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Geometry Mosaic to Improve Spatial-Visual Intelligence of Children Age 5-6 Years

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Abstract

This study aims to determine whether the application of a geometric mosaic can improve the spatial-visual intelligence of children aged 5-6 years. This research was conducted at Mutiara Hati kindergarten in Manyaran, Semarang by using a pre-experimental design method in the form of One Group Pretest-Posttest. The populations in this study were 45 children of class B in Mutiara Hati kindergarten in Manyaran, Semarang. The sampling technique in this study is purposive sampling, where the criteria for determining the sample are children who do not understand the criteria for spatial-visual ability. The sample used in this study was 30 children. The data from the pretest and posttest were processed using the SPSS application. The researcher also collected documentation that served as supporting data. The data results were obtained through statistical calculations through paired sample t-test. The results of the calculation of the hypothesis can be accepted then the value of t_{count} must be smaller than t_{table} ($t_{count} < t_{tabel}$) and Sig. <0.05. The results show that the value of $t_{count} < t_{tabel}$ is -7,350 <1,697 and Sig. 0,000 <0.05 so that Ha can be accepted. Based on this description, it can be concluded that the geometric mosaic can improve the spatial-visual intelligence of children aged 5-6 years at Mutiara Hati kindergarten in Manyaran, Semarang.

How to Cite

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INTRODUCTION

Early Childhood is a small human being who is still in the learning phase and requires an adult figure in accompanying their learning process. According to Law No. 20 of 2003 concerning the National Education System "early childhood is children who are in the age range of 0-6 years". Early childhood has very different characteristics from adults. At this time, the child is always curious about what they see, hold and hear. Children always have an interest in finding out about something. Early childhood is also very active, fickle and has a high interest in something.

According to Rahman (2009: 46-57), a kindergarten age child is an early age is an individual who continues to experience rapid development processes so that at this time is a period that can determine the child's next life. Early childhood is called the golden age. The golden period is a time when all the potential that exists in a child experiences very rapid development and the child's brain experiences very rapid growth due to the creation of millions and even billions of cells in the brain. This period is also marked by the ability of the human brain that is so extraordinary; children can absorb anything that is stimulated by the surrounding environment. Therefore, it takes various kinds of stimulation that has a variety of good variations in the form of sound, images, shapes, colors, and so forth. In maximizing learning activities, there is a need for supporting facilities such as learning media that can facilitate educators or teachers in introducing learning that is or will be learned in class.

Early childhood education (PAUD) is an education level that is carried out before the child enters elementary education where the child gets guidance from birth to the age of six years by providing educational stimuli to help growth and development so that children have the readiness to enter further education levels (Hasan, 2010: 15). Children's success in terms of learning is usually measured by cognitive abilities and social abilities alone, so that many do not know about kinesthetic, interpersonal, visual-spatial, and intrapersonal intelligence. The mistake in the development of children's potential is something that can lead to the emergence of the nature of educators who are not aware of the existence of intelligence, development, and potential in children.

According to Sternberg, Kaufman, & Grigorenko (2011) regarding psychometric approaches, intelligence is seen as a different psychological trait in individuals. According to an education expert from Harvard University named Howard Gardner, he revealed in Armstrong (2013) that Multiple Intelligence is a theory of cognitive function, and states that everyone has the ability and capacity of one or more of eight types of intelligence. According to Gardner (1983) in his book, Multiple Intelligences, he argues that in each human being there are one or more eight intelligences namely mathematical intelligence, linguistic intelligence, kinesthetic intelligence, spatial-visual intelligence, musical intelligence, interpersonal intelligence, intrapersonal intelligence, and naturalistic intelligence. One of the eight intelligences, there is a spatial-visual intelligence as one that is owned by an individual. Spatial-visual intelligence is used by children in visualizing images or objects to solve a problem and find answers to something. Children can see and observe the spatial world carefully, in detail and accurately. Such as knowing from various kinds of geometric shapes, being able to combine an incomplete picture into a whole, enthusiastically following activities related to visual-spatial.

