



# The Effect of the Application of the Problem Based Learning (PBL) Learning Model on Early Childhood High Order Thinking Skill (HOTS): A Quasi-Experimental Study

Nurul Alisia<sup>1</sup>✉, Arie Martuty<sup>2</sup>, Syamsuardi<sup>3</sup>, Aliem Bahri<sup>4</sup>, Intisari<sup>5</sup>, Nur Alim Amri<sup>6</sup>, Heni Safitri Hasbur<sup>7</sup>

<sup>1,3,4,5,6</sup> University of Muhammadiyah Makassar, Indonesia

<sup>2</sup>Makassar State University, Indonesia

## ABSTRACT:

This study aims to investigate the effect of the application of the Problem Based Learning (PBL) learning model on higher order thinking skills (HOTS) in early childhood. This study used a pre-experimental design with the One Group Pretest-Posttest model, involving 15 children aged 5–6 years in a private kindergarten in the Gatot Subroto area. The PBL model is applied through activities that allow children to observe phenomena, identify problems, design solutions, and draw conclusions independently. Data collection was carried out through observation of high-level thinking skills at two stages, namely before and after PBL treatment. The results of descriptive statistical analysis showed an increase in the average score from the pretest by 26.67 to 52.53 in the posttest. The Wilcoxon Signed-Rank test showed a significance value (2-tailed) =  $0.001 < 0.05$ , which indicates a significant effect of the application of PBL on the improvement of children's high-level thinking skills. These findings suggest that PBL is effective in developing analytical, critical, and creative thinking skills in early childhood. The implication of the results of this study is the need to integrate problem-based learning models in the early childhood education curriculum as a strategy to optimize cognitive development and children's readiness to face future challenges

## Artikel History

Submission : April 22, 2025

Received : Juni 21, 2025

Accepted : October 10, 2025

## Keywords:

Early Childhood, Higher Level Thinking skills, Learning Models, Problem-Based Learning

Doi:10.21009/jpud.v19i2.54673

Creative Commons Attribution 4.0 International License.



CONTACT Corresponding: Nurul Alisia, University of Muhammadiyah Makassar, Indonesia  
Email: [alisanurul38@gmail.com](mailto:alisanurul38@gmail.com)

## 1. Introduction

Higher Order Thinking Skills (HOTS) are an important focus in early childhood education. HOTS involves deep critical, analytical, creative, and reflective thinking skills, and is important to assist children in solving problems independently and innovatively (Selirowangi et al., 2024; Zhou et al., 2024). Brookhart, as quoted by Pollarolo et al. (2024), refers to HOTS as an approach that emphasizes knowledge transfer, critical thinking, and problem-solving. In the complex modern era, these skills are indispensable as the main foundation in facing life's challenges.

Nonetheless, there is still debate among practitioners and academics about the extent to which early childhood can develop HOTS effectively. Children in the preoperational stage, according to Piaget's theory of development, have a mindset that is still concrete and egocentric (Misriatun, 2024). However, recent studies have shown that with the right approach, early childhood can show the capacity to think at a higher level, such as the ability to evaluate and create new ideas (Jannah in Tasrif, 2022; Melania et al., 2020; Suryana, 2016).

Problems arise when many teachers do not fully understand how to stimulate high-level thinking skills in learning practice (Purnamasari et al., 2020). In addition, teachers are still reluctant to apply the HOTS approach because they are used to methods that are one-way and teacher-centered (Dimitrova et al., 2022). Initial observations conducted by researchers at a private kindergarten in the Gatot Subroto area, showed that children had difficulty

recognizing cause and effect, evaluating options, and coming up with solutions to the simple problems they faced. This is suspected to be due to monotonous learning methods and minimal exploratory stimuli (Kusuma et al., 2023).

To answer these challenges, a learning approach is needed that not only emphasizes results, but also on the child's thinking process. One of the learning models that is considered suitable to increase HOTS in early childhood is Problem Based Learning (PBL). PBL makes problems the starting point for learning and encourages children to explore, investigate, and formulate solutions collaboratively (Septina Lestari et al., 2021; Wulandari et al., 2023). According to Alonso-García et al. (2024), PBL can increase children's engagement and motivation, as well as provide space to develop critical thinking through relevant learning experiences.

The advantages of PBL in the context of early childhood education are also explained by Behrens et al. (2025), who state that this model is able to create an interactive and collaborative learning environment. This is important, because at an early age, children learn best through direct interaction with the environment and peers. In a study conducted by Intisari et al. (2024), PBL was proven to improve children's ability to understand real problems, as well as train their courage in making decisions. Even in challenging social conditions, PBL can strengthen children's adaptability and innovation (Sulaiman, 2020; Amalafitra et al., 2022).

Preliminary findings from this study showed that the average HOTS score of children before PBL treatment was 26.67, which is relatively low. After PBL treatment, the average score increased to 52.53, which indicates that children are beginning to be able to identify problems, strategize, and come up with solutions independently. The Wilcoxon Signed-Rank test yielded a Sig. (2-tailed) value =  $0.001 < 0.05$ , which suggests the increase is statistically significant. But more than just numbers, this increase reflects that PBL provides a meaningful learning experience and encourages the development of children's thinking as a whole (Selirowangi et al., 2024; Liang et al., 2024).

Thus, this study focuses on efforts to investigate the effect of the application of problem-based learning models on the improvement of high-level thinking skills of children aged 5–6 years in private kindergartens in the Gatot Subroto area. It is hoped that the results of this research can contribute to learning innovations in early childhood education to be more adaptive, reflective, and empower children's thinking potential from an early age.

