



Research Article

Implementation of the Problem Based Learning Model with Realia Media to Improve Elementary School Students' Critical Thinking Skills

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Received : April 16, 2026

Revised : June 29, 2026

Accepted : July 05, 2026

Available online : July 27, 2026

How to Cite: Syaipia Laila Nur Fitriani, Dede Trie Kurniawan, & Mega Laeni. (2026). Implementation of the Problem Based Learning Model with Realia Media to Improve Elementary School Students' Critical Thinking Skills. *Elementaria: Journal of Educational Research*, 4(1), 13–26. <https://doi.org/10.61166/elm.v4i1.109>

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Abstract. This research is motivated by the low critical thinking skills of fourth grade elementary school students, such as difficulty analyzing problems, expressing logical opinions, and drawing conclusions. This is caused by an inappropriate learning model so that students are less active in solving problems. Efforts made are implementing a Problem Based Learning (PBL) model assisted by realia media so that students learn through real problems and concrete objects. This study aims to

determine the effect of the Problem Based Learning (PBL) model assisted by realia media on students' critical thinking skills, the effect of the Inquiry model assisted by YouTube video media on the control class, and the differences in critical thinking skills of the two classes. The method used is a quasi-experiment with the Matching-Only Pre-test-Post-test Control Group Design, involving 24 students of Neglasari State Elementary School and 22 students of Mekarsari State Elementary School. The results show an increase in average scores in both classes, with the post-test of the experimental class (42.58) higher than the control class (27.90). The significance value of 0.000 is smaller than 0.005 so that H_a is accepted and H_0 is rejected. It can be concluded that there are differences in critical thinking skills between students who use the Problem Based Learning (PBL) model and those who use the Inquiry model assisted by YouTube video media.

Keywords: Critical Thinking, Problem Based Learning (PBL) Model, Realia Media, Force

Abstrak. Penelitian ini dilatarbelakangi oleh rendahnya kemampuan berpikir kritis siswa kelas IV sekolah dasar, yang ditunjukkan melalui kesulitan dalam menganalisis permasalahan, mengemukakan pendapat secara logis, dan menarik kesimpulan. Kondisi tersebut disebabkan oleh penggunaan model pembelajaran yang kurang tepat sehingga siswa kurang aktif dalam memecahkan masalah. Upaya yang dilakukan adalah menerapkan model Problem Based Learning (PBL) berbantuan media realia agar siswa dapat belajar melalui permasalahan nyata dan objek konkret. Penelitian ini bertujuan untuk mengetahui pengaruh model Problem Based Learning (PBL) berbantuan media realia terhadap kemampuan berpikir kritis siswa, pengaruh model Inquiry berbantuan media video YouTube pada kelas kontrol, serta perbedaan kemampuan berpikir kritis antara kedua kelas. Metode penelitian yang digunakan adalah quasi experiment dengan desain Matching-Only Pre-test-Post-test Control Group Design, yang melibatkan 24 siswa SD Negeri Neglasari dan 22 siswa SD Negeri Mekarsari. Hasil penelitian menunjukkan adanya peningkatan nilai rata-rata pada kedua kelas, dengan nilai post-test kelas eksperimen (42,58) lebih tinggi dibandingkan kelas kontrol (27,90). Nilai signifikansi sebesar 0,000 lebih kecil daripada 0,005, sehingga H_a diterima dan H_0 ditolak. Dengan demikian, dapat disimpulkan bahwa terdapat perbedaan kemampuan berpikir kritis antara siswa yang mengikuti pembelajaran menggunakan model Problem Based Learning (PBL) berbantuan media realia dan siswa yang mengikuti pembelajaran menggunakan model Inquiry berbantuan media video YouTube.

Kata Kunci: Berpikir Kritis, Model Problem Based Learning (PBL), Media Realia, Gaya.

INTRODUCTION

In the 21st century, educational activities are a complex series of events, as education is paramount for every nation's development. A great nation will prioritize education, with education transforming poverty into prosperity for its people (Megawanti, 2015). Education and educational science are closely related, both in practice and theory, and both support each other in the human journey (Abd Rahman et al., 2022).