According to Gardner in Armstrong (2013) spatial-visual intelligence is intelligence that involves sensitivity to lines, colors, shapes, spaces, and relationships related to it, including the ability to visualize, represent visual or spatial ideas graphically, and develop spatially. According to Achdiyat & Utomo (2017), spatial-visual intelligence is the ability to see the relationship between form and space, present, transform, and call back symbolic information and the ability to describe something in mind and then manifest it in real form. Meanwhile, according to Fitriyani & Tasu'ah (2015), spatial-visual intelligence is the ability of children to understand patterns, spaces, colors, lines, shapes, as well as to build and visualize ideas in the mind in detail.

Based on the description above it can be concluded that spatial-visual intelligence means it has a connection with the child's visual, where the child indirectly learns from what is seen by the eye also with the development of art and creativity in children that directly intersect with lines, colors, shapes, spaces, and other visual related matters.

The stages of the development of spatial-visual intelligence according to Lowenfeld and Brittain (1982) include: a. Scribble stage (age 2-4 years), starting the ability of doodles in the abstract; b. Prescematic stage (ages 4-7 years), marked the ability of children to make a variety of shapes that are recognized but not as detailed as adults; c. In the schematic stage (ages 7-9 years), children can create themed and consistent activities; d. Dawning Realism Stage (ages 9-11

years), children begin to independently express freedom following the environment.

In this stage, it has been explained that children's abilities can increase according to the stages of their artistic development. Whereas in this study, children that will be investigated are aged between 5 to 6 years, where the child is in the preschematic stage in which the child can make forms that can be recognized but the shapes that are made are not as detailed as adults.

Based on observations made by the researcher at Mutiara Hati kindergarten in Manyaran, Semarang, in learning activities using classical models where the learning process or activities are carried out by all the same children in one class at the same time. There is a drawback of the classical model, which is prioritizing audio as an acceptance of learning compared to visual because children are required to listen carefully and verbally from the teacher carefully. While students have different limitations in verbalism, each individual has different interests and speeds to absorb learning. With such conditions, the learning conditions of individual students both regarding speed, difficulty, and interest in learning are difficult for teachers to pay attention to.

The results of a brief interview between the researcher and the teacher, there are several things related to the media used by the teacher in the learning process. Where the teacher only uses worksheets as the only activity in the classroom, for the development of spatial-visual intelligence itself, the teacher still uses worksheets whose contents consist of drawing and coloring only. Children will get bored easily and of course, this is not following the principles of learning and playing in children. So in this case, the teacher needs other media besides using worksheets to maximize the ability of children, one of them is in terms of spatial-visual intelligence.

According to the standard level of achievement of children's development at the age range of 5-6 years in the Regulation of the Minister of Education and Culture of the Republic of Indonesia (PERMENDIKBUD) No. 137 of 2014, children can classify objects based on color, shape, and size, which are 3 different types or variations. However, researcher found an imbalance between the ability of children with the standard level of development achievement, including the average child only knows two colors, the child does not recognize geometric shapes well, among them only recognize two shapes namely circle and square, knowledge of the child's spatial concept also still lacking, for example, knowledge about the direction, position, and size that does not fit.

Therefore, researchers will apply a geometric mosaic as one of the games that can be used as an interesting game media. According to Solichah (2017), mosaic art is a two or three-dimensional art that uses pieces of a particular material that are then arranged and filled in patterns that have been made before. Mosaic art is generally considered two-dimensional because of its painting-like nature. In early childhood learning activities, the mosaic is an activity where the child arranges and attaches pieces of paper of various sizes into a particular object as desired. Geometric mosaic can attract the children's attention because through the geometric mosaic, children can be creative with a variety of shapes, patterns, and colors they want so that the child can indirectly hone and develop one of the intelligence possessed in the child.

