



The Effect of Differentiated Learning Models on the Problem-Solving Abilities of Children Aged 5-6 Years

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ABSTRACT: It is important to develop problem-solving abilities in early childhood because in everyday life children will be faced with various problems that must be resolved. Teachers must create a conducive and more creative environment to motivate children to solve problems. This research aims to determine whether there is an influence of the differentiation learning model on the problem-solving abilities of children aged 5-6 years. The research approach used is a quantitative approach with a quasi-experimental design type of research and designing experiments that include an experimental group and a control group. Data collection techniques include tests, observation, and documentation. The data analysis technique used consisted of prerequisite tests and an Independent Sample t-test with a population of 41 children. From the results of the analysis of the Independent Sample T-test, it can be proven that the results of the research hypothesis that has been formulated are that there is a difference in the average problem-solving abilities of children aged 5-6 years because H_0 is rejected and H_a is accepted, that is, there is the influence of the differentiation learning model. about the problem-solving abilities of children aged 5-6 years. Researchers propose that instructors who are interested in applying a diversified learning strategy construct a variety of activities to better assess learning and potential based on the research that has been conducted. The inclinations of every student are based on their unique abilities and interests. It is advised that future researchers wishing to perform comparable studies choose tasks that are more suited for monitoring youngsters between the ages of five and six to study their problem-solving skills.

Keywords: problem-solving ability, differentiated learning, children aged 5-6 years

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1 INTRODUCTION

Cognitive development in children aged 4-6 years, within the scope of cognitive development is divided into 3 parts, learning and problem solving, logical thinking, and symbolic thinking (Sakina, 2022). Cognitive development shows how children can use their intelligence to solve problems. Because cognitive ability is a process that can assess, connect and can be considered to reason and solve problems, and there are several programs for children (Anggraini et al., 2020). Problem solving skills in children require special attention, because often the difficulties that arise when they continue to a higher level of education are related to their difficulty in solving problems. Therefore, it is important to stimulate problem-solving abilities from an early age. Problem-solving skills are an aspect of thinking that involves a series of actions such as collecting information, analyzing data, developing solution options, and choosing the most effective solution. These skills are an integral part of cognitive development, which also includes the ability to make decisions, think critically and think creatively (Widiastuti et al., 2018).

Children's ability to solve problems can increase their cognitive capacity in terms of thinking and creativity. However, there are still many children who ask for help from adults or educators in applying problem solving in everyday life. Research conducted by Sakina (2022), shows that children's problem-solving abilities have not yet developed, some children are less able to complete the tasks given in terms of problem-solving development, such as not being able to group large and small objects, size, many, or few objects and objects, small things that the teacher still helps with. Therefore, individual differences in problem solving are often caused by differences in non-cognitive abilities (Chen et al., 2020).

The importance of stimulating problem-solving abilities is related to the golden period experienced by children which only occurs once in their lives. Therefore, the environment around children acts as a laboratory where they learn to solve problems. Therefore, the learning approach should provide opportunities for children to carry out certain tasks independently, so that they can gain meaningful experience and knowledge. One method that can be used to expand problem solving abilities is using differentiated learning. The differentiated learning model is learning that gives students the freedom to be creative with their abilities without any pressure or coercion from other parties (Widiastuti et al., 2018). Play provides ongoing opportunities for children to hone and improve their abilities, so they can develop social skills, take on new roles, try challenging things, and solve complex problems (Miller et al., 2016).

Differentiated learning is a teacher's initiative in adapting learning activities in the classroom to students' learning needs, including the level of readiness to receive new material, interests, and variations in student diversity profile or learning style (Herwina, 2021). Differentiated learning can help students achieve optimal learning outcomes, because the products produced are in accordance with their interests. Therefore, a differentiated learning process must provide ample space for students to demonstrate what they have learned. Apart from that, because creativity in the 21st century will continue to develop, differential learning is a highly recommended approach to be applied in learning to make it easier to achieve learning goals. Differentiated learning teaches how teachers create a learning environment that invites students to learn and work hard to achieve high learning goals. With differentiated learning, students receive full support from teachers to hone their desired areas. Students can feel that learning is their right by giving students the opportunity to explore themselves. Based on relevant study, this research aims to determine

whether there is an influence of the differentiation learning model on the problem-solving abilities of children aged 5-6 years.