In line with this, education is a crucial element in improving the quality of a nation's human resources (HR). Superior HR is naturally formed from the educational

values ingrained in society. Furthermore, education plays a role in shaping individual character and abilities, enabling them to compete in the global marketplace. However, other factors also influence a nation's competitiveness (Sanga & Wangdra, 2023). Therefore, education is crucial for human development throughout the human journey. Many factors support each other in the educational process, including the school itself, which is a formal educational institution that encompasses the learning process to achieve national educational goals.

Understanding the critical thinking learning process is crucial in elementary schools because students are expected to understand concepts and even apply them in their daily lives. In line with this, critical thinking skills are part of higher-order critical thinking skills, requiring students to develop processes for analyzing or evaluating information about a problem based on logical thinking to finalize decisions, thus producing something new and providing new understanding of existing concepts. To improve critical thinking skills, it is crucial to design learning activities as effectively as possible so that learning activities are enjoyable and purposeful (Fristadi & Bharata, 2015; Bagiada et al., 2022).

Therefore, even in elementary school education, critical thinking remains low, with research showing that 7% of students' critical thinking skills fall into the very high category, 41% into the high category, and 52% into the low category, impacting the learning outcomes of fourth-grade students at Karangduren 02 Elementary School (Dari & Ahmad, 2020). In line with this, research on critical thinking skills in elementary school students shows that 4% of students have critical thinking skills in the very high category, 4% in the high category, 7% in the low category, and 85% in the very low category. The largest percentage is found in the very low category (Rofi'ah & Rokhmaniyah, 2024). Therefore, this low critical thinking ability can be characterized by several things, such as a lack of ability to identify problems, formulate arguments, analyze information logically, evaluate evidence, and draw rational conclusions.

Furthermore, other research indicates that critical thinking skills in elementary schools are still low. Based on tests conducted, only 9 students (28%) scored above the Minimum Competency (KKM), while 23 students (72%) fell below the minimum competency (KKM), which is 75. This indicates that students' critical thinking skills are still low and require continuous improvement (Pada, 2023).

Critical thinking skills will undoubtedly impact students' cognitive development and adaptability. Therefore, low critical thinking skills in Indonesian students are a significant issue and must be addressed immediately. Inappropriate learning models or methods used by teachers contribute to low critical thinking skills in Indonesian students (Dari & Ahmad, 2020; Rofi'ah & Rokhmaniyah, 2024). Learning models have a significant impact on students' thinking patterns. Learning models help students develop their cognitive development, especially critical thinking skills. Therefore, inappropriate learning models will result in less than

optimal cognitive development. In line with this, several factors influence student activity in the learning process. According to Slameto (2010: 54), "factors that influence student learning are classified into internal and external factors." Internal factors or factors within students that influence the learning process include physical factors, mental factors, fatigue, and student activity. Meanwhile, external factors or factors from outside the student that influence the learning process include family factors, school factors, namely methods, models, learning media, facilities and infrastructure, as well as environmental factors, friends, and society (Putri & Fitri, 2022). With the right learning model, students' enjoyment of learning will grow and ultimately encourage students to think critically and produce maximum learning outcomes.

While the application of the problem-based learning model offers various advantages, it also has several drawbacks. Innovation is essential to minimize these shortcomings. One such innovation is learning media. The use of learning media can help students absorb learning more quickly and enhance the effectiveness of learning activities (Hariyanti et al., 2021). The function of media in learning is to increase student stimulation in learning activities. Students become more enthusiastic and engaged in learning, improving their ability to understand the material, thereby automatically enhancing students' critical thinking skills (Hamid et al., 2020). Realia media plays a crucial role in the problem-based learning model, increasing student engagement and helping them solve real-world problems. Realia media itself is widely used as a learning aid to introduce new subjects with their meaning, not to things that were initially only presented abstractly through theoretical presentations with words or visuals (Nurchayani et al., 2025). Fourth-grade elementary school students are in the concrete operational stage (9-10 years old). Therefore, when delivering lesson materials, teachers are expected to emphasize real-world media or visual aids that are more concrete and logical. A concrete concept is achieved when children engage in direct experience and actively discover it themselves through their learning experiences (Bukori, 2020).