Based on the foregoing, the researchers conducted a study with the title Mosaic Geometry to Increase Spatial-Visual Intelligence of Children Aged 5-6 Years at Mutiara Hati Kindergarten in Manyaran, Semarang. According to the problem, it shows that the visual-spatial ability of group B children can be improved through the application of geometric mosaic. So it is very important to conduct research on "Whether the application of geometric mosaic can improve the spatial-visual intelligence of children aged 5-6 years at Mutiara Hati kindergarten in Manyaran, Semarang". The purpose of this study was to determine how much the application of the geometric mosaic can improve the spatial-visual intelligence of children aged 5-6 years at Mutiara Hati kindergarten in Manyaran, Semarang. The advantage of this research is the activity of making mosaics using pieces of paper with a variety of geometric shapes and varying colors so that children are more interested and learning activities to be fun, but it is also suitable for ages 5-6 years or kindergarten age, in accordance with the principles of play and learning and can provide an increase in spatial-visual intelligence and other children's development in accordance with the standard level of achievement and development of children.

METHODS

In this study, researchers will use a quantitative research approach with an experimental research design. Quantitative research is used to test hypotheses (Sugiyono, 2009). This experimental research design uses pre-experimental design in the form of one group pretest-posttest de-

sign. In the study, there was only one group that was given an initial test to determine the condition before being given treatment. This is used to provide accurate results in comparing treatment results (Sugiyono, 2011). The experiment was started by giving a pretest (O1), then experimental treatment (X), and posttest (O2) (Purwanto, 2016).

The independent variable (x) in this study is the geometric mosaic, while the dependent variable (y) is the spatial visual intelligence of children aged 5-6 years. While the population in this study were all children of group B, amounting to 45 children in Mutiara Hati kindergarten in Manyaran, Semarang. Sampling is done by using a purposive sampling technique. Purposive sampling technique is the taking technique that is done by making certain considerations (Sugiyono, 2011: 83). The sample of this research is group B children aged 5-6 years with a total of 30 children.

The study was conducted 12 times. Each meeting will be treated with a period of 15-30 minutes. The research was started by conducting a pretest, and then continued with the geometric mosaic form treatment 12 times and finally, the posttest was conducted. The data collection techniques in this study using observation, questionnaires and documentation studies. Observation is an observation activity that is going on directly (Sukmadinata, 2013: 220). The questionnaire is a data collection technique that is done indirectly or not in the question and answer activity with respondents (Sukmadinata, 2013: 219). Documentation study is a data collection technique that is carried out by collecting and analyzing documents both written, drawing and electronic media (Sukmadinata, 2013: 212).

After doing research, the next step is to analyze the data. The data analysis technique used in this study is the paired sample t-test technique using the SPSS statistical program. This calculation will see the results of normality tests and hypothesis test results. A normality test is used to determine whether the data used is a normal distribution or not. While hypothesis testing using a paired sample t-test is used to determine whether the independent variable can affect the dependent variable.

RESULTS AND DISCUSSION

The study was conducted at Mutiara Hati kindergarten in Manyaran, Semarang. The institute's address is at Candi Pawon Timur VIII Street, Rt 08 Rw VII, Manyaran, Semarang., Central Java. The study was conducted on group B children aged 5-6 years. This research was conducted on 3 September 2019 to 30 September 2019. Treat geometric mosaic given 12 times with a period of 15 to 30 minutes. The study began with a pretest, treatment, and ended with a posttest.

The research at Mutiara Hati kindergarten in Manyaran, Semarang was conducted in group B children aged 5-6 years. The sample in this study is 30 children. After conducting the research, we can find out the results of the data description as Table 1.

Based on the Table 1, it can be concluded that there is an increase in the value of pretest and posttest of children's spatial-visual intelligence. The minimum value of pretest of children's spatial-visual intelligence is 49 and the minimum value of the posttest of children's spatial-visual intelligence is 92. The maximum value of pretest of children's spatial-visual intelligence is 83 and the value of children's spatial-visual intelligence is 92. The average or mean value of the child's spatial-visual intelligence pretest is 73.00 and the mean of posttest spatial-visual intelligence 81.10.

