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Problem Solving Method through Mathematics Home Media to Stimulate Early Childhood Cognitive Development

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Abstrak:

Pemecahan masalah adalah diantara bentuk kemampuan kognitif yang penting dikembangkan sejak usia dini. Banyak metode untuk mengembangkan kemampuan ini, satu diantaranya adalah melalui metode problem solving. Penelitian ini bertujuan untuk mengetahui sejauh mana efektivitas penggunaan metode problem solving dengan dukungan media rumah matematika dalam mengembangkan kemampuan kognitif anak usia dini. Pendekatan penelitian yang peneliti gunakan adalah kuantitatif dengan jenis eksperimen. Sampel dalam penelitian ini yaitu anak usia dini yang ada di kelas B1 dan B2 TK Islamiyah Pontianak. Pengambilan sampel dilakukan dengan teknik total sampling, sedangkan data dikumpulkan melalui teknik observasi, teknik tes dan dokumentasi. Hasil penelitan menunjukkan bahwa, perkembangan kognitif anak di kelas kontrol sebelum menggunakan metode problem solving berbantuan media rumah matematika belum berkembang dengan baik, dengan perolehan nilai total skor sebesar 1130. Sementara, pada kelas eksperimen, kemampuan kognitif anak mengalami peningkatan yaitu dengan total perolehan skor sebesar 1205. Berdasarkan hal tersebut maka, penggunaan metode problem solving berbantuan media Rumah Matematika dapat meningkatkan kemampuan kognitif anak usia dini.

Kata Kunci: *Metode Problem Solving, Rumah Matematika, Kognitif, Anak Usia Dini*

Abstract:

Problem solving is one of the forms of cognitive ability that is important to develop from an early age. There are many methods to develop this ability, one of which is through the problem-solving method. This study aims to determine the extent of the effectiveness of the use of problem-solving methods with the support of mathematics-based home media in developing early childhood cognitive abilities. The research approach used by the researcher is a quantitative type of experiment. The sample in this study is early childhood in grades B1 and B2 of Pontianak Islamiyah Kindergarten. Sampling was carried out using the total sampling technique, while data was collected through observation techniques, test techniques, and documentation. The results of the research show that the cognitive development of children in the control class before using the problem-solving method assisted by mathematics home media has not developed well, with a total score of 1130. Meanwhile, in the experimental class, the child's cognitive ability has

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increased, with a total score of 1205. Based on this, the use of the problem-solving method assisted by the mathematics home medium can improve the cognitive abilities of early childhood.

Keywords: Problem Solving Method, Mathematics Home, Cognitive, Early Childhood

Introduction

Early childhood cognitive development is among the most important aspects. Through cognitive skills, children will be able to think logically, solve problems in their lives independently and precisely, be able to think symbolically, recognize the concept of numbers and alphabets, be able to group, be able to analyze relationships, have good creativity, be able to speak or communicate well with others, and many more. Cognitive abilities will greatly help children in their daily lives. Several simple behaviors that early childhood has good cognitive abilities include: being able to identify his needs; being able to introduce his identity to others; getting to know the surrounding objects and using these objects for his needs; processing information; understanding dialogue with others, including understanding stories; understanding commands; and many more. Judging from this, it is not wrong that parents, including teachers, are obliged to intervene and stimulate children's cognition to develop optimally (Alpiana et al., 2023; Armita et al., 2024; Hasanah, 2023).

Indeed, it is not easy to develop children's cognitive abilities. Several of the obstacles that affect this include hereditary or hereditary factors, unsupportive environmental factors, maturity factors, children's talent interest factors, freedom factors, the availability of game tools, teacher factors, the learning methods used, and many more (Cioffredi et al., 2024; Herlambang et al., 2023; Mangin et al., 2017; Zhou, 2022). However, there are many things that parents or teachers at school can do to develop early childhood cognitive competence. Several of them are: through games; introducing children to the surrounding environment with observation and exploration activities; introducing the concept of numbers and alphabets; introducing children to relationships between variables; storytelling; socio-drama; center methods; and including using the problem-solving method (Alharthi, 2023; Hamzah et al., 2023; Liu et al., 2022; Şandor, 2024).