## 2. Method

### 2.1 Research Approaches and Subjects

This study uses a quantitative approach with the type of experimental research in the form of pre-experimental designs. The research design used a one-group pretest-posttest design. This method was chosen because the researcher wanted to investigate the effect of treatment, namely the *Problem Based Learning* (PBL) learning model, on higher *order thinking skills* (HOTS) in early childhood under limited conditions, namely without a control group. This approach is appropriate for the context of early childhood education which has a small population and emphasizes intervention against one learning group (Sugiyono, 2015).

The subjects in this study were 15 children aged 5–6 years in a private kindergarten in the Gatot Subroto area, who were selected using the purposive sampling technique. The subject criteria are children who have never received a problem-based learning intervention before and are at a stage of cognitive development that is in accordance with the development goals of HOTS. The research was conducted in three main stages. Pretest, measure the child's initial HOTS ability before being given treatment using observation guidelines. Treatment, providing treatment in the form of the application of the problem-based learning model (PBL) during several meetings with activities that triggered HOTS and posttest, remeasuring the child's HOTS ability after being given treatment, using the same instrument as the pretest.

**Table 1.** One Group Pretest-Posttest Design Research Design

| Pretest Treatment Posttest |   |    |
|----------------------------|---|----|
| O1                         | X | O2 |

## 2.2 Data Collection and Analysis Techniques

Research instruments are tools that assist researchers in collecting data (Sugiyono, 2015). The data to be collected determines the type of research instrument chosen. However, in this study, the instrument used in this study is a structured observation sheet. The data analysis technique used was nonparametric statistics using the Wilcoxon Signed Rank Test to evaluate differences in treatment of research subjects. This is used for two paired samples and data that are not normally distributed with a sample of  $n < 25$  (Riadi, 2016). The Wilcoxon Signed Rank Test procedure can be done by determining a hypothesis and then testing the hypothesis with a significance level of 0.005 or 5%. Conclusion making and statistical testing based on hypothesis testing will be carried out using IBM SPSS 25.

Achievement of Higher Level Thinking Skills (HOTS) Observation is carried out directly by researchers and classroom teachers using guidelines that measure the four main aspects of HOTS, namely through several indicators that include (knowing information, identifying problems, solving problems, and producing solutions) each aspect is assessed using an assessment scale that has been validated by education experts and supervisors. Validation is carried out to ensure that the instrument can measure the HOTS indicator appropriately according to early childhood development. Observation is carried out during the learning process, both in the pretest and posttest stages, by recording the child's behavior and response to tasks given in the context of problem-based activities (such as games, experiments, and group discussions). It is expected that when students acquire new information, they can understand the context and relevance of the information to the situation at hand.

When students have the ability to identify problems, they can recognize the core of the problem at hand and determine the aspects that require further analysis. Students are also expected to formulate key questions that will help them in the problem-solving process. When students attempt to solve problems, they demonstrate the ability to plan logical and systematic steps. They can explore various strategies, choose the most appropriate approach, and adapt when facing obstacles in the process.

When students are able to come up with solutions, they demonstrate creativity and analytical skills. They can formulate several alternative solutions, evaluate their effectiveness, and choose the most relevant solution based on the analysis that has been done. This allows them to provide a strong justification for the choices made. These indicators of achievement of high-level thinking skills demonstrate students' ability to think critically and systematically, and build decision-making skills that are essential to their success in many aspects of life.

The assessment involves input from supervisors, education experts, and teachers who are experienced in assessing learning instruments. The test measures four aspects of high-level thinking skills, namely the ability to find information, identify problems, solve problems, and come up with solutions. After each learning session, students receive an evaluation of the results of the instruments used. Nonparametric statistical methods, such as Wilcoxon's marked rating test, were used to test the hypothesis of this study. This test compares the results of pre-test and post-test experimental groups using Problem-Based Learning (PBL) to find out if the application of this learning model results in a significant improvement in students' high-level thinking skills (HOTS). The data analyzed consisted of the difference in scores between the pre-test and post-test groups. This method of analysis can be applied to relatively small data samples that do not meet the assumption of normality.

The criteria for hypothesis testing are as follows:

H<sub>0</sub> is accepted if the Sig. (2-tailed) value is  $> 0.05$  which means that the PBL model has no effect on HOTS.

H<sub>1</sub> is accepted if the Sig. (2-tailed) value  $< 0.05$  which means that there is a significant influence of the PBL model on HOTS.

The results showed that the Sig. (2-tailed) value  $< 0.05$  which means that there is a significant influence of the use of learning media on learning motivation. Problem-Based Learning (PBL) is a problem-based learning model for students' High Order Thinking Skill (HOTS) abilities in private kindergartens in the

Gatot Subroto area. These findings suggest that problem-based learning can improve critical thinking skills in early childhood. This is the basis for integrating the problem-based learning model with the High Order Thinking Skill (HOTS) abilities of students in private kindergartens in the Gatot Subroto area. Problem-Based Learning (PBL) Social Studies learning model into the early childhood education curriculum as an effective strategy in developing higher-level thinking skills.

### 3. Result

The results of this study show that there is a tendency to increase children's higher level thinking skills (HOTS) after the implementation of the problem-based learning model (PBL). Children show active participation, simple analytical skills, and formulate solutions in the context of daily learning. Observational guideline tools collect data by measuring three main components: knowing information, identifying problems, solving problems, and generating solutions. The Wilcoxon Marked Rating Test was used to compare the pre-test and post-test scores of the experimental group.