2 THEORETICAL STUDY

2.1 *Differentiated Learning Model*

Differentiated learning is an approach that has great relevance in the educational context of the 21st century. Although it is not a new concept in the field of education, this approach is also known as differential learning or differentiated learning. Differential learning is a learning model that emphasizes the importance of movement variations and is rooted in the dynamic systems theory of human movement (Herwina, 2021).

Differentiated learning is an effort to adapt the learning process in the classroom to meet everyone's learning needs. The adjustments in question are related to students' interests, learning profiles and readiness in order to achieve improved learning outcomes (Rusmayadi et al., 2022). This is in line with the results of Kamal's research which states that the application of differentiated learning can increase student activity and learning outcomes and is able to provide opportunities for students to learn naturally and efficiently. Students' learning activities in the learning process are indicators of their desire to ask questions, express opinions, do assignments and answer teacher questions (Faiz et al., 2022).

2.2 *Problem Solving Skills*

The learning approach uses problem solving techniques, where problems become a tool to help children's understanding of the concepts being taught (Anggraini et al., 2020). This is in line with Pusari's (2018) research that problem-solving is a thinking process that focuses on finding solutions or resolution options for a particular problem. Children's ability to solve problems can improve aspects of their thinking and creativity from a cognitive perspective. However, in the process of development, there are still many children who are not able to solve problems independently, and still need the help of adults or teachers to apply problem solving skills in everyday life (Ilyas, et al., 2021).

Developing problem solving abilities is an aspect that must be emphasized in the learning process from an early age, because problem solving is one aspect that exists in the realm of development (Sakina, 2022). It is important to develop problem solving abilities in early childhood because in everyday life children will be faced with various problems that must be resolved. The problem solving abilities that children have from an early age will help them solve their own problems according to their age, and can make children more independent, less likely to complain, and also behave better as long as the environment is supportive (Widiastuti et al., 2018). Problem solving is a technique used by individuals who have knowledge, skills and understanding to deal with unusual situations. This ability first develops through physical and psychological activities carried out by children. However, to activate it, initial stimulation needs to be done through physical activity such as exploration. Cognitive development occurs when children build their knowledge through active exploration and direct investigation of the physical and social environment around them (Sakina, 2022).

From the description above, it can be concluded that problem solving is a process related to choosing the right solution or action to change the current situation towards the desired condition.

It is a method that gives children the opportunity to solve simple problems through planning, predicting, making decisions, and observing the results of their actions. Problem solving ability is an approach taken by children by utilizing their knowledge, skills and understanding to achieve certain goals. Initially, this ability develops through physical and psychological activities carried out by children. The problem-solving abilities of children aged 5-6 years are based on Child Development Achievement Level Standards such as, 1) Demonstrating exploratory and probing activities. 2) Solve simple problems in everyday life in a flexible and socially acceptable way. 3) Apply knowledge or experience in a new context. 4) Show a creative attitude in solving problems (ideas, out-of-the-box ideas).

3 METHOD

The method used is a quantitative approach, with the aim of measuring the influence of the differentiation learning model on children's problem-solving abilities. This research includes quantitative experimental research, namely quasi-experimental design because the researcher wants to obtain knowledge and information by using numerical data as a tool to analyze information about what he wants to know and design an experiment that includes an experimental group and a control group. In this experimental research, it was carried out by providing treatment in a learning model. The experimental group was given special treatment, especially in the learning process which was carried out by applying a differentiated learning model, while the comparison group received conventional learning. For the dependent variable, problem-solving ability, this variable is used as a variable that is also influenced by the independent variable.

3.1 *Instrument*

Quantitatively, the variables that are the main problem of this research are as follows: The independent variable which is the independent variable in this research is the differentiated learning model and the dependent variable in this research is problem solving ability. The problem-solving ability instrument is presented in Table 1.

Table 1. Research Instrument

Aspects Researched	Assessment instrument	Indicator	Theoretical basis
Problem solving skills	1. Skills in observing	a. Using the sense of sight to observe an object. b. Using the sense of hearing to observe an object.	(Syaodih et al., 2018)
	2. Ability to collect information	a. Gather activity clues through observation. b. Gather activity instructions by asking the teacher.	(Wahyuti et al., 2023)
	3. Information processing skills	a. Carry out activities based on the instructions received. b. Complete the activities given well and coherently based on the instructions obtained.	(Wahyuti et al., 2023)
	4. Communication skills	a. Shows the results of activities that have been carried out.	(Wahyuti et al., 2023)

b. Explain/tell the results of their work to teachers and friends.