Several of these methods can be confirmed by the results of scholars' research. Research conducted by Maria Ulfa (2022), found that the center method can improve children's cognitive abilities because, in the center's learning activities, children simulate playing for real. This play simulation encourages children to be able to solve problems while making children more creative. Furthermore, Sry Tatminingsing stated that the diverse and comprehensive games given by teachers will significantly improve early childhood cognitive abilities (Tatminingsih, 2019). Similarly, research conducted by Lina Dini Lestari found that problem-solving skills are closely related to children's cognitive development. The ability to solve problems is very important for children because it becomes a practical skill because children in their daily lives encounter problems (Lestari, 2020).

The problem-solving method is among the many ways that can be used to develop children's cognition. This method has several advantages, so it is recommended to use it (Chen, 2024;). These advantages are: The problem-solving method is a method that is very contextual to the real life or daily life of children. Problem-solving can challenge children's abilities while providing satisfaction because they can solve problems and gain new

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knowledge about them (Ningtyas et al., 2024). Problem solving can also increase children's activity and creativity; it can also train children to transfer their knowledge to understand real-life problems; and it includes training children's critical thinking skills (Erol et al., 2023; Khalid et al., 2020; Kim et al., 2019; Yalçın & Erden, 2021).

However, challenges in using problem-solving methods also exist. Several of these challenges include, for example: children have different cognitive abilities; children have a short attention span, so they get bored quickly if they take too long to solve a problem; and children will not be able to control their emotions if they are not able to complete their tasks. Cognitive development has a close relationship with the problem-solving method. Cognitive development refers to mental processes that involve attention, memory, understanding, and critical thinking (Bidzan-Bluma & Lipowska, 2018; Hunnius, 2022; Saracho, 2023; Silva Pacheco & Iturra Herrera, 2021).

According to Amin (2017), the problem-solving method is a way to understand, encourage children to pay attention, research and think, and analyze problems to solve problems. The problem-solving method is a way to solve children's problems and find effective and efficient solutions. According to Utami et al. (2017) problem solving is a teaching method that involves children's involvement in a learning process so that they can learn how to handle problems that arise, both individually and in groups, and be able to solve them individually or collaboratively.

The following are the steps of problem solving: Children can be aware of a problem, children find a problem, children clearly understand the nature of the problem, and then collect data from the problems found. Then analyze and be consistent with the data, try to draw conclusions, and evaluate the entire problem-solving process. In addition to using problem-solving methods, you can also use mathematics at home. Mathematics home media is a very simple medium, and the tools and materials used are very easy to get. According to Nofira and Haziza (2023), Mathematics home media is a medium that can improve students' skills in counting, recognizing numbers 1–10, grouping objects and numbers, and solidifying children's counting concepts in a fun and interesting way for students. Mathematics home media in problem solving activities is believed to be able to stimulate children's cognitive development because, through the combination of these two things, children learn to solve problems related to numbers, know cause and effect, and learn to group.

At Pontianak Islamiyah Kindergarten, based on preliminary data from the researcher's measurement results through tests, it was found that children's cognitive abilities were mostly in the category of undeveloped and began to develop. The results of interviews with teachers, it was said that there had been activities or stimulation given to children so that children's cognition developed optimally. Several of these methods are for example: teachers teach numbers, teach the alphabet, teach games, and tell stories. However, due to the limited variety of methods applied by teachers, children's cognitive development still needs further intervention. On this basis, the author conducted experimental research to improve early childhood cognitive abilities through the problem solving method assisted by mathematics home media.

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Method

This study uses the type of experiment and true experimental design with the research method of only post-test control design (Albay & Eisma, 2021; All et al., 2017; Longva & Foss, 2018; Rose & McKinley, 2020). In this model, there are two groups: the first group is given treatment, and the second group is not treated. The group that was given treatment was called the experimental group, and the group that was not treated was called the control group. The reason why the researcher chose experimental design or true experimental design with the posttest-only control design research technique is because the researcher wants to see if there is a difference in the control class and in the experimental class by using the problem-solving method assisted by mathematics home media for children's cognitive development.

