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The Effect of Demonstration Methods to Improve Science Thinking Skills In Children Aged 5-6 Years

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Abstract. The purpose of the study was to determine the effect of demonstration methods on improving the science process skills of children aged 5-6 years. This is a quantitative study using the quasi-experimental method, with a non-equivalent control group design by comparing pre-test and post-test scores of the conventional learning class and the one implementing demonstration learning., The number of samples was eighteen. They were aged 5-6 years and were currently studying at the Kindergarten of Tunas Bangsa Makassar. Data were collected using an observation sheet in the form of a checklist. Then, they were analyzed using descriptive statistics and inferential statistics (independent sample t-test). The descriptive statistical analysis shows that the average value of the class taught by conventional methods is lower than the class taught by using the demonstration method. So that the demonstration method can increase the average value of children's scientific thinking skills. The hypothesis testing shows that the P value = sig 0.00 and the Tcount value are greater than T_{table} so, we conclude that the demonstration is able to improve the ability of scientific thinking skills in Makassar Tunas Bangsa Kindergarten

Keywords: Demonstration method, science process skills, early childhood

INTRODUCTION

The constructivist learning theory believes that humans build their own learning through interacting with their environment in formal, informal, and nonformal educational institutions. They build new knowledge above the previous knowledge they learn (Jain et al., 2013). According to the *Center On The Developing Child* (2016), developing children's

capacity will become the foundation for further education. When children get what they need for their growth and development, they will give back to societies in the future through their achievements at school, independency, and knowledge of the productive economy, and they can become productive citizens. One of the developments for children is by training their scientific thinking through concrete activities in learning (Mirawati & Nugraha, 2017; Trundle,

2009). Science learning can help children to develop their attitudes and basic abilities for other knowledge (Kermani & Aldemir, 2015).

Science education in preschool facilitates children's curiosity about new things. Early stimulation gives scientific experience to them so that they can understand the world better and prevent them from misunderstanding a scientific event (Gerde et al., 2018)

The development of science literacy is a cognitive skill that should be started in early childhood to develop other skills (Amri et al., 2023). Children's literacy in science can be developed by teaching them about the phenomena around them. It is supposed to be carried out in their golden age as in this phase, they experience rapid development and growth, allowing them to accept and absorb knowledge related to their environment (Anggreni et al., 2022). Science facilitates children to interact directly with nature to develop their scientific knowledge through structured and planned activities implemented through playing while learning (Farida, 2021; Prasanti & Fitriani, 2018). Early childhood science skills play an important role in helping them to understand their surroundings better and act as a foundation for further education.

Stimulating children's scientific abilities can simultaneously stimulate and develop their cognitive abilities and creativity. They will be easier to interact with and more confident because their adaptability will become faster. This will also make them more active in interacting with their world. Scientific abilities will help children shape their mindset, care for themselves, and take responsibility for society (Noor, 2020). Then (Rahardjo, 2019) argues that learning science develops students' language and numeracy skills.

According to Putra (2013), teaching science to children has many advantages, (a) develop skills in understanding the children's problems through scientific procedures so that children will be better at solving the various problems they face. (b) children can behave scientifically; in this case, they can analyze a problem fundamentally, make decisions with rational considerations, are not easily influenced by irrational things, and are always open to new, innovative, and useful things, (c) provide knowledge that has a scientific basis and can be trusted, everything obtained must come from scientific sources, (d) stimulate students' interest in scientific matters through a rational process of

phenomena that occur in the natural surroundings. This ability allows children to participate in daily activities in society (Farida, 2021; Jain et al., 2013).

Meanwhile (Eshach & Fried, 2005; Mirawati & Nugraha, 2017) put forward reasons why children's scientific abilities must be developed; (a) children naturally can observe and think about natural processes even though they still need concrete explanations, (b) exposing children to science will develop positive attitudes towards science, (c) providing general information about scientific phenomena directs children to more easily understand scientific concepts that are learned later formally, (d) the use of scientific language at an early age influences the development of scientific concepts and literacy in the future, (e) helps children understand scientific concepts and reasoning, (f) science is an efficient means for developing scientific thinking concretely through experiments and demonstrations of natural events, (g) Science is part of the continuing education curriculum up to tertiary education.

