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The Use of Problem-Based Learning to Improve Higher Order Thinking Skills of fifth-Grade Students

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ABSTRAK

Pendidikan diharapkan dapat menghasilkan lulusan yang mampu bersaing dan memiliki keterampilan abad 21. Rendahnya peringkat siswa Indonesia dari hasil PISA dan TIMMS membuktikan masih belum optimalnya pembelajaran untuk mengembangkan Higher-Order Thinking Skills (HOTS). Penelitian ini bertujuan untuk mengetahui pengaruh model Problem Based Learning (PBL) terhadap HOTS dalam pembelajaran IPA siswa kelas V SD. Penelitian ini menggunakan desain pretest-posttest dan termasuk jenis penelitian kuasi eksperimen. Subyek penelitian merupakan siswa kelas V. Instrumen penelitian ini terdiri dari soal kognitif HOTS dan lembar observasi. Soal kognitif berfungsi untuk mengukur pengetahuan (kognitif) siswa mulai dari C4 (menganalisis), C5 (mengevaluasi), dan C6 (menciptakan). Sementara lembar observasi digunakan untuk melihat proses berpikir kritis, berpikir kreatif, menalar, dan kemampuan mengambil keputusan pada kegiatan pembelajaran. Teknik analisis data menggunakan teknik analisis deskriptif dan teknik analisis statistik inferensial uji-t. Temuan dari hasil soal tes diketahui bahwa soal tes adanya perbedaan yang signifikan antara hasil belajar HOTS yang diberikan soal HOTS menggunakan PBL dengan siswa yang tidak menggunakan PBL. Senada dengan hasil soal tes, pada temuan hasil observasi juga menunjukkan kemampuan HOTS pada siswa yang menggunakan PBL yang lebih tinggi dibanding kemampuan HOTS pada siswa yang tidak menggunakan PBL. Penelitian ini memberikan bukti empiris yang kuat bahwa model PBL dapat menjadi strategi yang efektif untuk meningkatkan kemampuan HOTS siswa.

ABSTRACT

Education is expected to produce graduates who can compete and have 21st-century skills. The low ranking of Indonesian students from the results of PISA and TIMMS proves that learning is still not optimal for developing Higher-Order Thinking Skills (HOTS). This study aims to determine the influence of the Problem-Based Learning (PBL) model on HOTS in science learning for grade V elementary school students. This study uses a pretest-posttest design and is a type of quasi-experimental research. The research subjects were grade V students. Cognitive problems function to measure students' (cognitive) knowledge starting from C4 (analysing), C5 (evaluating), and C6 (creating). Meanwhile, observation sheets are used to see the process of critical thinking, creative thinking, reasoning, and decision-making skills in learning activities. The data analysis technique uses descriptive analysis techniques and t-test inferential statistical analysis techniques. The findings from the test results showed that there was a significant difference between the HOTS learning outcomes given in HOTS using PBL and students who did not use PBL. In line with the test results, the findings of the observation results also show that the HOTS ability in students who use PBL is higher than the HOTS ability in students who do not use PBL. This study provides strong empirical evidence that the PBL model can be an effective strategy to improve students' HOTS abilities.

1. INTRODUCTION

The term High Order Thinking Skills (HOTS) has recently become the most interesting discussion in the world of education and has become one of the goals of the learning process at every level. Since the 1980s and 1900s, researchers have increase focused on research aimed at improving students' HOTS (Achilov, 2017), which is considered a tool for developing individuals and communities simultaneously

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(Abosalem, 2015). High-level skills can be achieved through the curriculum or the learning process, which can help students use critical thinking and problem-solving approaches (Saputri et al., 2019). HOTS is a skill that can be adjusted to the final 3 (three) abilities of Bloom's Taxonomy, namely the ability to analyze (C4), evaluate (C5), and create (C6) (Widyaningsih, Komariah, Mujasam, & Yusuf, 2019; Ichsan et al., 2019). HOTS allows students to apply and relate what they already understand to the new knowledge they will learn to balance and combine what was previously understood with something they will learn (Jailani et al., 2017; Yanuarto et al., 2023). HOTS must be instilled and applied to students at a young age because HOTS is also an important ability that will be needed in the 21st Century era, including the skill to resolve issues, think critically, argue, and make decisions. (Ida et al., 2020; Kholisho et al., 2020; Sepriyanti et al., 2022; Tyas et al., 2019; Widana & Sopandi, 2021).