The topic of force in fourth-grade students is already categorized as critical. Damayanti's (2021) research found that the results of the Student Worksheet (LKPD) given to SD Negeri 02 Sidomulyo showed good critical thinking skills in science (Damayanti et al., 2021). Force is a crucial topic in elementary school science learning, studying the causes of changes in the motion and shape of objects. This material covers concepts such as push and pull forces, gravity, friction, magnetic force, and the effect of force on the motion of objects. Understanding the concept of force is crucial because it serves as the foundation for students to understand simple physical phenomena in everyday life, such as why objects fall, how vehicles move, or why objects stop after being pushed. However, in reality, elementary school students often find force material difficult. This is because students are not only asked to memorize concepts but also require critical thinking skills, analyze cause-

and-effect relationships, and apply force concepts in real-world contexts. Therefore, a more effective, engaging, and contextual learning approach is needed so that students can understand the material in depth. Furthermore, this force material should be included in the elementary school curriculum so that this research can contribute to improving the quality of learning in schools.

METHOD

This study employed an experimental research method. According to Fraenkel et al. (2012), the experimental research method is a research approach aimed at determining the causal relationship between independent and dependent variables. In practice, the independent variable is controlled and regulated according to the research problem to determine its impact on the dependent variable. A characteristic of experimental research that distinguishes it from other types of research is the researcher's ability to manipulate the independent variable according to the research needs. Furthermore, the researcher can determine the type of treatment given to the subjects, who receives the treatment, and the extent of the treatment's impact (Fraenkel et al., 2012).

The approach used in this study was quantitative. Quantitative research emphasizes the assessment of students' critical thinking skills, thus presenting research data numerically. The collected data is then processed through statistical analysis, followed by hypothesis testing. Quantitative research utilizes measurement as the primary basis for data collection and analysis. The accuracy of research results is highly dependent on the quality of the instruments used, as instruments serve as a tool to describe research variables objectively and measurably (Reza et al., 2026). Thus, research using a quantitative approach can reveal differences between groups and relationships between the variables being studied. In practice, a quantitative approach places significant emphasis on the development of research instruments, as these serve as the data source for drawing research conclusions. Therefore, instruments in quantitative research must meet valid and reliable criteria. Therefore, they need to be tested for suitability by experts in the relevant field before being used in the data collection process.

The research design used was a quasi-experimental one. Quasi-experimental research is a research method used to test cause-and-effect relationships between variables without involving a complete randomization process for research subjects (Anastasya & Rindrayami, 2025). According to Isnawan (2020), the main characteristic of quasi-experimental research lies in the random selection of experimental and control classes. The type of quasi-experimental design used in this study was the Matching-Only Pre-test-Post-test Control Group Design. In this design, researchers matched subjects to the experimental and control classes based on certain predetermined variables. However, this design does not fully guarantee subject equality with respect to other variables within the control class, because even

after the matching process, subjects remained within their pre-formed groups (Fraenkel & Wallen, 2022).

Treatment group	M	O	X	O
Control group	M	O	C	O

Figure 1. The Matching Only Research Design

This study used a sample of 24 fourth-grade students from Neglasari Elementary School as the experimental group and 22 fourth-grade students from Mekarsari Elementary School as the control group. The sampling technique used was purposive sampling, which is a non-random sampling. This technique determines the selected sample based on certain criteria tailored to the research. The research sample was taken based on considerations of similar student characteristics, the curriculum used, the way the teacher delivers the material, time allocation, and teaching materials so that the two classes from different schools are matched.