Based on the Table 2, it is known that the acquisition of pretest scores of 30 children in the very high category is 0 and the percentage is 0%. The high score is 0 with a percentage of 0%. The medium score is 15 children and the percentage is 50%. The enough score is 12 children with a percentage of 40%. The low score is 3 children with a percentage of 10%. And the very low score is 0 with a percentage of 0%. The next is the acquisition of children's scores after the treatment or posttest from 30 children with the same category. The very high category is 0 and the percentage is 0%. The high score is 1 child with a percentage of 3%. The medium score is 23 children and the percentage is 77%. The enough score is 6 children with a percentage of 20%. The low score is 0 with a percentage of 0%. And the very low score is 0

Table 1. Description of Pretest and Posttest Spatial Visual Intelligence in Children

	N	Range	Minimum	Maximum	Sum	Mean	Std. Deviation	Variance
Pretest	30	34	49	83	2190	73,00	8,502	72,276
Postest	30	30	62	92	2433	81,10	5,915	34,990
Valid N	30							

with a percentage of 0%. Pretest and posttest normality test results are as Table 3.

Based on the Table 3 that the Kolmogorov-Smirnov normality test shows the data of children's spatial-visual intelligence in Mutiara Hati kindergarten has a significant value of 0.105 for the pretest results of children said to be normally distributed because of significant values on the pretest results of children's spatial-visual intelligence> 0.05. While the significant value of 0.769 for the posttest results of children is said to be normally distributed because the significant value of the posttest results of children's spatial-visuall intelligence> 0.05.

Based on the Table 3, it can be concluded that the results of this study are that there are differences between before and after the geometric mosaic is given. This means that the spatial-visual intelligence of children aged 5-6 years can be increased after being given a geometric mosaic. This is evidenced by the calculation of the Paired Sample t-Test.

Based on the Table 4, the data is obtained through statistical calculations through the Paired Sample t-Test. The data in the table, it can be seen that the result of the t-value is 7,350. Testing is done from a sample of 30 children in class B, to see the results of the calculation of the hypothesis can be accepted, the value of t_{count} must be smaller than t_{table} ($t_{count} < t_{table}$) and Sig. <0.05. The results show that $t_{count} < t_{table}$, is -7,350 <1,697 and Sig. 0,000 <0.05 so H_a is accepted. The results of the analysis showed that there was an increase in the spatial-visual intelligence of children aged 5-6 years after being given a geometric mosaic treatment.

Increased Spatial Visual Intelligence Children 5-6 Years Old at Mutiara Hati Kindergarten in Manyaran, Semarang

Efforts that can be made to achieve the above objectives are by applying the geometric mosaic, in which this geometric mosaic has the aim to improve the spatial-visual intelligence of children aged 5-6 years. According to Winnuly in Surya (2013) in his research explained that intelligence actually exists and is rooted in the human nerves in the brain and is also the center of human activity. Spatial-visual intelligence must be stimulated by giving a habit of routine activities that can be done several times a week to hone the child's visual-spatial abilities to develop according to their age range and can be useful for life in the future.

Table 2. Value Categories

Kategori	Interval	Pretest		Posttest	
		Jumlah	%	Jumlah	%
Sangat Tinggi	107-121	0	0%	0	0%
Tinggi	92-106	0	0%	1	3%
Sedang	77-91	15	50%	23	77%
Cukup	62-76	12	40%	6	20%
Rendah	46-61	3	10%	0	0%
Sangat Rendah	30-45	0	0%	0	0%
Jumlah		30	100%	30	100%