The HOTS is not optimal, especially in Indonesia. This can be proven by the findings of PISA (Programme for International Student Assessment) research in December 2022, which found that Indonesian students aged 15 years received the following scores: Mathematics 366 (from an average of 472), Literacy 359 (from an average of 476), and 383 (from an average of 485) (OECD, 2023). The question used in PISA is a HOTS question. In these questions, students are expected to be able to apply the ideas they have learned, as well as problem-solving skills, analysis, and other higher-order thinking skills (Jailani & Retnawati, 2016; Ramadhani et al., 2021). Generally, learning objectives in elementary school focus more on developing cognitive skills at the Low Order Thinking Skill (LOTS) level (Laksana, et al., 2024), which involves abilities like memorizing, recalling existing knowledge, and understanding (Jansen & Möller, 2022) rather than emphasizing higher-level cognitive abilities associated with Higher-Order Thinking Skills. Science learning in elementary schools aims to maximize the understanding of scientific concepts and foster positive attitudes for solving everyday problems (Fitria, et al., 2021) while Higher-Order Thinking Skills (HOTS) can help address environmental issues in science education (Ichsan et al., 2019). For this reason, teachers need to choose a suitable learning model in science education to facilitate students' real learning experiences (Handayani, et al., 2021) and encourage them to be active, creative, and think critically in solving problems around them (Widyaningrum et al., 2021). The lesson focused on in this study is the human digestive system. This lesson was chosen because it is relevant to students' lives, primarily related to their bodies, and it requires students to memorize and apply their knowledge (Andayani, et al., 2022; Putra & Wulandari, 2021).

Practically, applying HOTS in science learning is still not optimal because teachers focus more on delivering all subject matter. Based on the interview results of grade V teachers, it is known that students have difficulty applying HOTS in teaching and learning activities because they are not familiar with HOTS questions. Because the focus of learning in primary schools leans more towards lower order thinking skills (LOTS), which involve the ability to answer fact-based questions and performances related to LOTS are easy to assess, as teachers can evaluate them by comparing the student's work to a single (Usmaedi, 2017; Jansen & Möller, 2022). Students are trained to give simple and direct answers, which makes it difficult to deal with more complicated questions. As a result, they tend to guess the answer rather than invest time in searching for the right answer (Eisenman & Payne, 1997). Especially in lessons about the digestive system, the previous learning model emphasized memorization skills more because the evaluation type was more focused on testing how well students memorized the material. Teachers consider HOTS questions difficult and are reluctant to give them to students because they are worried that it will make them difficult (Zohar & Dori, 2003), and they must create HOTS questions (Jansen & Möller, 2022). Although students can use higher-order thinking skills (HOTS) in the learning process, their implementation is still not optimal. Therefore, there needs to be additional encouragement so students can develop their potential using HOTS. So, it is not because of students' inability to apply HOTS but because learning has not succeeded in encouraging students to optimize the use of HOTS.

Science learning has not fully developed students' thinking skills and scientific attitudes, as it tends to focus more on memorizing concepts with little practical application (Sigit et al., 2022), rather than embracing 21st-century learning, which is essential for fostering life skills based on science and technology (Widestra & Yulkifli, 2021). The Problem-Based Learning (PBL) model educates students to solve problems that occur in everyday life because from these problems, students can find their knowledge and acquire attitudes and skills from decisions made from solving these problems. The teacher is no longer a source of knowledge but gives students an open-ended question or problem and asks them to solve it using the knowledge and skills they've acquired (Zohar & Schwartzer, 2005; Irawati & Sulisworo, 2023). The Problem-Based Learning (PBL) model is a model that prioritizes activeness, integration, and cooperation (Arends & Kilcher, 2010).