RESULTS AND DISCUSSION

Based on the findings obtained in the experimental class, which aimed to answer the first research question, namely the effect of using the Problem-Based Learning model assisted by realia media on the critical thinking skills of elementary school students, statistical tests showed an effect of using the Problem-Based Learning model assisted by realia media on students' critical thinking skills. This was evidenced by the more active and participatory responses from students after being treated with the Problem-Based Learning model assisted by realia media. During the pre-test, students tended to be passive and were unable to provide reasons or in-depth analysis of the problems presented. However, after learning with Problem-Based Learning assisted by realia media, students showed improvements in their ability to analyze, evaluate, and draw logical conclusions.

Based on the results of the difference test using the Wilcoxon Signed Rank Test, a significance value (Asymp. Sig., 2-tailed) was obtained of 0.000 or $0.000 < 0.05$. Based on the test results, to determine the effect of Problem Based Learning assisted by realia media on critical thinking skills in elementary school students focused on the experimental class, it can be seen in the diagram of the average pre-test and post-test critical thinking skills t , before and after the treatment was given.

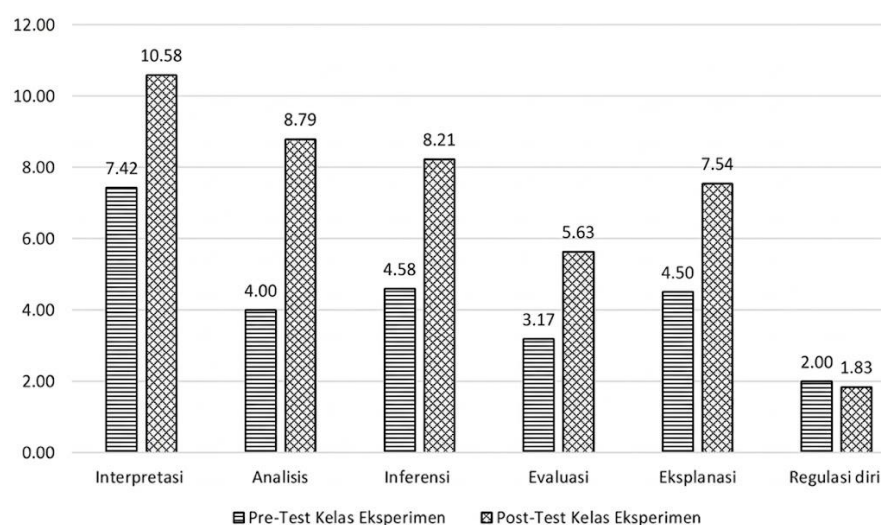


Figure 2. Diagram of Average Critical Thinking Skills Scores of Experimental Class

Based on the diagram above, it can be seen that most indicators of students' critical thinking skills in the experimental class improved after implementing the Problem-Based Learning (PBL) model. The indicator that experienced the most significant improvement was analysis, with a 4.79-point increase (from 4.00 to 8.79). This improvement occurred because in the PBL model, students were confronted with real-world problems that required them to identify important information, connect concepts, and systematically analyze the problem. This process directly trained students' analytical skills in understanding and solving problems.

Other indicators that also showed significant improvement were inference, with a 3.63-point increase (from 4.58 to 8.21) and interpretation, with a 3.17-point increase (from 7.42 to 10.58). This indicates that after implementing PBL, students were better able to interpret information, draw logical conclusions, and understand the meaning of the problems presented. In problem-based learning, students not only receive information but also actively construct understanding through discussion and exploration.

The explanation indicator increased by 3.04 points (from 4.50 to 7.54), indicating that students are increasingly able to explain their thinking and solutions coherently and logically. Meanwhile, the evaluation indicator increased by 2.46 points (from 3.17 to 5.63), indicating progress in students' ability to assess and consider alternative solutions to a problem.

However, the self-regulation indicator saw a slight decrease of 0.17 points (from 2.00 to 1.83). This may be because self-regulation skills are related to metacognitive awareness, such as the ability to control and reflect on one's own thought processes, which require more time and practice to develop optimally.