Farida (2021) emphasizes that science skills that must be developed in children are specific to the ability of science process skills. Science skills allow children to obtain new information through real experiences, including observing, comparing, classifying, grouping, measuring, and communicating. (Anggreni et al., 2022; Charlesworth, 2015). Developing science skills requires learning methods to improve children's ability to think about scientific processes.

Based on observations in group B TK Tunas Bangsa Makassar, the children's scientific ability level was still very low. None of the eighteen students had good science abilities. We discovered this fact after we gave a test that consisted of questions about measuring the intensity of rainwater from the evaporation process, as well as simply telling the process of how rain occurs. One of the causes of low scientific ability was that the learning process was dominated by teacher talk while there was no visualization through pictures. This made children only imagine the object being explained so they could not construct their own knowledge through observation. For this reason, there must be a method that allows students to be directly involved in learning through observation and interaction with teachers and other students in learning activities.

Science skills can be trained through demonstrations. According to Akinbobola & Ikitde (2011), The demonstration method combines explanation and practice so that it can explain real events in the form of concepts and principles using media so that students can see them clearly. Demonstration learning is a method for conveying learning material; children carry out experiments through observation by proving and experiencing what they have learned (Nurqolbi et al., 2019).

The demonstration method is teaching by demonstrating processes, rules, events, and a series of activities using media that can support the achievement of learning objectives. The teacher in this activity will display the process or sequence of an event to students (Khoiri, 2021). In learning science skills, students will be shown how to carry out science experiments and provide opportunities for students to prove a scientific process for themselves so that they can construct their own knowledge. (Wardhani et al., 2020).

Demonstrations are very effective in stimulating children's memory development. When learning takes place, children can respond spontaneously so that they can gain new understanding in the form of ideas or concepts and products for children as a result of direct interaction between teachers and students in learning. (Cabibihan, 2013, p. 126).

According to Moeslichatoen (2004), a Demonstration will present a real picture of a phenomenon to students so that they can show their ideas through activities and make them more careful and thorough in carrying out an activity.

Syaiful (2010, p. 91) mentioned some stages in learning implementing the demonstration method as follows: (a) the teacher prepares learning needs and explains the stages of demonstration activities from the beginning to the end, (b) the teacher prepares students mentally and physically to enter demonstration activities, (c) teacher starts conducting demonstrations by associating students' knowledge with the skills they will learn in the demonstration, (d) in the demonstration, the teacher only gives a little explanation so that children can focus and enjoy the demonstration, and the teacher should observe and ensure that they can follow the demonstration properly, (e) during the activities, the teacher has to concern on students' safety and comfort. Humor may be needed to reduce class tension, (f) Students are given the opportunity to ask about activities and propose problems, so they can compare each concept and fact. In addition, they are given the opportunity to conduct experiments under the guidance of the teacher, so they can feel the sensation of demonstration activities (Yahya, 2020).

METHOD

This study used a quantitative approach with a quasi-experimental model to prove and see the effect of applying the demonstration method on the development of science skills in early childhood (5-6 years) (Hastjarjo, 2019). We chose the quasi-method because it does not require a control but only a comparison group (Sugiyono, 2017). The non-equivalent design involves the control and experimental classes and compares the pre-test and post-test values to determine differences in the abilities of the groups before treatment and after the treatment applied to the experimental group (Creswell & Creswell, 2017). The population in this study was formed naturally, so sampling was not required (Ruseffendi, 2010). The research was conducted at Makassar Tunas Bangsa Kindergarten in groups B1 and B2, which had 18 students, 9 of which were in the control and experimental classes, respectively. The assessment used a Likert scale with a range of 1-4(Mulyatiningsih, 2014). Data were collected using an observation sheet by providing a checklist of the score that corresponds to the aspect of the student's scientific thinking skills being observed. These indicators are: a) observing the process of rain using the three senses, b) comparing the types of rain, c). classifying clouds based on their characteristics, d) measuring the quantity of rainwater from the evaporation process that will result in rain, e) showing exploratory activities and investigating the impact of rain, and f) recognizing the causes and effects of rain according to natural phenomena. Treatment was carried out three times. Data were analyzed using SPSS IBM 23 involving an independent sample t-test to compare post-test and pretest scores.