3.2 Research Design

Quantitative research is a method for testing certain theories by examining the relationship between variables. Therefore, researchers use quantitative methods because researchers want to numerically measure the effect of certain treatments on the subjects studied (Munawwirah et al., 2021). This research design is described in Table 2.

Table 2. Quasi-Experimental Design

Group	Pre-Test	Treatment	Post Test
E	O1	X	O2
K	O3	-	O4

3.3 Participant

The population in this study were all students aged 5-6 years. The population in question is spread into 2 groups, namely Groups B1 and B2 with a total of 41 students. In this study, researchers used a purposive sampling technique, namely a sampling technique where sample members were chosen deliberately in determining the sample and with the criteria of children aged 5-6 years. In this study, the sample was 32 people and divided into 2 groups, namely 16 people in the experimental group and 16 people in the control group.

3.4 Data Collection

In this study, three different kinds of data gathering methods were used, specifically: a. Test, treatment test was used in this investigation. Children will take this exam both before and after getting therapy in learning activities that employ various learning models to gauge their problem-solving skills. Documentation, information is extracted from pre-existing documents using the documentation method, which is a data-collecting methodology. Both the students' starting and progressing abilities are assessed in this study using documentation. Observation, the method of observation involves observing and documenting the state or behavior of the thing under observation to gather data.

3.5 Procedures

Data collection stages in this research include a. The planning stage includes determining the topic, research object, problem formulation, determining the research title, and objectives, as well as determining the sample and research instruments. The pretest is carried out to measure the child's initial abilities before receiving treatment. Providing treatment aims to assess children's problem-solving abilities before and while receiving treatment through different learning models. Posttest, used to evaluate children's problem-solving abilities after receiving treatment using different learning models. Results analysis was carried out to identify changes in children's problem-solving abilities and to assess whether the use of the differentiation learning model affected these abilities. The data analysis techniques used in this research are descriptive analysis techniques and parametric analysis which go through testing stages, normality tests and homogeneity tests.

4 RESULTS AND DISCUSSION

4.1 Results

4.1.1 Frequency Distribution of Pretest Problem Solving Ability Scores for Children Aged 5-6 Years in the Experimental Group and Control Group

The data collected in this research includes children's scores on the initial test (pretest) which reflects their abilities before receiving treatment with the differentiation learning model, and the final test (posttest) which reflects their abilities after receiving treatment with the differentiation learning model. Pretest data is used to evaluate the initial abilities of research subjects, while post-test data is used to evaluate the final abilities of research subjects and as a basis for determining whether the differentiation learning model has an impact on problem-solving abilities in children aged 5-6 years at Nurul Ikhsan Bilanrengi Kindergarten (see in Table 3).

Table 3. Frequency Distribution of Pretest Problem Solving Ability

Category Interval	Control Experiment			
	Percentage	Frequency	Percentage	Frequency
10-14 Not enough	10	63%	13	81%
15-19 Enough	6	38%	3	19%
20-24 Good	0	0%	0	0%
25-29 Very good	0	0%	0	0%
Amount	16	100%	16	100%

Based on the information contained in the table at the initial test stage (pre-test), as many as 10 children out of a total of 16 children in the experimental group were classified as low. This condition is caused by their lack of skills in observing, collecting information, processing information, and communicating or talking about activities. In contrast, in the control group, 13 out of 16 children were also categorized as poor for similar reasons. Furthermore, in the experimental group it was found that 6 out of 16 children were classified as adequate, showing development in the ability to observe, collect information, process information, and communicate or narrate activities with the help of the teacher. Meanwhile, in the control group or 3 children out of 16 children were also included in the sufficient category because they had demonstrated ability in this aspect. However, it is known that at this stage there is not a single child in the experimental group or control group who can be classified as good or very good. So, it can be concluded that the highest score on the pretest results for the experimental group and the control group was in the poor category with a percentage of 63% in the experimental group and 81% in the control group. Then in the sufficient category the experimental group had a percentage of 38% and the control group 19%.

