 with model learning Project Based Learning.

Based on tested normality as much as 30 student group experiment 1 And 30 student experimental group 2. Results test normality use Kolmogorov-Smirnov on group experiment 1 with significance 0.201 > 0.05 so distributed normal, on group experiment 2 with significance 0.202 > 0.05, then it is normally distributed. The results of the normality test using Shapiro-Wilk in the experimental group 1 with significance 0.192> 0.05 so distributed normal. Mark test normality experimental group 2 with significance 0.191 > 0.05 so distributed normal. Results test normality of the experimental group 1 And group experiment 2 with mark significance > 0.05 so can concluded that the data is normally distributed.

Table 4. Results Test Normality Score Ability Think Group Criticism Experiment 1 And Group Experiment 2

		Tests of Normality Kolmogorov-Smirnova			Shapiro-Wilk		
Ability Critical thinking	Group Experiment 1	0.167	30	0.201	0.921	30	0.192
	Group Experiment 2	0.167	30	.202 *	0.921	30	0.191

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Test homogeneity done For know whether second group experiment 1 And experimental group 2 homogeneous. Based on results mark significance 0.353 > 0.05 so own variance Which the same or homogeneous. Results test homogeneity can concluded that mark significance > 0.05 so experimental group 1 and experimental group 2 with the variances owned by the samples concerned No Far different or can it is said homogeneous. Test homogeneity done For know whether second group experiment 1 And experimental group 2 homogeneous. Based on results mark significance 0.351 > 0.05 so own variance Which the same or homogeneous. Results test homogeneity can concluded that mark significance > 0.05 so experimental group 1 and experimental group 2 with the variances owned by the samples concerned No Far different or can it is said homogeneous.

Table 5. Results Test Homogeneity Ability Think Critical
Test of Homogeneity of Variances

	Levene Statistics	df1	df2	Sig.
Ability Think Critical	.871	1	30	.351

After conducting normality and homogeneity tests on data from experimental group 1 and experimental group 2, the results showed that both groups showed normal and homogeneous data distribution. Next, a significance test was conducted on the differences in students' critical thinking abilities between experimental class 1 and experimental class 2 using the t test. The purpose of this test is to determine whether there is a significant difference in students' critical thinking abilities between the use of problem-based learning (PBL) and project-based learning (PjBL) models. The following are the results of the t test:

Table 6. Results Test T- Test

Group Statistics				
Experimental Group N		**Mean**	**Std. Deviation**	**Std. Error Mean**
Group Thinking Skills	Experiment 1 30	79.00	12,123	2,213
Group Criticism	Experiment 2 30	83.00	10,454	1,897

Based on Table 6, it can be seen that experimental group 1 has 30 students with an average score of 79.00, while experimental group 2 has the same number of students, namely 30 with an average score of 80.00. From this average, it can be seen that experimental group 2 with a project-based learning model is superior to experimental group 1 with a problem-based learning model. To determine whether there is a significant difference between the groups experiment 1 And group experiment 2, done test t use independent samples test. The following are the results of the t-test with the independent samples test:

Table 7. Results of the Independent Samples Test

		F	**Sig**	**T**	**df**	**Sig. (2-tailed)**
Critical Thinking Skills	Equal variance	0.411	0.521	-1,967	30	0.002
	Equal variance not assumed			-1965	70,111	0.002

From Table 7, the results of the t-test calculation using the independent samples test show the value significance (2-tailed) as big as 0.001, Which more small from 0.05. With thus, Ho rejected, and Ha is accepted. In conclusion, there is a significant difference between the use of problem-based learning models (PBL) and project-based learning (PBL) on critical thinking skills. Based on the results of the average critical thinking ability, it is clear that the treatment using the Project-Based Learning model has a higher level of critical thinking skills than the Problem-Based Learning model. This research is supported by research conducted by El Gamal et al. (2024), shows that the Project Based Learning model is significantly superior to the Problem Based Learning model in terms of the critical thinking skills of elementary school students.