**Table 2 Pre-Exam Table**

| NOT | Name                    | Sign | Predicate |
|-----|-------------------------|------|-----------|
| 1   | Dyta Aulia Natasyah     | 15   | BB        |
| 2   | Eka Sakti Oktaviani     | 17   | BB        |
| 3   | Hamdiani                | 19   | BB        |
| 4   | Marcelina               | 21   | BB        |
| 5   | Nur Afira Bakti         | 23   | BB        |
| 6   | Holy Revelation         | 25   | BSH       |
| 7   | Nur Yulianti            | 45   | BB        |
| 8   | Zulaika Riski Ramadhani | 29   | BB        |
| 9   | Ibrahim Lukman          | 16   | BB        |
| 10  | Muh Alif Yusril         | 18   | BSH       |
| 11  | Syafik Ramadhan         | 45   | BB        |
| 12  | Akram Kusuma            | 30   | BB        |
| 13  | Ananta Bagus            | 28   | BSH       |
| 14  | Inspired by Ramadhan    | 45   | BB        |
| 15  | Muh Alif                | 24   | BB        |

Before the treatment, the results of the pre-test showed that the child's High Order Thinking Skill (HOTS) skills were low on average, with most participants experiencing difficulties in the ability to find information, identify problems, solve problems, and come up with solutions.

**Table 3 Post-Exam Table**

| NO | Name                    | Tanda | Predicate |
|----|-------------------------|-------|-----------|
| 1  | Dyta Aulia Natasyah     | 45    | BSH       |
| 2  | Eka Sakti Oktaviani     | 47    | BSB       |
| 3  | Hamdiani                | 49    | BSB       |
| 4  | Marcelina               | 50    | BSB       |
| 5  | Nur Afira Bakti         | 53    | BSH       |
| 6  | Holy Revelation         | 55    | BSB       |
| 7  | Nur Yulianti            | 59    | BSB       |
| 8  | Zulaika Riski Ramadhani | 60    | BSB       |
| 9  | Ibrahim Lukman          | 48    | BSH       |
| 10 | Muh Alif Yusril         | 46    | BSH       |
| 11 | Syafik Ramadhan         | 60    | BSH       |
| 12 | Akram Kusuma            | 45    | BSH       |
| 13 | Ananta Bagus            | 53    | BSB       |
| 14 | Inspired by Ramadhan    | 60    | BSB       |
| 15 | Muh Alif                | 58    | BSB       |

After treatment, the post-test results showed a significant improvement in children's High Order Thinking Skills (HOTS), namely some children were able to identify their own problems, solve problems, and produce independent solutions.

### 3.1 Quantitative Results

**Table 4 Descriptive Statistics**

|                         | N  | Minimum | Maximum | Mean  | Standard Deviation |
|-------------------------|----|---------|---------|-------|--------------------|
| <i>Pre-test</i>         | 15 | 15      | 45      | 26,67 | 10,554 people      |
| <i>Post-tests</i>       | 15 | 45      | 60      | 52,53 | 5,805 people       |
| Valid N (based on list) | 15 |         |         |       |                    |

Table 4 shows that the average score in the post-test (52.53) was much higher than in the pre-test (26.67), which suggests that the use of the problem-based learning model (PBL) can improve early childhood Higher Level Thinking skills (HOTS). A lower standard deviation score (Std. Deviation) in the post-test (5,805) indicated that the improvement was more even among the participants, indicating uniform treatment effectiveness. This study did not have a control group,

and the sample was small ( $n = 15$ ). To improve the validity of the results, future research is recommended to use true experimental designs with control groups. The development of more standardized instruments can also lead to more honest results. Therefore, the findings of this study show that the problem-based learning (PBL) model is effective for improving early childhood high-level thinking skills (HOTS). This research is very relevant to be applied in the early childhood education environment.

To test the hypothesis that the successful use of the problem based learning (PBL) learning model in improving the ability of High Order Thinking Skill (HOTS) is used

The Wilcoxon Signed-Rank test is used because the data is not distributed normally. The test results showed a Z value of -3.424 and an Asymp value. Sig. (2-tailed) is 0.001. This value is smaller than the significance level of 0.05, so the null ( $H_0$ ) hypothesis is rejected. This means that there is a significant influence between the Problem Based Learning (PBL) learning model on early childhood High Order Thinking Skill (HOTS) skills.

The Wilcoxon test is used to determine if there is a significant difference between data that does not meet the assumption of normality.

**Table 5 Nonparametric Statistical Tests**

|                            | Post-test - Initial<br>Test |
|----------------------------|-----------------------------|
| Indonesian: Z              | -3,424 yearsB               |
| Asimptomatik Sig. (2-oaks) | 0,001                       |

- a. Wilcoxon Marked Rating Test
- b. Based on negative ratings.

The Z value shows the results of statistical calculations in the form of the difference between the increase and decrease in the ranking between the pre-test and the post-test. Higher ranking increases, meaning that most post-test scores are higher than pre-test. Asymp. Sig (2-tailed) = 0.001 This is the p-value of the double-sided test. The result is considered statistically significant because the value of  $p(0.001)$  is smaller than the level of significance found, which is usually 0.05. This means that pre-test and post-test scores differ significantly. So, the results of the treatment have a significant effect. The question-based learning model (PBL) can significantly improve children's high-level thinking skills (HOTS).