4.1.2 Frequency Distribution of Problem-Solving Ability of Children Aged 5-6 Years Post Test Experimental Group and Control Group

Based on the Table 4, information at the final test stage (posttest), there were no children included in the deficient category, either in the experimental group or the control group. Furthermore, in the experimental group there was 1 child out of 16 children who was classified as adequate. Meanwhile, in the control group, 7 children out of a total of 16 children were in the sufficient category, indicating that their ability to observe objects, collect information, process information, and communicate or narrate activities had developed. Furthermore, there were 9 children out of 16 children in the experimental group who were in the good category.

Table 4. Frequency Distribution of Problem-Solving Ability of Children Aged 5-6 Years Post Test

Intervals	Category	Test		Control	
		Frequenc y	Percentag e	Frequenc y	Percentag e
10-14	Not enough	0	0%	0	0%
15-19	Enough	1	6%	7	44%
20-24	Good	9	56%	7	44%
25-29	Very good	6	38%	2	13%
Amount		16	100%	16	100%

Meanwhile, in the control group there were 7 children out of 16 who were in the good category. This shows that the child can independently observe objects, collect information, process information, and could communicate or tell stories about activities he has carried out independently without the help of a teacher. Furthermore, it was found that 6 children out of 16 children in the experimental group were in the very good category, while in the control group there were 2 children out of 16 children who were also in the very good category. This shows that the child can be independent without the teacher's help, and even could analyze the objects observed, respond to the teacher's answers, help his friends, tell the results of his work to the teacher and his friends, and sit quietly while listening to the teacher's explanation. their other friends. From the frequency table of the posttest assessment results in the experimental group, the percentage was 56% in the good category and in the control group it was 44%, while in the very good category the percentage was 38% in the experimental group and 13% in the experimental group. It can be concluded that the highest score from the post-test assessment is in the good category.

4.1.3 *Descriptive Statistics of Pre-Test Scores for the Experimental Group and Control Group*

The lowest score in the pre-test for the experimental group and the control group was 10, and the highest score for both reached 16. The average pre-test score for the experimental group was 13.37, while for the control group it was 12.31. By referring to the average pre-test score, it can be concluded that before receiving treatment, children's problem-solving abilities tend to be the same between the experimental group and the control group.

4.1.4 *Descriptive Statistics of Post-Test Scores for the Experimental Group and Control Group*

The experimental group obtained a minimum post-test score of 18, while the control group obtained a minimum post-test score of 17. A comparison of the minimum post-test scores for the two groups showed that the experimental group had a higher minimum score than the control group. In addition, the maximum post-test score for the experimental group reached 28, while the control group reached 25. Comparison of the maximum post-test scores showed that the experimental group had a higher maximum score than the control group. Overall, the post-test average of the experimental group was 23.88, while the control group had an average of 21.06. Post-test mean analysis showed that the experimental group had a significantly higher mean score than the control group. Therefore, it can be concluded that the problem-solving ability of the experimental group experienced a more significant increase after receiving treatment with the differentiation learning model compared to the control group.

4.1.5 Normality Test

In the data normality test, the Kolmogrov-Smirnov test menu is used. Based on the output table of normality test results, the Asymp Sig (2-tailed) value was 0.80, more than the significant value of 0.05, meaning that the data from the experimental group and control group were normally distributed.

4.1.6 Homogeneity Test

Based on the calculation results of the homogeneity test output above, the data obtained a significance value of 0.471 provided that the significance level or personality value is more than 0.05 so it can be said that the population has the same variance. So, with the results of these significance values, it can be concluded that the research samples in the experimental group and control group have the same or homogeneous variance.

4.1.7 Parametric Independent Samples t-Test

Based on the output above, the Sig value is obtained assuming Equal variances. (2-tailed) of 0.016 is smaller than the alpha value of 0.05, meaning that the H_0 test of t-Test for independent samples is rejected and the H_a test of t-Test for independent samples is accepted, namely that there is a difference in the average problem-solving abilities of children aged 5-6 years. experimental and control groups. From the results of the analysis of the independent sample t-Test, it can be proven that the research hypothesis that has been formulated is that there is a difference in the average problem-solving abilities of children aged 5-6 years in the experimental group and the experimental group. control group, H_0 is rejected, and H_a is accepted, namely that there is an influence of the differentiation learning model on problem-solving ability in children aged 5-6 years at Nurul Ikhsan Bilanrengi Kindergarten.