Table 3. Pretest and Posttest Normality Test Results

One-Sample Kolmogorov-Smirnov Test			
		Pretest	Posttest
N		30	30
Normal Parameters	Mean	73,00	81,10
	Std. Deviation	76,50	82,00
Most Extreme Differences	Absolute	78	84
	Positive	8,502	5,915
	Negative	72,276	34,990
Kolmogorov-Smirnov Z		34	30
Asymp. Sig. (2-tailed)		49	62

a. Test distribution is Normal

Table 4. Results of Calculated Paired Sample t Test

Paired Samples Test									
		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	
Pair pretest- 1	posttes	-8.100	6.036	1.102	-10.354	-5.846	-7350	29	.000

Spatial-visual intelligence can be improved by using a geometric mosaic. This activity is expected to help children in the development of art. This is needed because this activity can be a fun activity and can be followed according to the interests and talents of children. In daily activities, this activity requires proper coordination between eyes and hands. There are several materials used in making mosaics including paper, and other materials, creativity is the main thing in choosing and making children to express themselves with the specified media (Pamadhi, 2009: 5).

Based on the results of the hypothesis test conducted using the Paired Sample t-Test, it is known that the result of the t_{count} is - 7,350. Testing is done from a sample of 30 children class B, to see the results of the calculation of the hypothesis can be accepted, the value of t_{count} must be smaller than t_{table} (t_{count} <t_{table}) and Sig. <0.05. The results show that t_{count} <t_{tabel}, is. -7,350 <1,697 and Sig. 0,000 <0.05 so Ha is accepted. The results of the analysis showed that there was an increase in the spatial-visual intelligence of children aged 5-6 years after being given a geometric mosaic treatment and it can be seen that the children's spatial-visual intelligence increased after being given a geometric mosaic, the increase can be seen from the mean pretest and mean posttest values of 73, 00 to 81.10.

The geometric mosaic can be called the media because it can stimulate the children's spatial-visual intelligence properly, with the presence of the media itself which is very useful in the learning process. This result is in line with the theory of Gerlach & Ely in Arsyad (2007), that the media are human, material, events that build conditions where students can obtain knowledge, skills or attitudes. Besides, learning media is something that can be used to channel messages and stimulate the learning process of children (Aqib, 2013: 50). Likewise with the opinion of Indraswari (2012: 12) that the mosaic media is suitable for kindergarten age because it is following the principle of playing in kindergarten, through mosaic activities, it can provide a satisfactory influence to improve children's learning outcomes, with an increase in each treatment.

A geometric mosaic can improve spatial-visual intelligence. Children who have spatial-visual intelligence have visualization learning methods based on their vision. Children will get stimulation of spatial-visual intelligence if they are in an environment that allows children to do visual-spatial activities following their development, for example, there are activities to imagine (Rosidah, 2014: 291). The activity of making a geometric mosaic carried out in this study includes the activity of making a mosaic using pieces of paper with a variety of different geometric shapes and colors so that children are more interested and learning activities can be fun. This is in line with the theory put forward by Hartati (2005: 30-33) about the principles of early childhood learning, one of which is learning is done while playing, learning through play can allow children to explore, discover, express feelings, be creative, and learn with fun.

CONCLUSION

Based on the results of research and discussion, it can be concluded that the spatial-visual intelligence of children increases after the application of a geometric mosaic. The increase can be seen from the mean value of children's early reading skills which initially increased from 73.10 to 81.10 so that an average increase is 8.10 was obtained. The results showed that the average value of spatial-visual intelligence of children aged 5-6 years in Mutiara Hati kindergarten Manyaran Semarang increased higher after being given a geometric mosaic from the child's spatial-visual intelligence before being given the application of a geometric mosaic. Besides, the results of hypothesis testing indicate the value of Sig. <0.05 and the value of t_{count} <t_{table} is -7.350 <1,697 so H_a can be accepted. Based on these results, it shows that there is an increase in the spatial-visual intelligence of children aged 5-6 years in Mutiara Hati kindergarten in Manyaran, Semarang after being

given the application of a geometric mosaic.

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