This research was conducted at Islamiyah Kindergarten, which is located on Imam Bonjol Street, Southeast Pontianak District, Pontianak City, West Kalimantan. The population in this study is students in class B of Islamiyah Kindergarten, with a total of 30 students, namely class B1, which consists of 15 people, and class B2, which consists of 15 students. The sample used in this study is an Islamiyah kindergarten with a number of research samples, or population studies, of as many as 30 students. Research variables are objects that are researched by researchers; usually, the object of research can be people, objects, or events that describe a situation. The independent variable in this study is the media-assisted problem-solving method of the Mathematics Home. The dependent variable in this study is cognitive development. The collection techniques in this study include using observation techniques, test techniques, and documentation techniques to support the data collection process that will be undertaken by the researcher.

Result and Discussion

Learning Procedures with Problem Solving Methods through Mathematics Home Media

The table below is a table about the procedure for using the problem-solving method assisted by mathematics home media in Islamiyah Kindergarten, which will be explained by the researcher as follows:

Table 1.
Process of Using the Problem Solving Method
With Mathematics Home Media

No	Process
1.	Before the core activity, the teacher explained the use of mathematics home media, accompanied by the use of problem solving.
2.	The teacher gave an example of an assignment using mathematics home media, accompanied by a problem-solving method.
3.	The teacher gave an example of an assignment using mathematics home media, accompanied by a problem-solving method.
4.	Students pay attention to what is conveyed by the teacher through examples of assignments with mathematics home media.
5.	The teacher provides an opportunity for students to ask questions related to the material that has been delivered by the teacher.
6.	Students ask about objects around them that are conveyed by the teacher.

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7.	The teacher gives an explanation that has been asked by the students using examples of objects around them using the problem-solving method.
8.	The teacher gives an example of an assignment to find out Student Understanding
9.	Students understand the problems with the assignment given by the teacher.
10.	Students can search for information related to issues they understand.
11.	Students can analyze the information they have gathered.
12.	Students are able to deduce problems from the information they have encountered.

The use of the problem-solving method assisted by mathematics home media in the experimental class that has been produced by the researcher aims to help teachers improve children's cognitive development. In the process, children are also directed to listen, observe, and conclude when the teacher explains, so that the problems they face can be solved. As stated by Utami et al. (2017), solving a problem requires more than just a simple task because it requires a series of well-considered steps.

In this experimental class, children are given examples of assignments using mathematics home media. The child was asked to solve the case at the mathematics home media. On the sidelines of completing their assignments, the teacher gave the child the opportunity to ask questions. The teacher must answer using a real example as the child's reel life. Through these examples, children learn to understand problems and how to solve them in their cases.

Early Childhood Cognitive Development before Using Problem Solving Methods through Mathematics Home Media

The cognitive development of children in the control class before using the problem-solving method through home mathematics is included in the category of undeveloped, especially in the aspects of symbolic thinking, logic, and problem-solving skills. Based on the results of the cognitive development test on the test sheet, a total score of 1130 was obtained in all aspects. The test results were obtained before using the problem-solving method assisted by mathematics home media.

The low results of cognitive tests in the aspects of problem solving, logical thinking, and symbolic thinking are due to the absence of variations in methods and strategies carried out by teachers. The media used is also not varied or interesting. Methods, strategies, and learning media are important and key factors in learning (Wulandari et al., 2023). The method chosen by the teacher must be appropriate, namely adjusting to the characteristics of the child and adjusting the subject matter conveyed. More than that, teachers must also be proficient and capable of carrying out the procedures of the method. In addition to methods, media is also important. Media is needed to make it easier for teachers to convey material to children. For children, media is something that makes them interested in learning activities. Media can increase interest and motivation in learning. Based on this, the media is designed to be in accordance with the material and characteristics of children. Media must also be varied by teachers because children are easily bored if only the media is used continuously.