Inferential statistical tests using Wilcoxon Signed-Rank showed a value of  $Z = -3.424$  with a significance of 0.001. The value is less than 0.05, so the null ( $H_0$ ) hypothesis is rejected, which means that there is a significant influence between the dependent variable and the bound variable. Practically, this can be seen from the change in children's behavior in group discussions, their courage to convey ideas, and creativity in drawing solutions. This is not just a difference in numbers, but an educational meaning that problem-based learning is able to activate children's thinking potential from an early age. Problem-based learning (PBL) model in students of high level thinking skills (HOTS) The results of this test reinforce the finding that problem-based learning can improve students' critical thinking skills. Significant improvements demonstrate the effectiveness of PBL methods in helping students understand problems, find solutions, and create innovations. Thus, this study provides empirical evidence that problem-based learning (PBL) can improve students' critical thinking skills at the early childhood education level. These results confirm the relevance of problem-based learning models to be applied more widely to formal education. The results of this

test reinforce the finding that problem-based learning can improve students' critical thinking skills. Significant improvements demonstrate the effectiveness of problem-based learning models. Problem-based learning (PBL) method in helping students understand problems, find solutions, and create innovation.

The problem-based learning (PBL) learning model in this study actively involves children in the learning process through real-life problem-solving activities that are relevant to their lives. This method not only improves critical thinking skills, but also trains students' communication and collaboration skills (Liang et al., 2024). The data obtained also shows that after the application of this learning model, children can learn independently and independently. Problem-based learning (PBL), no student gets substandard grades, this shows the success of this method in improving students' abilities evenly

The results of this study have important implications in the context of early childhood education. Early childhood is a critical developmental period so it requires the right stimulation to optimize its potential. Problem-based learning (PBL) enables students to develop high-level thinking skills comprehensively, while helping them become more creative and innovative individuals (Kwangmuang et al., 2021). Therefore, this study recommends the integration of PBL into the early childhood education curriculum as an effective strategy in training high-level thinking skills (HOTS)

In addition, to support the successful implementation of problem-based learning (PBL), teacher training is an urgent need. Teachers need to understand how to design problem-based learning that is relevant to student development. With adequate training, teachers can implement effective problem-based learning (PBL) to improve the quality of learning in the classroom. In the future, further research is needed to explore the application of problem-based learning (PBL) in various educational contexts and age levels, as well as its impact on other abilities (Rittmann & Mpofu, 2024).

Overall, this study proves that problem-based learning (PBL) is one of the most effective learning models in the ability of students to think skills at higher levels (HOTS) based on the results of the pretest for high-level thinking skills showing an average score of 26.67. After treatment through problem-based learning with three meetings, the posttest results increased to 52.53. This increase in score indicates that the child is beginning to be able to use high-level thinking skills, such as recognizing cause and effect in situations, choosing solutions, and devising simple strategies for solving problems. Qualitative data in the form of behavioral observations are presented as a support for quantitative data, not as part of a mixed method. The goal is to describe more fully how HOTS develops in real life in children's behavior during the PBL process. This model can be a solution to improve learning approaches that are still teacher-centered (Nowlan et al., 2023). Problem-Based Learning (PBL) not only improves critical thinking skills, but also provides a meaningful learning experience for students, so they are better prepared to face future challenges

### **3.2 Qualitative Results**

Qualitative results were obtained from direct observation during the learning session involving tower construction, puzzle solving, and search for lost items. These observations show positive behavioral changes in students that include active participation, cooperation, and critical thinking skills in solving given challenges. The results obtained are summarized in several key findings that illustrate indicators of children's high-level thinking ability to express opinions about new information, identify object differences, problem-solving ability, and ability to come up with solutions. Expressing opinions about new information The results of observations show that children are able to express their opinions about the new information provided. In the activity of

building the tower, the children are shown different types of materials (e.g., wooden blocks, cardboard, and stone). They are then invited to discuss which materials are best suited to use. Children demonstrate an understanding of the characteristics of each material and express their opinions, such as, "Cardboard is lighter, so it is easier to move, but wooden blocks are stronger." Identifying Object Differences During the puzzle-making session, children were asked to identify the differences between one piece of the puzzle and another.

They actively compare the shape and color of the pieces. For example, a child points to a red piece and says, "It's different from the blue one, it's bigger." This activity helps them better understand the concept of difference and object classification. Problem-Solving Abilities In the search for lost items, children are faced with situations where some items have been hidden. They must formulate a strategy to find those items. Children work together in groups, share ideas, and try different methods, such as dividing the search area into sections. One child noted, "Let's look at the most likely place first, then we'll move on to another area." This demonstrates their ability to identify problems and design an effective search plan.

Ability to find solutions When children manage to find some lost items, they are also asked to evaluate their search methods. They reflect on the solutions they have used and look for ways to improve the efficiency of their search. For example, after finding some items, a child says, "We can use a flashlight to see in the dark, it will help us find more items." then Shoe rack missing "Our shoe rack was there yesterday, but today it is gone! We need to find out where the shoe rack is." One morning, the children in the class noticed that their shoe rack, which was usually located in the corner of the room, was missing. They were all confused and wanted to find out where the shoe rack was. The children began to discuss with each other. They remembered that the shoe rack was there yesterday. One of the children said, "I saw it before we got home from school yesterday!" They all agreed to conduct a search. First, they made a list of places where the shoe rack might be located. They note multiple locations, such as in the teacher's room, behind the door, or perhaps outside the classroom. The children then divide themselves into small groups, with each group responsible for checking a specific location. After dividing up tasks, they begin their search. Each group tries to explore the designated location, helping each other out and sharing information about what they find. One group checked the teacher's room and found some shoes left behind, but did not find a shoe rack. The other group checked outside the classroom and saw some other items, but still couldn't find a shoe rack. When the search time was running out, they regrouped and discussed what they had found. Although the shoe rack had not yet been discovered, one child suggested, "How about we make a new shoe rack out of boxes in the classroom?" This shows that children are not only capable of finding solutions, but also innovative in their approaches. After each session, children are asked to reflect on their experiences. They discuss what works and what doesn't work in the learning process. In a tower building session, a child said, "Our tower is taller, but it's not stable, so we need to add more support." This demonstrates their ability to evaluate their results and think of improvements for the next project.