Previous research has proven that the PBL model can improve the HOTS ability of grade V students (Kurniasari, et al., 2020; Sutika et al., 2023). However, the study has not explained in detail the improvement of each HOTS ability because it is only based on the results of test questions. In addition, previous research has emphasized improving thinking skills in HOTS, such as critical thinking and creative thinking skills (Handayani, et al., 2021; Handayani, 2022). Based on this research, the PBL model is an alternative model that can increase HOTS. This study was conducted to see the effectiveness of the PBL model in increasing HOTS and each ability in HOTS in the digestive system material. The novelty of this research lies in connecting higher-order thinking skills with observation, making the findings more comprehensive in the study of higher-order thinking skills.

The purpose of this study is to analyze the effectiveness of the Problem-Based Learning (PBL) model in enhancing the Higher-Order Thinking Skills (HOTS) of grade V students in science learning, particularly in the topic of the human digestive system. This research also aims to evaluate the improvement of each HOTS component (analyzing, evaluating, and creating) developed through the PBL approach. Additionally, it seeks to connect the development of HOTS with observation-based activities, providing a more comprehensive understanding of how higher-order thinking skills can be effectively integrated into elementary science education.

2. METHOD

The research method used in this study is a quasi-experiment, where researchers compare the outcomes of groups differentially exposed to the treatment across pre- and posttreatment periods to estimate the causal effects of policy (White & Sabarwal, 2014; Gopalan et al., 2020). This method was chosen because this study aims to see how the impact of using PBL (experimental class) on HOTS elementary school students regarding digestive system material compared to classes that use the learning process directly (control class). The research design used in this study is a non-equivalent pre and post-test design with explanations in Table 1.

Table 1. Research Design

Class	Pre-test	Treatment	Post-test
Experiment	O1	X1	O3
Control	O2	X2	O4

Information: X1 : Use of PBL models; X2 : Use of Direct Teaching Learning; O1 : Pre-test in the experimental class; O3 : Post-test on experimental class; O2 : Pre-test on the control class; O4 : Post-test on the control class

Table 1 explains the research design carried out in this study. Initially, a pretest test was carried out to see how the initial abilities of the two classes were compared then, after that two different treatments were carried out, the experimental class using the PBL learning model and the control class using direct learning or commonly used in the class

The participants in this study were two grade V in public schools in Central Java Province, Indonesia. The subjects of this study consisted of 15 students in the control class (nine women and six boys) and 15 in the experimental class (five girls and ten boys) with ages ranging from 11 – 12 years. The selection of schools and classes was because, socially, all participants came from middle-class backgrounds and were of a homogeneous Javanese ethnicity. Students are generally accustomed to the learning process directly, which is more verbal. The method of conducting this research begins by equipping teachers with an understanding of the implementation of learning through discussions for 3 days. The teachers in this study had more than 10 years of teaching experience. A limitation of this study was the small sample size, due to the participants' unique characteristics, which offered distinctive contributions (Breier, 1988; Happell et al., 2022). Participants generally came from the middle to upper economic group. Still, they tended to choose to attend public schools rather than attending excellent schools because their parents were busy being entrepreneurs in agriculture, plantations, and farms. In addition, the learning outcomes they obtain are generally still below the standards that have been set.

The instrument developed in this study consists of HOTS test questions and observation sheets for the HOTS test question instrument, which is adjusted to the cognitive level of HOTS starting from Analyse (C4) and Evaluating (C5). At the same time, for Create (C6) we did not include it in this research instrument. The observation sheet refers to the HOTS indicators: critical thinking, creative thinking, decision-making ability, and argument ability. HOTS test questions are used to measure cognitive ability on the HOTS criteria, and observation sheets are used as supporting data to determine whether the processes of 21st-century skills that are aligned with HOTS are also improving. The distribution of the test questions is more transparent; the following is shown in the grid of the HOTS test questions in Table 2.