DISCUSSION

Effectiveness of Project Based Learning Assisted by Vip Matter – Media on the critical thinking skills of elementary school students

Project Based Learning (PjBL) is very effective for training the critical thinking skills of elementary school students. These results are in line with research by El Gamal et al. (2024); Mutanga et al. (2024) that Project Based Learning Assisted by Vip - Matter Media on the critical thinking skills of elementary school students. These results are in line with research by Adhelacahya et al. (2023); Anazifa et al. (2017), that Project Based Learning Assisted by Vip - Matter Media on the critical thinking skills of elementary school students. This method makes students learn through solving problems in the real world. Students not only memorize theory, but also actively design, research, and create works to answer teacher questions. Elementary school students learn best through concrete experiences they encounter frequently. Teachers often pose open-ended problems, such as "How can we conserve water at school?" Students then analyze the problem, search for information, and make a simple water filter. This trains their analytical skills. Numerous studies have proven the success of PjBL. For example, a literature review showed that the PjBL model can improve critical thinking skills by up to 80%. Students learning with PjBL scored significantly higher on critical thinking tests than those learning with traditional lecture methods. Critical thinking is a crucial skill in the 21st century. It teaches children to be discerning, to learn how to make informed decisions, and to be accustomed to finding solutions when faced with problems.

According to El Gamal et al. (2024); Loyens et al. (2023), Project-Based Learning (PjBL) enables elementary school students to learn by creating real-world projects. This method fosters critical thinking skills by requiring students to solve problems, gather data, and make decisions. Students don't just memorize theory but also learn to think independently. They are exposed to real-world problems. For example, students might examine trash in the school environment. They must determine the causes and how to clean it up. This teaches them how to analyze problems

directly. Project-Based Learning (PjBL) encourages students to actively ask questions. They investigate various topics to complete projects. This process helps students discover new facts and connect them to science. Students learn to filter information. They need to know which information is correct and important for their project. For example, when creating a project about plants, they analyze the effect of water and sunlight on the growth of the plants. Projects are usually done in groups. Students learn to accept friends' opinions, discuss, and find solutions together if there are problems. This opens their minds to be more open. Students learn more than just the theory in books. They see the results of their own efforts. This makes their understanding of a lesson much stronger and longer lasting.

Project-Based Learning (PjBL) has a powerful impact on improving elementary school students' critical thinking skills. This model empowers students to learn to solve real-world problems rather than simply memorizing. Students design, create, and evaluate their own projects. Teachers provide real-life challenges. For example, students might be asked to build a simple water filter. They must think about what materials to use and how it works. Students don't receive information directly from the teacher. They research, discuss with friends, and test their ideas. This trains them to differentiate between true and false information. When a project fails or doesn't go according to plan, students have to find a way out. This trains them to assess situations and make decisions appropriately. As a result, the critical thinking skills of elementary school students increased drastically. Students are used to not believing things easily and always want to know the reasons.

Effectiveness of Problem Based Learning Assisted by Vip Media - Matter on the critical thinking skills of elementary school students

The Problem-Based Learning (PBL) model is highly effective in improving elementary school students' critical thinking skills. These results align with research by Adhelacahya et al. (2023) and Anazifa et al. (2017). The Problem Based Learning (PBL) model is very effective in improving the critical thinking skills of elementary school students. These results align with research by Anggraeni et al. (2023); Al Ali, R. (2024) and Chang et al. (2022). The Problem-Based Learning (PBL) model is highly effective in improving elementary school students' critical thinking skills. Research shows that this model has a positive impact of 30.1% on improving these skills. Students solve problems around them. This makes the lesson more meaningful. Students are used to looking for information themselves to answer difficult questions. Students discuss in groups to find a way out. Like a puzzle, the teacher asks a question at the beginning. Students are not immediately told the answer. They must find out the causes, discuss them with their peers, and draw conclusions. This process trains children's brains to analyze cause and effect. Problem-Based Learning (PBL) trains elementary school students to solve real-life problems. This method is highly effective in developing critical thinking skills. Students are accustomed to analyzing information, looking for evidence, and making informed decisions. They don't just receive raw information from the teacher. Students are trained to break down complex problems into smaller parts. It's like taking apart a lego toy to see how each piece connects. Students learn to find out the root cause of a problem. Students are encouraged to always ask "why" and "how". For example, when seeing garbage piled up in the school environment, students will think critically about where the garbage came from, why it piled up, and how to clean it up. Students learn that one problem can have many ways to solve it. They will compare each solution. Students are trained to choose the best path by considering the consequences of each choice. Real problems make students more active and motivated to learn. They feel challenged to discover new facts. This will make students more open-minded to their peers' opinions. Implementing Problem-Based Learning in schools is crucial for preparing students to become skilled problem solvers in the future.

According to Mutanga et al. (2024), Problem- Based Learning (PBL) has a significant positive impact on elementary school students' critical thinking skills. This model encourages students to learn to solve real-life problems. As a result, students not only memorize theory but also become adept at analyzing and finding solutions. The evidence and full details are below. BL is a learning model that uses real problems as the center of learning. This problem is similar to everyday events. According to Mutanga et al. (2024), the application of PBL to fourth and fifth grade elementary school students demonstrated a significant increase in their critical thinking test scores compared to conventional learning methods. Other research found that this learning model contributed up to 30.1 % to the development of children's reasoning abilities.