RESULTS AND DISCUSSION

Before testing the hypothesis, we conducted a prerequisite test on the pretest and posttest data as a condition for parametric statistical tests (Sari, Negara, and Ayu Tirtayani 2018). According to Oktaviani and Notobroto

(2014) and D'Agostino and Stephens (1986), if the sample is less than 50, then the data normality test with Shapiro-Wilk is recommended as in the following table 1.

Table 1. Data Normality Test Results for Conventional Class Pretest and Class Posttest using the Demonstration Method

	Shapiro-Wilk		
	Statistic	df	Sig.
Pretest of Conventional Class	.921	18	.134
Pretest of Class with Demonstration Method	.914	18	.100

Table 1 data explains that the conventional class normality test shows the value of P = sig .134, and classes taught using the demonstration method have a value of sig. P = sig .100. The probability level is 95% with an alpha value = 0.05. Then this data is compared with the results of the Shapiro-Wilk test, and it is known that the P value of conventional class 134 > 0.05, which has a normal distribution because it is bigger than 0.05. while the experimental class got the value of P = sig .100 > 0.05, meaning that the data had normal distribution because the P value is bigger than 0.05.

Table 2. Results of Normality Test of Postest Data of Conventional Class and Class using Demonstration Method

	Shapiro-Wilk		
	Statistic	df	Sig.
Posttest of Conventional Class	.925	18	.161
Posttest of Class with Demonstration Method	.924	18	.153

Data in Table 2 explains that the conventional class P value normality test shows a value of P = sig .161, and the class that implements the demonstration method shows a value of sig. P = sig .153. The probability level is 95% with an alpha value of 0.05. Then this data was compared with the results of the Shapiro-Wilk test; it was concluded that the conventional class P value with a value of .161 > 0.05 had a normal distribution because the value was greater than 0.05. While the experimental method class with a value of P = sig .153 > 0.05 is normally distributed because it is greater than 0.05.

To ensure that the variances used in the two data, namely the conventional learning data and the demonstration method learning data to improve children's science process skills, are the same, we conducted a homogeneity test on the pretest and posttest data. If the value of P = sig. > 0.05 on Based on Mean, then the data variance is the same (homogeneous); if the sig value < 0.05, then the data variance is different (not homogeneous).

Table 3. Homogeneity Test of Pretest-Posttest Conventional Class Data and Class Pretest-Posttest with Demonstration Method Data

		Levene Statistic	df1	df2	Sig.
Pretest	Based on	.894	1	34	.351
Postest	Mean	1.506	1	34	.228

Based on the homogeneity test for the pretests of the conventional class and the demonstration method class, the P value of Based on Mean = sig .351 > 0.05 so that the data variances are the same (homogeneous). The posttest of the conventional class and the demonstration method class had Based on Mean

P value = sig .228 > 0.05 so that the variance of the data is the same (homogeneous).

Table 4. Descriptive Data of Pretest from Conventional Class and Pretest of Class with Demonstration Methods in Improving Children's Science Thinking Skills

	N	Minimum	Maximum	Mean	Sum	Std. Deviasi
Pretest of Conventional Class	18	10.00	15.00	11.8889	214.00	1.45072
Posttest of Class with Demonstration Method	18	10.00	14.00	12.1667	219.00	1.15045

Based on Table 4, the number of samples in the conventional class is 18, and in the class with the demonstration method is 18. The lowest score in the conventional class and in the class with the demonstration method is 10. Meanwhile, the highest score in the conventional class is 10, and the highest score in the class with the demonstration method is 14. The total score in the conventional class is 214, while in the class with the demonstration method is 219. The standard deviation of the conventional class is 1.45072, while the class with the demonstration method is 1.15045. The average value of the conventional class is 11.8889, while the class with the demonstration method is 12.1667. From this data, we conclude that the mean value of the class using the demonstration method is greater than the conventional class, which shows that the demonstration method improves children's scientific thinking process skills.