The results of the study showed that learning activities involving building towers, putting together puzzles, and searching for lost items were very effective in improving children's high-level thinking skills. These activities not only encourage critical and creative thinking skills, but also help children develop social and collaborative skills. With real experience through these activities, children are better prepared to face future challenges with more confidence. This study found that the problem-based learning (PBL) model has been proven to be effective in honing high-level thinking skills (HOTS) in early childhood.

These findings are in line with Zhou et al. (2024), who stated that children can demonstrate high-level thinking skills if given a learning context that supports exploration. Alonso-García et al. (2024) also found that PBL promotes the formation of meaning in contextual and collaborative learning. In Indonesia, a study by Selirowangi et al. (2024) showed similar results, that PBL was able to increase children's thinking activeness.

#### 4. Discussion

Research on the effect of the application of the Problem Based Learning (PBL) learning model on the ability of High Order Thinking Skills (HOTS) in early childhood is focused on how this method can develop high-level thinking skills in children, especially in the context of early childhood education (PAUD) (Anggraini et al., 2024). This Problem Based Learning (PBL) learning model is a student-centered learning model by exposing students to various problems faced in real life and students trying to solve these problems (Meilasari et al., 2020). This approach has been proven to be effective in improving high-level thinking skills because it provides children with the opportunity to work in challenging situations and solve problems collaboratively (Erlangga et al., 2023).

High Order Thinking Skill (HOTS) encompasses more complex thinking abilities and involves analysis, synthesis, evaluation, and problem-solving. This ability is very important to be developed early because it can strengthen the cognitive foundation of children that will support their ability to solve problems and think critically in the future. The High Order Thinking Skill (HOTS) involves not only an in-depth understanding of information, but also the ability to connect existing knowledge to new situations, develop new ideas, and evaluate and consider various possible solutions.

Learning model Problem Based Learning (PBL) involves students to be active in learning activities and needs information to be able to solve existing problems (Kurniasih et al., 2020). The problem-solving process in PBL encourages students to consider different perspectives, stimulate imagination, and collaborate with their peers (Asriningtyas et al., 2018) based on the information that has been obtained. In this process, the child focuses not only on the correct answer, but also on the deep thinking process. For example, in the context of early childhood education, teachers can use problems that are relevant to the child's world, such as problems related to the surrounding environment or children's daily lives. This will make it easier for children to understand problems and develop their critical thinking skills.

Research conducted in early childhood shows that the application of Problem Based Learning (PBL) can improve High Order Thinking Skill (HOTS) them. (Dias-Oliveira dkk., 2024) Using this method, children are encouraged to think more independently, work together in groups, and consider different perspectives in solving problems. This problem-focused learning process encourages children to be more active in finding solutions and learning through their experiences. They are not only informed, but also given the opportunity to explore issues firsthand, discuss with peers, and build new knowledge through collaboration.

In addition, Problem Based Learning (PBL) also improves children's social skills because children often work in groups to solve problems (Mayasari et al., 2022). This group work allows children to learn to listen to other people's opinions, put forward their own ideas, and communicate more effectively. Thus, the application of Problem Based Learning (PBL) not only has an impact on improving High Order Thinking Skills (HOTS), but also on children's social and emotional development.

However, to obtain optimal results, the application of PBL in early childhood needs to be adjusted to the stage of cognitive development. Because children at an early age are still in the preoperational stage according to Piaget's (1952) developmental theory, they tend to think concretely and more easily understand concepts that they can observe directly (Misriatun, 2024). Therefore, the problems presented in Problem Based Learning (PBL) learning must be relevant to their world and can be understood through experiments or practical activities that involve direct observation, such as simple experiments or educational games that involve problem solving.

The application of Problem Based Learning (PBL) in early childhood also demands the role of teachers as very important facilitators. Teachers not only provide instructions, but also guide children in the process of thinking

and solving problems (Maulani, 2023). Teachers must be able to create an environment that supports exploration and collaboration, as well as provide constructive feedback to help children develop high-level thinking skills.

Overall, the application of the Problem Based Learning (PBL) learning model can have a significant impact on the development of High Order Thinking Skills (HOTS) in early childhood. By giving children the opportunity to think critically, solve problems, and work together in groups, this model helps them develop complex thinking skills, which will be very useful for their future learning. Therefore, PBL can be considered a very effective learning model to improve High Order Thinking Skills (HOTS) in early childhood.

## 5. Conclusion

Based on the results of the study, it can be concluded that the application of the Problem Based Learning (PBL) learning model has a positive and significant effect on improving the ability of High Order Thinking Skills (HOTS) in early childhood. The average increase in critical thinking skills in early childhood was 0.05. The value of the child's High Order Thinking Skill (HOTS) from pretest to posttest accompanied by a decrease in standard deviation showed that children who were given Problem Based Learning (PBL) treatment showed significant development in critical thinking, problem-solving, and analytical skills. The results of the Wilcoxon statistical test with a value of  $\text{Sig. (2-tailed)} = 0.001$  reinforce this finding, which shows that the application of PBL has a significant effect on children's High Order Thinking Skill (HOTS) ability.