Overall, based on the diagram, it can be concluded that the implementation of the PBL model has a positive impact on improving elementary school students' critical thinking skills, particularly in the areas of analysis, inference, and

interpretation. This improvement demonstrates that problem-solving-centered learning encourages students to think more deeply, systematically, and reflectively in understanding learning materials.

Further findings emerged from the learning conducted in the control class using the inquiry model assisted by YouTube videos. In the initial stage (pre-test), students still experienced difficulty in solving critical thinking skills problems. Some students were unable to analyze problems in depth, draw logical conclusions, and provide appropriate reasons for their chosen answers. This indicates that before the treatment, students' critical thinking skills were still relatively low.

After the treatment through inquiry learning assisted by YouTube videos, changes occurred in the learning process. The use of videos helped students visualize the concepts being studied, making it easier to understand the phenomena presented. The inquiry model also encouraged students to observe, ask questions, gather information, and draw conclusions based on their observations. The level of student participation was not as high as in the experimental class, as learning still tended to rely on video presentations and teacher direction.

The analysis yielded a significance value (Asymp. Sig. 2-tailed) of 0.000, or $0.000 < 0.05$. This indicates a significant difference between the pre-test and post-test scores in the control class. Based on the results of the second hypothesis test, to determine the effect of using the inquiry model on critical thinking skills in elementary school students focusing on the control class, it is presented in the diagram of the average pre-test and post-test scores for critical thinking skills and after treatment.

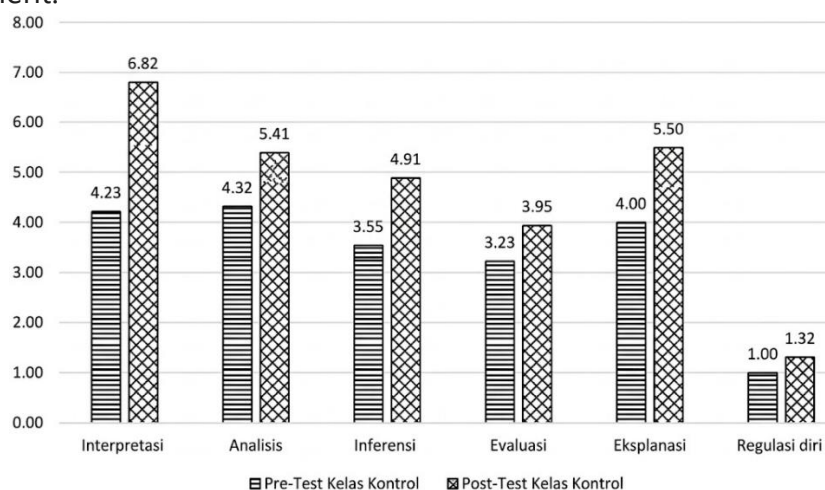


Figure 3. Diagram of Average Critical Thinking Skills Scores in the Control Class

Based on the diagram above, it can be seen that all critical thinking skill indicators in the control class improved after implementing the YouTube video-assisted inquiry model. The highest increase was in the interpretation indicator, at 2.59, while the lowest increase was in the self-regulation indicator, at 0.32.

This improvement indicates that the use of videos in learning helps students better understand and interpret information. However, for indicators requiring higher-order thinking skills, such as evaluation and self-regulation, the improvement was relatively smaller because they require more intensive practice and familiarization.

After obtaining the results from the first and second problem formulations, the third hypothesis was tested, which aimed to determine the differences in elementary school students' critical thinking skills between classes using the Problem-Based Learning (PBL) model and those using the YouTube video-assisted inquiry model.

After obtaining the results from the first and second problem formulations, the third hypothesis was tested, aiming to determine the differences in elementary school students' critical thinking skills between classes using the Problem-Based Learning (PBL) model and those using the YouTube video-assisted inquiry model.

Based on the results of the N-Gain score test with the Mann–Whitney U Test on the post-test scores of the experimental and control classes, a significance value (Asymp. Sig. 2-tailed) of $0.000 < 0.05$ was obtained. This indicates a significant difference between the critical thinking skills of students learning using the PBL model and those learning using the YouTube video-assisted inquiry model.