Table 5. Descriptive Data of Posttests of Conventional Class and Class with Demonstration Methods in Improving Children's Science Thinking Skills

	N	Minimum	Maximum	Mean	Sum	Std. Deviasi
Posttest of Conventional Class	18	12.00	18.00	15.2222	274	1.76754
Posttest of Class with Demonstration Method	18	19.00	24.00	22.0000	396	1.15045

Based on Table 5, the number of each sample of the conventional class and the class that applied the demonstration method is 18. The lowest score in the conventional class is 12, while the lowest score in the class using the demonstration method is 19. The highest score in the conventional class is 18, while in the class with the demonstration method is 24. The total score in the conventional class is 274, while the total score in the class with the demonstration method is 396. The standard deviation of the conventional class is 1.76754, while the class using the demonstration method is 1.15045. The average value in the conventional class is 15.2222, while in the class using the demonstration method is 22.0000. The data shows that the mean value of the class using the demonstration method is greater than that of the conventional class, which indicates that demonstration can improve children's scientific thinking skills.

Table 6. Results of Hypothesis Test for Children's Science Thinking Skills in Conventional Classes and Classes with Demonstration Methods

Developmental Aspects	N	Value of t_{count}	Value of t_{table}	df	Sig.	Conclusion
Children's Science Thinking Skills	18	12.703	2.033	34	0,00	H_o *was rejected/* was accepted.

The data in Table 6 is the result of an analysis of hypothesis testing using an independent sample t-test. The criterion for testing the hypothesis is if $H_0 = T_{count} \leq T_{table}$, then the H_0 hypothesis is accepted while the H_1 hypothesis is rejected. If the alternative hypothesis $H_1 = T_{count} \geq T_{table}$, then the H_1 hypothesis is accepted while the H_0 is rejected. In Table 6, it can be seen that the T count of students' science thinking skills = is 12.703, and the T table = 2.033. then, the T count (12.703) > T_{table} (2.033), meaning that H_0 is rejected while H_1 is acceptedm with the value of P = Sig.0,00 < 0,05. These results conclude that the demonstration method can significantly improve the scientific thinking skills of children aged 5-6 years in Tunas Bangsa Kindergarten, Makassar City.

Discussion

Based on the descriptive analysis, the mean score of the posttest of the conventional class was 15.2222, and that of the class implementing the demonstration method was 22.0000. This data shows that there is a difference between the mean values (6,778). Thus, the demonstration method is able to increase the average science thinking skills. The hypothesis test shows that the value of P = sig 0.00 and the value of Tcount is greater than Ttable, so we conclude that demonstrations can improve the scientific thinking skills of students in Tunas Bangsa Makassar Kindergarten.

Demonstrations in learning science skills that focus on natural phenomena, namely rain, are able to improve children's abilities to observe, compare, classify, measure, investigate, and explain the causes and effects of an event. This research confirms Samta and Mulyani (2021), who found that the application of demonstrations improves children's science skills through online learning. Research by Fatmawati, Fadillah, and Halida (2014), who applied demonstrations that allowed children to try and practice several learning activities, is

able to increase their understanding of science, especially regarding the properties of water. Implementation of the demonstration method provides an opportunity for children to learn to solve problems which are part of science skills. When children make observations, they will process information and convey it to others. Thus, their knowledge will develop. This is in line with (Cecep et al., 2022; Dela Delviana, 2022), who found that the demonstration method was able to improve scientific abilities, especially in the aspect of problem-solving and increase children's concentration in making observations or in analyzing an object. A study by Şentürk (2017) found that engaging children in teacher-prepared experimental learning settings developed their science skills and knowledge. During activities, children can ask questions, explore new information, and build knowledge.

The results of this study reveal the importance of teaching science skills to children aged 5-6 to give them the opportunity to observe, explore and discover important and fundamental things. Therefore, teachers must comprehensively plan, implement, and evaluate science activities in the school environment (Uludağ & Semra Erkan, 2023).

CONCLUSION AND SUGGEST

Based on descriptive statistical analysis, the average value of the class taught using the conventional method was lower than the one taught using the demonstration method. The results show that the implementation of demonstration increases the average value of children's science thinking skills. The results of the hypothesis test show that the value of P = sig 0.00 and the value of Tcount is greater than Ttable, so it can be concluded that the demonstration method can improve the students' science thinking skills in Tunas Bangsa Makassar Kindergarten.

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