Therefore, the application of the Problem Based Learning (PBL) Model can be considered effective in developing high-level thinking skills in early childhood, considering that this method actively involves children in problem-based learning that is relevant to their daily lives. This supports the theory that learning based on real experience and active exploration can stimulate children's cognitive development, preparing them to think critically and solve problems in innovative and effective ways.

## 6. References

- Abdullah, I., & Sari, IP (2014). The Identity Politics of the Indonesia-Malaysia Border Community: The Case of Badau in Kapuas Hulu, West Kalimantan. *Journal of Psychology*, 4(3). <https://doi.org/10.22146/kawistara.6378>
- Angraini, SD, & Susiloningsih, W. (2024). The Effect of Problem-Based Learning Models on High-Level Thinking Skills in Elementary School Class IV Science Learning. *Journal of Humanities and Social Sciences*, 2(03), 1052-1059.
- Agustina, A. (2023). Social Skills Development through Problem-Based Learning. *Journal of Child Education*, 8(1), 45-52.
- Alonso-García, S., Rodríguez Fuentes, A.V., Ramos Navas-Parejo, M., & Victoria-Maldonado, JJ (2024). Improving computational thinking in early childhood education with educational robotics: A meta-analysis. *Heliyon*, 10(13). <https://doi.org/10.1016/j.heliyon.2024.e33249>.
- Asriningtyas, A.N., Kristin, F., & Anugraheni, I. (2018). Application of the Problem Based Learning Model to Improve Abilities. *JKPM Journal*, 5(1), 5–10.
- Amalafitra, A., et al. (2022). Education and Child Independence. *Journal of Child Education*, 12(3), 245- 260.
- Behrens, S., Lawson, L.A., Bigelow, K., Dean, E., Zhang, A., Foster, L.H., & Bridges, M.S. (2025). Exploring home visitors' use and perceptions of developmental monitoring: A mixed-methods study. *Early Childhood Research Quarterly*, 71 (October 2024), 1–11. <https://doi.org/10.1016/j.ecresq.2024.11.011>
- Dimitrova, E., Hu, J., Liang, Q., Stigler, B., & Zhang, A. (2022). Algebraic model selection and experimental design in biological data science. *Advances in Applied Mathematics*, 133, 102282. <https://doi.org/10.1016/j.aam.2021.102282>
- Dias-Oliveira, E., Pasion, R., Vieira da Cunha, R., & Lima Coelho, S. (2024). Development of critical thinking, teamwork, and communication skills in business school–Project-based learning approach. *Thinking Skills and Creativity*, 54 (October), 101680. <https://doi.org/10.1016/j.tsc.2024.101680>.
- Erlangga, S.Y., Poort, E.A., Manasikana, O., & Dimas, A. (2023). Meta-analysis: a problem-based effect size learning model on higher level thinking skills (HOTS) and students' conceptual understanding in physics. *Compton: Scientific Journal of Physical Education*, 9(2), 185-198.
- Ery Wahyuti, S., et al. (2023). Children's cognitive development through play. *Journal of Child Psychology*, 14(1), 56-72.
- Fatmawati, R. (2021). Learning Environment That Supports Problem-Solving Skills. *Journal of Education and Learning*, 15(2), 134-150.
- Fitria, R. (2018). Cooperation in Problem-Based Learning. *Journal of Educational Innovation*, 10(2), 123-130.
- Firmansyah, D. & Dede. (2022). General Sampling Techniques in Research Methodology: A Review of the Literature. *Scientific Journal of Holistic Education (JIPH)*, 1(2), 85–114. <https://doi.org/10.55927/jiph.v1i2.937>.
- Heryani, L. (2023). Creativity in Early Childhood Problem Solving. *Journal of Early Childhood Education*, 5(1), 78-89.
- Hendarto, B. (2021). Benefits of PBL in Early Childhood Education. *Journal of Education*, 15(3), 78-85.