4.2 Discussion

4.2.1 Description of Problem-Solving Abilities Before and After Implementing the Differentiation Learning Model

Before being treated with the differentiation learning model, the development of problem-solving abilities of children aged 5-6 years had an average score of 13.36 in the experimental group and 12.31 in the control group. From the results of the average pre-test scores of the experimental group and the control group, before being treated with the differentiation learning model, the development of problem-solving abilities of children aged 5-6 years at Pondok Nurul Ikhsan Kindergarten Bilanrengi could be said to have not developed. Meanwhile, after being given treatment, the development of children's problem-solving abilities in the experimental group had an average score of 23.88, while in the control group which was not treated with the differentiated learning model, the development of children's problem-solving abilities had an average score. amounted to 21.06, so it can be said that the experimental group and control group after being given treatment experienced an increase, but after seeing how the scores of the experimental group and control group increased before and after being given treatment, it can be concluded that the experimental group experienced a significant increase compared to the control group.

Based on the results of research that has been conducted, it shows that learning using the differentiation learning model develops children's problem-solving abilities. This statement is

strengthened by the results of hypothesis testing using descriptive statistical test calculations and parametric tests, the results of which show that the average problem-solving ability score in After being treated with the differentiation learning model, the children in the experimental group experienced a significant increase or change. compared with the problem-solving abilities of children in the control group.

4.2.2 *The influence of the differentiation learning model on problem solving abilities*

The Independent Sample t-test obtained a Sig value assuming Equal variances (2-tailed) of 0.016 is smaller than the alpha value of 0.05, meaning that there is a difference in the average problem-solving abilities of children aged 5-6 years in the experimental group and the control group. From the results of the Independent Sample T-test analysis, the interpretation of the decision taken is that H_0 is rejected and H_a is accepted because the Equal variances value is assumed to be Sig. (2-tailed) of 0.016 is smaller than the alpha value of 0.05, meaning that there is a difference in the average problem solving abilities of children aged 5-6 years in the experimental group and the control group.

Based on research results by Kurniasih and Priyanti (2023), the differentiation approach to learning allows teachers to accommodate individual differences in the classroom. Pay attention to each child's learning style, interests, and level of development. application of this differentiated learning. Nafisa and Fitr (2023) explain that the application of differentiated learning is believed to be able to stimulate all aspects of children's intelligence through various kinds of directed learning activities, a learning environment that can encourage children to be active, creative and think critically through their own experiences.

The study by Rista (2020) shows that play activities using puzzle media will involve cooperation between the hands and eyes so that children have the skills to explore things according to the child's abilities and interests. The results of this research are also in line with the research conducted by Lidia et al., (2023), studying and solving problems for students, can help children in their daily lives to solve problems that are often encountered in their daily lives when playing, because at an early age children's cognitive abilities develop very rapidly so they can be well stimulated and optimally. Children's problem-solving abilities increase if children are given as wide an opportunity as possible to think and try on their own without being forced by the teacher (Sari et al., 2018). When opportunities to think are given more widely, children will have more opportunities to search and prove themselves.

5 CONCLUSION

The problem-solving abilities of children aged 5-6 years before being treated with the differentiation learning model in the experimental group and conventional learning in the control group, were still relatively low. Meanwhile, after being treated with the differentiation learning model in the experimental group and conventional learning in the control group. The problem-solving abilities of children aged 5-6 years increased with an average score of 23.88 in the experimental group and an average score of 23.88 in the experimental group experiment. The average score was 21.06 in the experimental group average in the control group. There is a difference in the average problem-solving abilities of children aged 5-6 years because H_0 is rejected and H_a is accepted, there is the influence of the differentiation learning model on the problem-solving abilities of children aged 5-6 years. Based on the research that has been carried

out, the suggestions put forward by researchers are for educators who are interested in implementing a differentiated learning approach. It is recommended to design various activities to better assess potential and learning. The tendencies of each student according to their respective interests and talents. For future researchers who are interested in conducting similar research, it is recommended to carry out or choose activities that are more effective in observing problem-solving abilities in children aged 5-6 years.

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