Based on the results of the average critical thinking ability, it is clear that the treatment using the Project Based Learning model has a higher level of critical thinking skills than the Problem Based Learning model. This research is supported by research conducted by M El Gamal et al. (2024), which shows that the Project Based Learning model is significantly superior to the Problem Based Learning model in terms of the critical thinking skills of elementary school students. There is a significant difference in effectiveness. Both models are equally helpful for students. However, certain models and media are superior for certain purposes. Project-Based Learning (PjBL) is more effective in stimulating student creativity, while Problem-Based Learning (PBL) is superior in developing analytical skills. When

combined with Vidio interactive power point -Matter (Virtual/Video- Matter) media, PBL is usually more effective in improving elementary school students' critical thinking skills because its main focus is solving fact-based problems directly. Problem-Based Learning (PBL) models involve students solving real-life problems. They learn to analyze data scientifically. This model is very powerful for improving students' reasoning skills. Project-Based Learning (PjBL) models involve students learning while creating works or products. According to Asmi et al. (2020), this model fosters creativity and complex problem-solving. The Role of Media (Vip - Matter): Learning media is very helpful for students. Media such as "Vip - Matter" makes abstract lessons tangible. Students find it easier to understand difficult concepts. PBL is more effective for honing problem-solving skills. PjBL often demonstrates higher average critical thinking scores because it involves the process of creating a product. The right combination of models and media will yield maximum learning outcomes.

Implications of research results

Project-Based Learning (PjBL) has a very positive impact on elementary school students. This model makes them more active and accustomed to solving real-world problems. They learn to analyze information, evaluate data, and make decisions. Their critical thinking skills improved rapidly. The following are specific implications of PjBL for elementary school students: Students don't just memorize theory. They seek solutions to real-world problems. They create products (e.g., a simple water purifier from a bottle). This requires them to critically test and refine ideas. Students are trained to ask "why" and "how" to ensure their work works. They discuss with friends. This opens their minds to different perspectives. Elementary students who are accustomed to Project-Based Learning (PjBL) will develop stronger analytical skills. Studies have shown that this project-based approach is highly effective and relevant in developing higher-order thinking skills.

Problem-Based Learning (PBL) has a positive impact on elementary school students. This method trains them to analyze real-world problems, test facts, and make decisions. As a result, students' problem-solving and reasoning skills improved significantly. Teachers presented everyday problems. For example, students were asked to find out why trash was piling up in the gutters. Students then look for the source of the problem. This activity trains them to connect lessons with real life. Students are encouraged to actively ask questions. They learn to distinguish between fact and opinion. This is similar to a detective looking for concrete evidence before drawing conclusions. Students work in small groups. They solve problems together. They learn to respect friends' opinions and defend their ideas with sound reasons. Students do not only receive information from the teacher (memorizing). They practice constructing arguments. Students also learn to find creative solutions. With PBL, elementary school students don't just learn to memorize material; they grow into active and critical problem solvers.

CONCLUSION

The Project-Based Learning (PjBL) model is highly effective in improving elementary school students' critical thinking skills. This model encourages students to actively solve real-world problems. Students learn to analyze information, collaborate, and draw conclusions. As a result, students don't just memorize but truly understand the lesson. Project-Based Learning (PjBL) focuses on engaging projects, such as making crafts from recycled materials. Students consider suitable materials and how to make them. Students are accustomed to facing challenges when creating projects. This method keeps students away from boredom. Students are more active in asking questions and discussing with their peers. Research shows that students who learn using PjBL have much stronger critical thinking skills compared to conventional learning methods. *Problem-Based Learning* (PBL) has been proven to be very effective for elementary school students. This model makes students more active in solving real-world problems. This significantly improves their critical thinking skills. PBL is a learning model that uses real-world problems as a starting point. Students are invited to find solutions independently or in groups. Educational research shows that the use of PBL has a strong positive influence on the development of elementary school students' reasoning.

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ACKNOWLEDGEMENT

Many thanks to all the lecturers at Muria Kudus University who have guided my research. Thank you to all my fellow students who have helped with my research.

AUTHOR CONTRIBUTION STATEMENT

HW created the concept, K wrote the background of the problem, FF developed the questionnaire. HW created the concept, FFprocessed the data, SK and GSwrote the manuscript.

AI DISCLOSURE STATEMENT

The authors declare that this research was prepared, researched, written, and edited without the aid of artificial intelligence (AI) techniques.

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