- Hendrawati, I. (2022). Collaboration in PBL Learning. *Journal of Education and Learning*, 9(4), 34-40.
- Herman, T., Hasanah, A., Nugraha, R., Harningsih, E., Ghassani, D., & Marasabessy, R. (2022). Problem-Based Learning-High Order Thinking Skill (HOTS) in Translation Materials. *Journal of Scholars: Journal of Mathematics Education*, 6(1), 1131-1150. <https://doi.org/10.31004/cendekia.v6i1.1276>.
- Intisari, Purwati, D., & Usman. (2024). The Effect of the Contextual Teaching and Learning Approach on Mastering Early Childhood Language Skills 5-6 Years Old. *Al-Fikru: Journal of Education and Science*, 5(1), 85-107.
- Julianti, S. (2020). The Importance of Critical Thinking in Early Childhood. *Journal of Educational Psychology*, 11(2), 56-62.
- Kusuma, D. (2023). Application of PBL in Early Childhood Education. *Journal of Educational Development*, 12(1), 23-30.
- Kurniasih, P.D., Nugroho, A., & Harmianto, S. (2020). Improving Higher Order Thinking Skills (Hots) and Cooperation between Students through the Problem Based Learning (PBL) Learning Model with Kokami Media in Grade IV of SD Negeri 2 Dukuhwaluh. *Attadib: Journal of Basic Education*, 4(1), 23. <https://doi.org/10.32507/attadib.v4i1.627>.
- Kusuma, T.C., Boeriswati, E., & Supena, A. (2023). The Role of Teachers in Improving Early Childhood Critical Thinking. *Aulad: Journal of Early Childhood*, 6(3), 413-420.
- Kwangmuang, P., Jarutkamolpong, S., Sangboonraung, W., & Daungtod, S. (2021). Development of learning innovations to improve high-level thinking skills for junior high school students in Thailand. *Heliyon*, 7(6), e07309. <https://doi.org/10.1016/j.heliyon.2021.e07309>.
- Karomah, N., et al. (2024). Adaptation of Children in a New Environment. *Journal of Developmental Psychology*, 18(4), 302-315.
- Liang, H., Lin, C., & Pang, A. (2024). An actor-critic reinforcement learning framework based on expert knowledge data to solve computationally expensive unit commitment problems with uncertain wind energy. *International Journal of Electric Power and Energy Systems*, 159 (May), 110033. <https://doi.org/10.1016/j.ijepes.2024.110033>
- Mayasari, A., Arifudin, O., & Juliawati, E. (2022). Implementation of the Problem Based Learning (PBL) model in increasing learning activity. *Journal of Tahsinia*, 3(2), 167-175.
- Maulani, S. (2023). Implementation of the Independent Learning Program for Early Childhood through Project-Based Learning. *Journal of Tunas Pendidikan Journal*, 6(1), 331-339.
- Maghfiroh, S., & Suryana, D. (2021). Learning media for early childhood in early childhood education. *Journal of Tambusai Education*, 5(1), 1560-1566.
- Marpaung, T., Hasni, U., & Pangaribuan, T. (2023). Development of the Baset Learning Project model to stimulate the thinking skills of early childhood aged 5-6 years. *Penda: Scientific Journal of Basic Education*, 8(2), 3842-3854. <https://doi.org/10.23969/jp.v8i2.10214>
- Meilasari, S., Damris M, DM, & Yelianti, U. (2020). A Study of the Problem Based Learning (PBL) Learning Model in School Learning. *BIOEDUSAIN: Journal of Biology and Science Education*, 3(2), 195-207. <https://doi.org/10.31539/bioedusins.v3i2.1849>
- Misriatun, S. (2024). Improving scientific understanding of energy in early childhood through simple experimental activities. *Journal of Anak Bangsa*, 3(2), 170-180.
- Melania, M., Sani, R., Meha, A.M., & Nenotek, S.A. (2020). The application of the 5E learning cycle model to improve students' higher level thinking skills (HOTS). 3(1), 15-23.
- Marpaung, T., Hasni, U., & Pangaribuan, T. (2023). Development of the Baset Learning Project model to stimulate the thinking skills of early childhood aged 5-6 years. *Penda: Scientific Journal of Basic Education*, 8(2), 3842-3854. <https://doi.org/10.23969/jp.v8i2.10214>.
- Mardiana, L. (2019). PBL Learning Strategies for Early Childhood. *Journal of Basic Education*, 14(3), 67-75.
- Nugraha, E. (2020). Increasing Children's Learning Motivation through PBL. *Journal of Educational Sciences*, 7(2), 90-98.
- Nugraha, E. (2020). The implementation of the tahfizh Qur'an program in PAUD is inclusive with the HOTS model. *As-Sibyan: Journal of Early Childhood Education*, 5(2), 95-106. <https://doi.org/10.32678/as-sibyan.v5i2.3569>
- Nowlan, N., Arya, A., Qorbani, H.S., & Abdinejad, M. (2023). Assessment of high-level thinking skills in a 3D virtual learning environment using expert motives and data. *Computers & Education: Reality X*, 2 (November 2022), 100012. <https://doi.org/10.1016/j.cexr.2023.100012>
- Purnamasari, I., Handayani, D., & Formen, A. (2020). Stimulation of HOTs Ability in Early Childhood Education Through STEAM Learning. *National Postgraduate Seminar*, 3(1), 507-516.
- Pollarolo, E., Papavaslopoulou, S., Granone, F., & Reikerås, E. (2024). Playing with coded toys in early childhood education and care: Teachers' pedagogical strategies, views and their impact on child development, a systematic literature review. *Entertainment Computing*, 50 (February), 100637. <https://doi.org/10.1016/j.entcom.2024.100637>
- Peters, A., Zeytinoglu, S., Leerkes, E.M., & Isbell, E. (2023). Specific developmental trajectories of the ERP index components of cognitive control in early childhood. *Developmental Cognitive Neuroscience*, 64 (September), 101319. <https://doi.org/10.1016/j.dcn.2023.101319>
- Rahmawati, R.L., & Nazarullail, F. (2020). Outing Class Learning Strategies to Improve Early Childhood Development Aspects. *Journal of PG-PAUD Trunojoyo: Journal of Early Childhood Education and Learning*, 7(2), 9-22. <https://doi.org/10.21107/pgpaudtrunojoyo.v7i2.8839>
- Ramadhani, S.D., & Haikal, M. (2024). The Effect of the Problem Based Learning Model with Metacognitive Reflection on Critical Thinking Ability and Student Learning Outcomes The Effect of the Problem Based Learning Model with Metacognitive Reflection on Students' Critical Thinking Ability. 3(2), 125-141.
- Rittmann, H., & Mpofu, N. (2024). Explore self-reported practices by teachers to foster critical thinking skills in a multilingual ESL high school environment. *Social Sciences and Open Humanities*, 10 (September), 101156. <https://doi.org/10.1016/j.ssaho.2024.101156>.
- Rochmah, U., et al. (2019). Children's Confidence and Problem Solving. *Journal of Child and Adolescent Psychology*, 10(2), 145-160.