The implementation of the Problem-Based Learning model in the experimental class provides students with the opportunity to actively engage in problem-solving through problem identification, discussion, analysis, and solution development. This process trains students in developing critical thinking skills indicators such as interpretation, analysis, inference, evaluation, and explanation in greater depth. Meanwhile, in the control class using the YouTube video-assisted inquiry model, students gain learning experiences through observation and question-and-answer sessions based on the videos. Although this model also improved critical thinking skills, the results were not as great as the improvement in the experimental class.

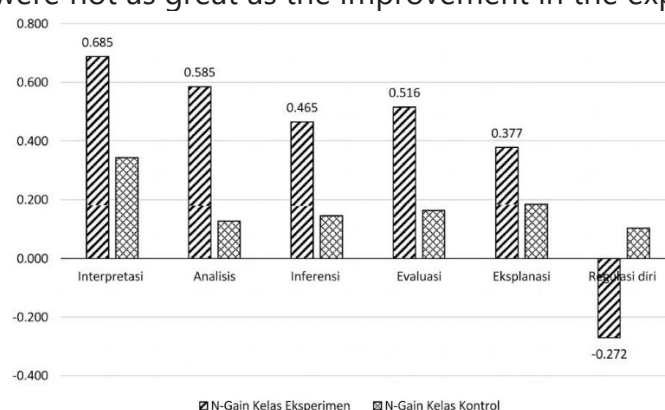


Figure 4. N-Gain Mean Score Diagram of Critical Thinking Skills Values of Experimental Class and Control Class

The diagram shows a comparison of the N-Gain (normalized increase) values between the Experimental Class (blue bars) and the Control Class (red bars) on six

indicators of critical thinking skills. Overall, the Experimental Class demonstrated significantly superior performance on five key indicators: Interpretation, Analysis, Inference, Evaluation, and Explanation, with the highest increase seen in the Interpretation aspect, which achieved a score above 0.6. This indicates that the treatment or learning model applied to the experimental class was very effective in triggering an increase in students' cognitive abilities compared to conventional methods in the control class. However, there was a significant decrease in one indicator, namely the Self-Regulation indicator, where the Experimental Class actually experienced a decrease in the value (negative N-Gain of around -0.25), while the Control Class continued to show a stable, albeit low, positive increase. This can occur because self-regulation is a student's ability to direct the learning process independently through the regulation of cognition, motivation, and behavior to achieve learning goals (Tekeng, 2015). This ability is not possessed equally by all students. Previous research shows that most students still fall into the low and moderate self-regulation category (Rahmawati & Alaydrus, 2021). Furthermore, self-regulation is also related to students' awareness of their thinking patterns, actions, and learning outcomes (Mukaromah et al., 2025). Therefore, if students are not yet accustomed to managing their learning process independently, their self-regulation indicator scores may be lower, even after receiving learning interventions.

Visually, this graph clearly illustrates that the educational intervention was highly successful in terms of technical thinking, but requires in-depth evaluation of the metacognitive or self-regulation aspect.

Therefore, the researchers recommend that other researchers conduct further research over a longer period of time to observe changes in depth. Furthermore, they are advised to involve a larger sample size with a greater diversity of student numbers and characteristics, so that the results can be more accurate and relevant to a broader context. Furthermore, the use of different research methods can provide more comprehensive and in-depth insights into the topic under study.

KIT GAYA The Powr Cube

The "Power Cube" learning media is a force kit designed as a concrete teaching aid to facilitate students' empirical understanding of basic physics concepts. This kit integrates six main types of forces in one compact container, which includes magnetic force through the use of horseshoe magnets, as well as spring force visualized through the elasticity of rubber bands and for muscle force using a handgrip mechanism. The phenomenon of gravitational force is demonstrated through experiments dropping objects into the container, while frictional force is demonstrated through the interaction of objects with wooden, rubber, and ceramic track surfaces. In addition, aspects of static electricity are practiced using plastic straws that are able to attract small pieces of paper due to electric charge. All of these components are driven by the user's muscle force, so this media not only functions as a demonstration tool, but also as a hands-on learning tool that

transforms abstract material in textbooks into real and applicable learning experiences for students.