Table 2. HOTS Test Question Grid

Basic Competencies	Indicator	Cognitive Level	Question Number
Explain the digestive organs and their functions in animals and humans and how to maintain the health of the human digestive organs.	Presented reading texts on the digestive process in humans, students can clarify their understanding of the digestive system.	C5	1,3,
	Presented reading texts about the digestive process in humans, students can express opinions about the human digestive system.	C5	2,15
	Presented an explanation of the digestive system, students can rationalize the way the body of the digestive system.	C5	4,14
	Presented a description of the digestive process; students can sort the digestive process.	C4	5
	Presented with pictures of animals or statements regarding animal digestion, students can determine the function of organs present in the animal.	C4	6,7,10
	Presented a statement regarding the digestive system of animals, students can analyse the digestive mechanism in the animal.	C4	8,9,10
	Presented a table of similarities and differences in animal and human digestion, students can compare the similarities and differences in the digestion of animals (cows) and humans.	C5	11
	Presented with human images or statements regarding human digestion, students can determine the function of these organs in humans.	C4	12,16,18,23, 24
	Presented a description of food and the digestive system in humans, students can determine the benefits of energy in the energy system of humans.	C4	13
	Presented readings about diseases of the digestive organs, students can analyse diseases of the digestive organs.	C4	17,20,21,22,25
	Presented with a description of the reading text, students can determine how to maintain and maintain healthy organs.	C4	19

The instruments used are first ensured their validity and reality before being used in research. Based on the validity results carried out by experts in the science education area and experts in the HOTS abilities area. The validation process of test questions is carried out by providing aspects of the instruments that have been made and giving their opinions on the instruments presented in the form of feasibility ranging from not feasible – to very feasible, including Construction, Language, Student Characteristics, and three HOTS criteria, namely analysis (C4) and evaluation (C5) for test questions. The results of this validity can be seen in Table 3.

Table 3. Obtaining HOTS Question Validation

Aspects	Score (%)	Criterion
Construction	87.5	Very Decent
Language	80	Decent
Student characteristics	86.7	Very Decent
HOTS Question Criteria for analyze (C4)	100	Very Decent
HOTS Question Criteria for evaluate (C5)	100	Very Decent

After completing the previous step, grade VI students at SD Negeri Selakambang 3 will participate in a question trial. The rationale behind opting for the sixth grade at Selakambang 3 Public Elementary School is that sixth-grade students have previously studied the curriculum covered in fifth-grade classes. From the acquisition of statistical tests using the SPSS program version 16 on 25 HOTS questions, there are ten invalid questions. The test questions in Table 4 conclude that there are 15 valid questions. For the reliability of Cronbach's Alpha, a score of 0.805 was obtained, which exceeded the standard of 0.7, so the question was said to be realistic. More details can be seen in Table 4.

Table 4. Trial Acquisition of Questions

Question number	Validity
3,4,6,7,8,9,10,14,16,19	Invalid
1,2,5,11,12,13,15,17,18,20,21,22,23,24,25	Valid

After obtaining a score trial, the question's difficulty level and the different questions' power was analysed. Based on the analysis output for the difficulty level of the questions, 4 (four) easily qualified questions, 10 (ten) moderately qualified questions, and 1 (one) difficult qualified question were obtained. The difference power analysis score is known to have 1 (one) question with excellent difference power, 12 (twelve) questions with good qualifications, and 2 (two) questions with sufficient qualifications. Based on the results of the HOTS test questions, there are 15 (fifteen) HOTS questions to be applied in the experimental and control classes.

The following quantitative data analysis processes the HOTS test questions with a normalized gain formula. The next stage is to categorize the obtained score from the normalized Gain so that the effectiveness of the treatment that has been carried out can be known. The following is shown in Table 5 of N-Gain interpretation scores.

Table 5. Categories interpretation of N-Gain Effectiveness

Percentage (%)	Interpretation
< 40	Ineffective
40 - 55	Less Effective
56 – 75	Quite Effective
> 76	Effective

(Hake, 1999)

Other analyses that become prerequisite tests are the normality and homogeneity tests. After obtaining homogeneous and normally distributed data, a t-test was completed using the SPSS 16 program to measure the effectiveness of the PBL model in HOTS. The normality test using the Kolmogorov-Smirnov test with the decision criterion using H_0 is accepted if the significance value > 0.05 with the normality test hypothesis in this study.