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Based on this explanation, the researcher designed an interesting method, namely problem solving for children's learning activities, which was then varied with the use of home media. It is hoped that the collaboration of this method and media will make learning interesting, not boring, and children active, so that it can stimulate their cognitive development.

Early Childhood Cognitive Development in Experimental Classes After Using Problem Solving Methods through Mathematics Home Media

The cognitive development of children in the experimental class after using the problem-solving method assisted by the "Mathematics Home" media can be seen in the exposure to the above data, where the cognitive development of children has progressed, be it in the development of thinking symbolically, logically, or solving their problems. An example is the home. What is the function of the home for us? Then some of them answered as shelter, shelter, and a place to bathe. Then the teacher also asked the same question in the experimental class about sheep: the first sheep had three legs, the second sheep had two legs, the third sheep had four legs, and the fourth sheep had four legs but no eyes. Which is the perfect sheep? In addition to the question, the teacher also included a picture of a sheep. However, in contrast to the control class, in the experimental class, many students answered correctly, were able to explain the cause of the question given by the teacher, and were able to write the correct number on the sheep. Not a few of the students answered correctly.

This is because students are willing to listen and hear explanations from teachers and can find the cause and effect of the problems they face. They are interested in the existence of a learning medium, and the methods used are also supportive. According to Rukiyah et al. (2023) problem solving has the potential to develop constructivist thinking skills because students need high thinking skills to understand the problems that occur so that the right alternative solutions are obtained. Based on the explanation above, it shows that the problem-solving method has an influence on children's cognitive development, especially in solving problems and thinking logically and symbolically. However, it is incomplete if only the method is used to improve children's development, but it must also be assisted by appropriate media, one of which is the mathematics home media.

Based on the results of the cognitive development test carried out with the total results of the cognitive development test obtained on the child's cognitive development test, which is 1205 in the range of 55–75, it is said to be the minimum value, and the maximum value is 80–100. And from the results of the cognitive development assessment criteria (learning to solve problems, thinking logically and symbolically), many students in the experimental class developed very well (BSB), and many students also showed development according to expectations (BSH), so it was said that their cognitive development increased.

The results of the cognitive development test have used the problem solving method assisted by mathematics home media. After an evaluation by providing cognitive development questions at the end of learning, almost all students can answer the questions correctly and only two students get a score of 55 and three students get a score of 100.

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The Effect of Early Childhood Cognitive Development with Problem Solving Methods through Mathematics Home Media

The results of the tests conducted by the researcher on children in Islamiyah Kindergarten, both in the control class and the experimental class, showed that there were differences. Early childhood children who are in the control class and do not receive tendency treatment have low cognitive abilities. In contrast to early childhood in the experimental class, where they are treated with the use of problem-solving methods assisted by mathematics home media, these children have very good cognitive abilities, namely developing according to expectations (BSH) and developing very well (BSB).

Based on the results of the R_{square} analysis of 0.064, it means that there is an influence on children's cognitive development after using the problem-solving method assisted by mathematics at home. Meanwhile, the results of constant data analysis were 0.783, and the regression coefficient (children's cognitive development) was 0.059. Thus, the resulting regression equation is X = 0.783 + 0.059. The regression equation above states that if there is an increase in the use of problem-solving methods assisted by home media, cognitive development will increase by 59 points. So it can be said that the use of the problem-solving method assisted by mathematics home media on the cognitive development of children in kindergarten Islamiyah increased by 59 points.

Conclusion

The cognitive development of children in Islamiyah Kindergarten after using the problem-solving method assisted by mathematics home media in the experimental class has increased. It can be seen when answering questions and expressing opinions and the results of cognitive development tests carried out with the total results of the cognitive development test obtained, namely: 1205 in the range of 55–75 as the minimum value and 80–100 as the maximum value. The problem-solving method supported by the "Mathematics Home" media has a positive impact on the cognitive development of children in Kindergarten Islamiyah Pontianak. The use of this medium helps children understand mathematical concepts in a more interactive and fun way, thereby improving their critical and creative thinking skills. With this approach, children can be better at problem-solving, which supports their overall cognitive development.

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