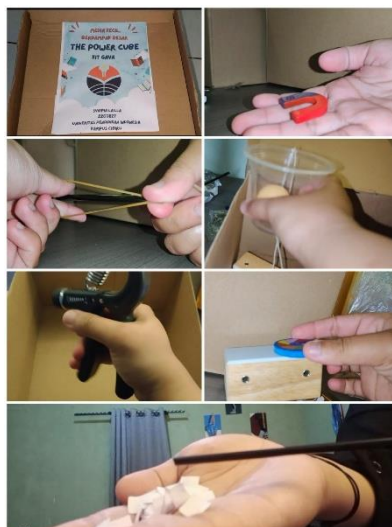


Figure 5. Relia Media

Based on the research findings, it was found that the use of problem-based learning models assisted by realia media significantly improved students' critical thinking skills in the topic of force in elementary schools. This was evident from the data analysis, which showed an improvement in students' critical thinking skills in the experimental class compared to the control class. Statistical tests using the Mann-Whitney test yielded a significance value of 0.000, indicating a significant difference between the class using the problem-based learning model assisted by realia media and the class using the inquiry model assisted by learning videos. Therefore, it can be concluded that the problem-based learning model assisted by realia media is more effective in improving students' critical thinking skills in the topic of force.

These findings align with research conducted by Putri et al. (2022), which states that the use of realia media in science learning can help students understand concepts more concretely, making it easier for them to analyze phenomena occurring around them. Furthermore, research by Wulandari et al. (2023) also demonstrated that the problem-based learning model can improve students' critical thinking skills because during the learning process, students are actively involved in solving problems related to real life. Who explains that problem-based learning places problems as the starting point for learning, encouraging students to investigate, discuss, and present logical arguments.

The use of realia media in this study also provided a more meaningful learning experience for students. Through experiments using real objects, such as pushing a table, pulling an object, or observing friction on a specific surface, students were able to directly observe the concepts being studied. This enabled students to not only passively receive information but also actively observe, analyze, and draw

conclusions from the phenomena occurring. This situation aligns with Facione's (2015) opinion, which states that critical thinking skills develop through analysis, interpretation, evaluation, and drawing conclusions based on evidence.

Compared to the control class using the inquiry model assisted by learning videos, the improvement in students' critical thinking skills was not as high as in the experimental class. This is because the use of learning videos only provided a visual learning experience, limiting students' direct interaction with the objects being studied. Although the inquiry model still encouraged students to discover concepts independently, student involvement in direct experimentation was not as intensive as when using realia media.

In addition, this study also compares the improvement of students' critical thinking skills between classes that use the problem-based learning model assisted by realia media and classes that use the inquiry model assisted by learning videos in the form of YouTube in understanding the concept of force, where in the learning that will be explained by the researcher through the processing and analysis of data that has been carried out, in the form of statistical data in the following discussion.

CONCLUSION

There is a difference in the improvement of critical thinking skills between students in grade 4 of Neglasari State Elementary School who use the problem based learning model assisted by realia media and grade 4 students of Mekarsari State Elementary School who use the inquiry model assisted by YouTube video media. Based on the results of the data analysis that has been done, the group of students who use the problem based learning model shows a superior improvement in 5 indicators where there are indicators of interpretation, analysis, inference, evaluation, explanation, compared to the group of students who use the inquiry model. In the self-regulation indicator, the group of students who use the inquiry model is superior to the group of students who use the PBL model with a difference of 0.166. However, the difference between the two groups is not too significant because both models used equally contribute to improving students' critical thinking skills in each class. Therefore, the PBL and inquiry models are models that can be used in science learning on the material of force to improve students' critical thinking skills.

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