The following validation test result is the HOTS observation sheet instrument test. This instrument is described from the aspect of HOTS ability, which consists of critical thinking, creative thinking, reasoning, and decision-making skills. The results of instrument validation show that the HOTS observation instrument has an average score of 80% for clarity, relevance, content validity, no bias, and language accuracy. At the same time, the highest score was accuracy at 86.7%. The acquisition of HOTS observation sheet instruments is shown in Table 6.

Table 6. Acquisition of HOTS Observation Sheet Instrument Validation

Aspects	Score (%)	Criterion
Clarity	80	Decent
Accuracy	86.7	Very Decent
Relevance	80	Decent
Content Validity	80	Decent
No bias	80	Decent
Language accuracy	80	Decent

3. RESULT AND DISCUSSION

Result

The results and discussion in the study were divided into two, namely regarding student learning outcomes on the ability and observation of HOTS. Student learning outcomes regarding HOTS abilities are conducted before (pretest) and after (post-test) learning activities in experimental and control classes. HOTS abilities related to 21st-century skills are carried out using observation sheets from student learning activities.

Student HOTS Learning Outcomes

The beginning condition of students' HOTS abilities in the control and experimental classes had nearly the same value, according to the study's findings, based on the pretest and post-test scores used in both classes. The experimental class's average pretest result was 41.3, while the control classes was 48.64. However, after being treated, the post-test findings showed a noteworthy variation in the experimental class, which increased to 83.3, and the control class by 68.2. These results showed that the increase in the results of the experimental class HOTS question score was higher than the control class, which also increased. More details are shown in Figure 1.

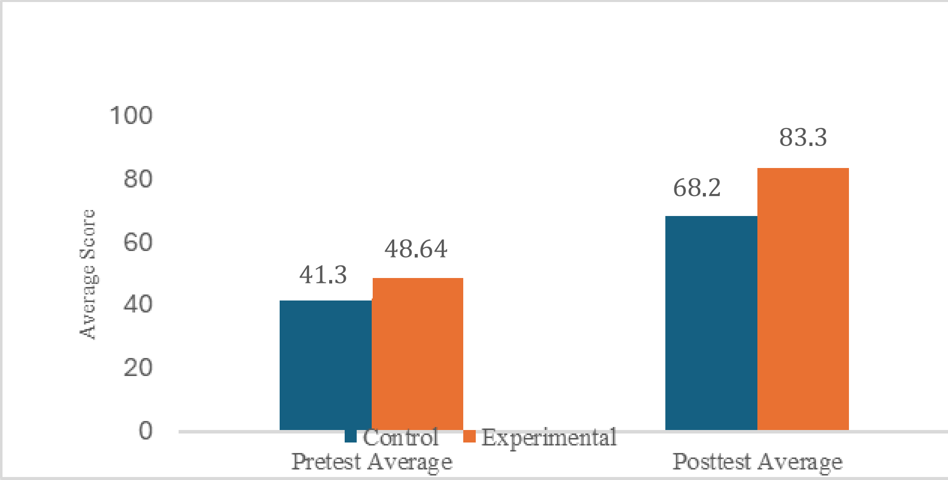

Figure 1. Average Pretest and Post-Test Acquisition

In line with the increase in scores on the pretest and post-test, other improvements were also seen from the results of the gain score test on the pretest and post-test in the experimental and control classes. The increase was to know the effectiveness of the average score in the experimental class and control class. Table 7 shows that the average gain score in the experimental class was 65.48%, with a minimum score of -43.56 and a maximum score of 100. Meanwhile, the average gain score in the control class showed an average of 42.85%, with a minimum score of 0.00 and a maximum score of 72.97. These results showed that the improvement in the experimental class was quite effective compared to the control class with less effective interpretation.

Table 7. Pretest and Post-Test Gain Score Results

Class	Average (%)	Interpretation
Experiment	65.48	Quite effective
Control	42.85	Less effective

After obtaining the gain score from the results of the HOTS question, the next step is to test the normality of the pretest-post-test result data. The normality test is used to determine whether the data is typically distributed. Table 8 shows the normality test in the control class on pretest and post-test data > a significance level of 0.05, indicating that the data are typically distributed. The same results were also obtained in the experimental class with pretest and post-test data, resulting in a score of > 0.05. The results explain that the experimental class's pretest and post-test data are typically distributed.