- Rizki, M. (2019). Problem-Based Learning in Creative Learning. *Journal of Educational Creativity*, 6(1), 15-22.
- Riadi, A. (2016). Problem-based learning improves the high-level thinking skills of grade VIII students of Smpn 1 Daha Utara and Smpn 2 Daha Utara. *Journal of Mathematics Education*, 2(3).
- Sari, P. (2021). The Role of Teachers as Facilitators in PBL. *Journal of Education and Learning*, 10(3), 44-51.
- Scott, S. (2024). Cognitive Developmental Observation. *The Right Assessment Techniques for Early Childhood*. Publication of CV Dewa.
- Sukardi, H. (2021). Problem-Based Learning Approaches for Early Childhood. *Journal of Active Learning*, 5(2), 77-83.
- Selirowangi, NB, Aisyah, N., & Rohmah, L. (2024). Application of the Problem Based Learning Model to Improve Higher Order Thinking Skills (HOTS). *EDUCATION: Journal of Education and Learning*, 5(1), 31-40. <https://doi.org/10.62775/edukasia.v5i1.714>
- Septina Lestari, A., Alwi, M., & Rahman Hakim, A. (2021). The Effect of the Problem Based Learning (PBL) Learning Model with the Help of Higher Order Thinking Skills (Hots) on the Learning Outcomes of Class V Students of SDN 2 Masbagik Utara. *Journal of Elementary Education*, 4(1), 1-6. <http://journal.ummat.ac.id/index.php/elementary>.
- Sya'dullah, A. (2022). *Fundamentals of Cognitive Psychology*. Yogyakarta: Education Publisher.
- Suryana, A. (2016). Active Methods in Early Childhood Learning. *Journal of Basic Education*, 8(3), 201-215.
- Syamsuardi, Hajerah, & Amri, N.A. (2019). Development of Pop-Up Book Media for Kindergarten Teachers in Tanralili District, Maros Regency, South Sulawesi Province. *Raudhatul Athfal: Journal of Early Childhood Islamic Education*, 3(2), 149-157. <https://doi.org/10.19109/ra.v3i2.4566>.
- Sugiyono. (2015). *Research and Development Methods*. Publisher of Alfabeta Bandung.
- Supiyati, S., & Wardi, Z. (2023). Application of Problem Based Learning (PBL) to Improve Students' Higher Order Thinking Skills (HOTS) Through Lesson Study. 1(2), 8-17.
- Tasrif, T. (2022). Higher Order Thinking Skills (HOTS) in social studies learning in high school. *Journal of Education Development: Foundations and Applications*, 10(1), 50-61. <https://doi.org/10.21831/jppfa.v10i1.29490>
- Wulandari, R.S., Munip, A., & Mawardi, A.C. (2023). 1More than expected1. 2. 3. *Pendas: Scientific Journal of Basic Education*, 64(3), 3-7.
- Wahyu, R. (2022). Evaluation of PBL Learning in Early Childhood. *Journal of Educational Evaluation*, 13(1), 38-45., J. (2020). Logic and Reflection in Children's Problem Solving. *Journal of Education and Psychology*, 9(2), 98-112.
- Yuriansa, M. (2022). Game-Based Education for Kids. *Journal of Early Childhood Education*, 7(4), 200-210.
- Yulianti, R. (2020). Problem-Based Learning for Early Childhood. *Journal of Child Education*, 9(2), 99-107.
- Zhou, Y., et al. (2024). Cognitive Development and Child Problems. *Journal of Child Studies*, 11(1), 88-102.

#### Internet Resources

- Antara News. (2023). P3AP2KB said the stunting prevalence rate in Sambas decreased by 2.1 percent. <https://kalbar.antaranews.com/berita/535725/p3ap2kb-sebut-penurunan-angka-prevalence-stunting-sambas-21-percent>
- BKKBN. (2024). Dashboard Dwarfs and Family Risk Strangling. <https://geoportal.big.go.id/webapp/dashboard-pengerdilan/#>
- Government department Empowerment Woman and Protection Children <https://kekerasan.kemenpppa.go.id/ringkasan>
- Kurnia, E. (2023, August 30). Sambas children struggle to overcome early marriage. [kompas.id. https://www.kompas.id/baca/nusantara/2023/08/30/anak-ikut-cegah-dan-overcoming-marriage-of-child-in-sambas](https://www.kompas.id/baca/nusantara/2023/08/30/anak-ikut-cegah-dan-overcoming-marriage-of-child-in-sambas)
- Muare Satu Data Sambas. (2021a). Recipients of Social Assistance Data in Sambas Regency. <http://databiakkite.sambas.go.id/data-penerima-bantuan-sosial-di-kabupaten-sambas/>
- Muare Satu Data Sambas. (2021b). Data on Child Case Complaints in Sambas Regency. <https://databiakkite.sambas.go.id/data-pengaduan-kasus-anak-di-kabupaten-sambas/>
- Suhendra. (2024, January 1). Cases of Obscenity, Narcotics and Crime in Sambas Regency Decrease For Year Year 2023. SUARAKALBAR.CO.ID. <https://www.suarakalbar.co.id/2024/01/kasus-cabul-narkotika-dan-laka-lantas-di-Sambas-Alami-Dcline-Year-2023/>.