Table 8. HOTS Question Normality Test Results

Class	Data	Significance (p)
Control	Pretest	0.193
	Posttest	0.131
Experiment	Pretest	0.079
	Posttest	0.066

In addition to conducting normality tests, data is also tested for homogeneity. The homogeneity test on the results of the HOTS question was conducted to find out whether the experimental class and control class data were homogeneous. The normality test was performed with the SPSS 16.00 program.

Test results of pretest homogeneity control class and experimental class in Table 9. The homogeneity test results state that the pretest data has a significance level of > 0.05, which is 0.502, which indicates that the pretest data is homogeneous. The same results were also obtained in the post-test data, with a significance score of 0.291 and a significance level of >0.05. The results explain that both pretest and post-test data are homogeneous.

Table 9. Results of Homogeneity of HOTS Questions

Data	Significance (p)	Condition	Interpretation
Pretest	0.502	p > 0.05	Homogenous
Posttest	0.291	p > 0.05	Homogenous

The results of the normality test of the next step are an independent t-test. This test determines whether the PBL model applied in the experimental class effectively improves students' HOTS abilities. Data on independent t-test results in the control class and experimental class are shown in Table 10. The pretest results of the experimental class and the control class have a significance of 0.144 or more than 0.05 thus, H0 is accepted. This means there is no significant difference between the experimental and control classes. The post-test results of the experimental and control classes had a result of 0.017 with conditions less than 0.05 and H0 was rejected. This means there is a significant difference in post-test scores, which explains the difference after the treatment is applied in the experimental class.

Table 10. Independent Sample t-test Results

Data	Sig 2-tailed (p)	Condition	Interpretation
Pretest	0.144	p > 0.05	H0 accepted
Posttest	0.017	p > 0.05	H0 rejected

Student HOTS Observation Results

In line with the acquisition of HOTS questions, the improvement of the process in student learning activities using the PBL model can also be seen from student observations. Observations were made on aspects of HOTS, namely critical thinking skills, creative thinking skills, reasoning skills, and decision-making. Observations made during the learning process on digestive system material in class IV. The results of observations on students' HOTS abilities are shown in Figure 2.

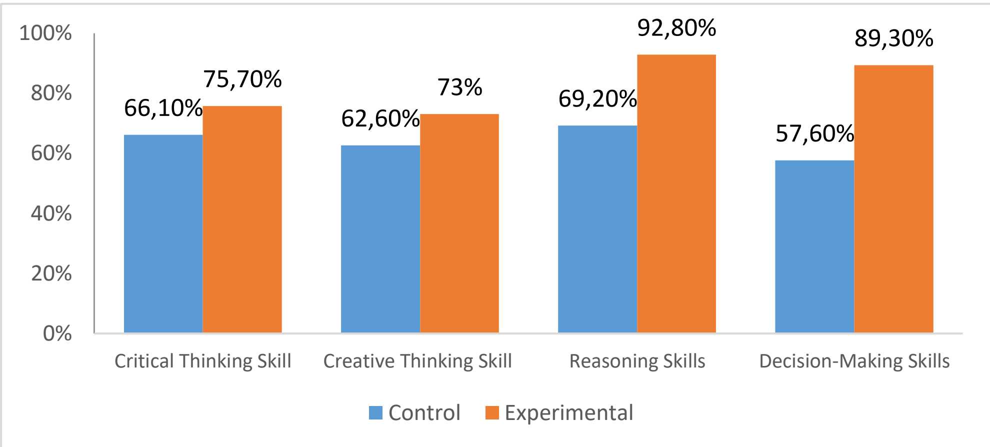

Figure 2. HOTS Observation Score

HOTS observation data obtained that critical thinking skills in the control class were 66.1% while in the experimental class, 75.7%. The output of creative thinking skills amounted to 62.6% in the control class and 73.2% in the experimental class. There is a noticeable gap between the decision-making and argumentation ability scores. The argument ability score in the control class was 69.2% while in the experimental class, it was 92.8%. The decision-making ability score in the control class was 57.6%, and in the experimental class, it was 89.2%. More details can be seen in Figure 2. The HOTS observation demonstrated that the experimental class's HOTS proficiency outperformed the control groups. Therefore, compared to the control class, the experimental class's use of the PBL paradigm is more successful in enhancing students' HOTS skills.

Discussion

According to the study's findings, grade V students' HOTS in understanding science-related digestive content has increased thanks to the PBL model. The problems used in the PBL model can be used to facilitate students in acquiring or integrating new knowledge (Moallem et al., 2019; Wijayanto et al., 2023). In line with this statement, science learning presents many problems that must be resolved. Research analysis results show that experiments enhance both the conceptual knowledge and skill aspects of the science process, as science process skills are inseparable from the conceptual understanding involved in learning and applying science (Harlen, 1999; Anam, et al., 2023). Furthermore, problems in the PBL model provide students with a meaningful learning experience because students are required to collaborate and interact in groups (Dakabesi & Luoise, 2019), create hypotheses, collect data, and create reports (Nurhayati, et al., 2021) to solve contextualized and open-ended designed problem (Luthfiyah, et al., 2019). One of the goals of science learning is to help students understand scientific concepts by addressing alternative ideas (Laksana, 2017) while also emphasizing the importance of developing higher-order thinking skills (HOTS) to solve problems and make decisions logically and reflectively in everyday life (Afikah, et al., 2023). The learning activities completed in the PBL activity encourage students to develop their thinking skills to complete the test in the form of HOTS.

Observations for higher HOTS capabilities using PBL models also support the pre-and post-test findings. There was a 9.6% higher difference in critical thinking skills than in the experimental class. The data proved that students in the experimental class showed better critical thinking skills than those in the experimental class. The inquiry adopted in PBL sessions can encourage and guide students to seek the information needed to solve certain problems because students who are accustomed to problem-solving and collaboration are more easily encouraged to think critically (Nurhayati, et al., 2021). In the ability of creative thinking, it is also known that classes that use the PBL model are higher than control classes. Creative thinking skills can be developed through problem-solving activities with high cognitive involvement in the Problem-Based Learning (PBL) model, as it allows students to engage with all syntaxes and apply their knowledge and skills in real-world or authentic contexts (Anjarwati, et al., 2018; Moallem, et al., 2019). A significant difference from observation can be seen in the ability to argue and the ability to make decisions in the experimental class, which is much higher than in the control class. Problem-based learning (PBL) facilitates group discussions, allowing higher-ability students to assist those with lower abilities (Simanungkalit et al., 2019), while also training all students to find solutions collaboratively or independently, using logic, reasoning, and argumentation to defend their opinions (Yulia & Salirawati, 2023).

This research demonstrates that the PBL paradigm is not only beneficial in raising students' HOTS based on cognitive learning outcomes alone. However, applying the PBL model can also encourage the application of HOTS capabilities in the science learning process, namely, critical thinking skills, creative thinking skills, reasoning skills, and decision-making. This implies that the learning process by applying the PBL model can improve the meaningful science learning process for students. With the inclusion of an observation sheet that encompasses four HOTS skills, the research results become more comprehensive. This allows us to not only obtain information from the cognitive aspect but also to understand their skills through the observations made.

The limitations of this study include the small sample size, which is due to the unique characteristics of the participants. This may affect the generalizability of the research findings to a broader population. Additionally, the study only involved fifth-grade students from a single elementary school in Central Java Province, Indonesia, which may limit the applicability of the results to different educational contexts. Suggestions for future research include expanding the sample size to better represent a broader population, employing mixed research methods to obtain more comprehensive and in-depth results, such as incorporating interviews or case studies and utilizing more advanced analytical techniques to achieve more accurate analysis results.

4. CONCLUSION

The findings in this research are the PBL model's efficacy in cognitive learning outcomes of HOTS and improving skills in HOTS, which can be seen from the increase in critical thinking, creative thinking, reasoning skills, and decision making in critical thinking, creative thinking, reasoning skills, and decision making. The findings of this research are useful for educators who want to improve student HOTS, especially in elementary school students. The recommendation for future research is to conduct further investigations using learning models or learning media to focus on reasoning and decision skills in HOTS skills.

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