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The Influence of Educational Games Tools on Students' Cognitive Ability in Geometry of Students Group A

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Abstract

This research has been done to respond the lower range of students' cognitive ability in group A to recognize shape of geometry in Al Irsyad kindergarten Pemalang. The main question in this research was is there any influence in using the educational games tools on the cognitive ability in geometry of students in kindergarten A? This research aimed to find out is there any influence of Educational Games Tools (APE) on students 'ability in recognizing the shape of geometry. The subjects of this research are students in group A in Al-Irsyad kindergarten, Pemalang. This research used quantitative approach with the types of pre-experiment and research design one group pre-post test where the researcher observed before and after the treatment.. The researcher chooses the samples with purposive sampling, there are 30 students. This study find out the average of pre-test score 1,83 lower than the average of post-test score 3,07. Statistic examined with normality test using one sample kolmogorov smirnov test find out the score 0,200 > α = 0,05, with the normal distributional data. From the Paired T-test program SPSS 24.0 version find out the result score Sig as 0,00 < 0,05 and score $-t_{hitung} < -t_{tabel}$ (-28,358 < -2,0452). Therefore, Ho refused and Ha accepted. We can conclude that APE influence on the students' cognitive ability in to recognize students geometry group A.

How to Cite

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INTRODUCTION

This article discusses the use of APE (educational game tools) on the cognitive abilities of the geometry fields of kindergarten group A. The article is divided into three main parts. The first section addresses the context and review of previous studies of educational game tools (APE) and geometry learning. The second part contains the methodological aspects of the study which are the main material of this paper. The third part explains the results of the study and discussion.

Playing for early childhood is a way of learning to find out new things from the experience gained. Playing is one of the principles of early childhood learning (Ardini, 2013). Through games, parents and educators can convey the elements of education in learning. Through the games, early childhood feels amused and happy.

Every human being, from children to adults, always has the desire to play, even though the game in every age varies in shape (Suhendi, 2001). In the games, a tool that can have a positive impact on the child is needed. The use of educational game tools (APE) can be done with a variety of steps, the form of the game, and various purposes of developed aspects.

APE functions important in developing children's abilities. The abilities that can be developed using APE are cognitive, affective, and psychomotor abilities. APE can improve children's cognitive abilities, for example when children play puzzles, beams, beads, balls and so on. This is because children use the mind to solve problems by playing.

There are many benefits that can be obtained if parents provide APE to children during playing activities (Fitriyani & Tasu'ah, 2014). Game tools are tools or objects provided by parents for their children that are useful for optimizing aspects of their development, providing a sense of fun, training children's thinking, and providing education to children (Suyadi, 2010).

The development of children's cognitive abilities can be done by introducing mathematics learning (Estirina, 2016). Mathematics is very important for early childhood because it can stimulate aspects of development and intelligence of children through stimulating the child's brain to think logically and mathematically (Suyanto, 2005). Desli and Dimitrou (2014), said that mathematics learning in kindergarten or preschool age ranges aims to change the way children think becomes logical so they are ready to enter the next school level. Most of the scope of Mathematics learning in kindergarten is the introduction of geometry (Suyanto, 2005). Children know Mathematics well when they are introduced to concrete objects to be counted (Rohmah & Waluyo, 2014).

Group A is the initial stage of children entering education in kindergarten. At this level, the cognitive development of children is in the pre-operational stage, where children are able to think concrete (real). In this phase, children begin to realize that understanding the things around them can be done with symbolic activities (Rahayu & Waluyo, 2015). Learning to use APE can help children to concretize something abstract.

One important element in preschool education is to help children recognize the basic concepts of geometry and teach them how, where, and when to use these concepts in their lives (Rohmah, et al., 2016). The introduction of geometry in kindergarten is done by showing forms relating to concrete objects in the environment around the child, such as the form of books, tables, blackboards, and so on. APE has many benefits, such as children will feel more interested, motivated to take part in learning, and foster children's curiosity (Jovanka, et al., 2016).

One of the Mathematics' scope, including at the PAUD level, is a geometric concept (Andriyani & Adiarti, 2016). This content is important to learn, as expressed by Clements and Sarama (Therese, et al., 2014), that spatial thinking and geometry are the second most important areas after numbers; because the concept of geometry supports the abilities and concepts of numbers and child arithmetic. Visual and spatial abilities can increase with exercises focused on geometry, direction, orientation, space, shape, and size (Utami & Adiarti, 2017).

In Indonesia, geometry has been included in the learning curriculum for children after an early age. The general purpose of geometry recognition according to the Ministry of National Education (2010) is that children are expected to know and differentiate and mention the names of geometric shapes by observing the shapes of objects around the child such as circle, triangle, trapezoid, square, oval, circle and others (Fuadiyah, 2013). In the Regulation of the Minister of Education and Culture of the Republic of Indonesia No. 146 year 2014 regarding the 2013 PAUD Curriculum, there is a level of children's knowledgeability that is able to recognize objects around them (name, color, shape, size, pattern, nature, sound, texture, function, and other characteristics).

Based on observations in Al Irsyad Pemalang Kindergarten, there is 43.3% (13 out of 30

Table 1. The Development of Recognizing Geometry Shape on Early Childhood (Ministry of National Education Regulation No. 146 Year 2014)

Basic Competence	Indicator of Development Achievement 4-5 years
Recognize things around them (name, color, shape, size, pattern, character, sound, texture, function, and others characteristics)	Get to know objects by grouping various objects by size (small, long-short, thick-thin, light-weight)
	Get to know objects by pairing objects with their partners
	Know objects by sorting objects based on the size from the shortest to the longest, the smallest.
	Get to know objects based on shape, size, and color through grouping activities
	Get to know the concepts of big, small, short, heavy, low, through comparing activities

children) who have low cognitive abilities in recognizing geometry shapes. There are several factors that can cause the child's low cognitive abilities to recognize geometry forms, namely internal factors and external factors (Andriyani & Adiarti, 2016). Internal factors are the ability of children to remember. While, external factors are information that is not the same given to children, giving rise to errors, the ability of teachers, learning facilities, and media used by teachers who still use teacher-centered activities.

Based on these problems, the researcher concludes that there is a need for a learning strategy in introducing geometry shapes, namely by using APE. APE can help children to get information concretely. The advantages offered in this study compared to previous studies are that the game equipment used does not only focus on one game. The use of 13 geometry games to improve children's cognitive abilities in recognizing geometry shapes. The purpose of this study is to determine the effect of APE geometry on improving cognitive abilities of group A students. The aspects of the methodology of this study are presented in the following sections.

METHODS

The study uses Pre-Experimental research method with One Groups Pretest-Posttest Design. The study sample consists of 30 students with a 4-5 year age category, consisting of 12 girls and 18 boys that is chosen by purposive sampling. The reason for choosing the group is because the students still have difficulty in mentioning the name and distinguishing characteristics of the two-dimensional figures. The data collection is carried out by using research instruments on the level of cognitive geometry of children developed based on the indicators contained in Permendiknas No. 146 of 2014. At first, the researcher develops 30 items. However, after testing only 26 of them are valid.

This study uses the descriptive data analysis method, normality test with the One-Sample Kolmogorov-Smirnov Test and hypothesis testing with the Paired Samples T-test. In this study, the APE used are geometry dice, geometry base, geometry puzzle, beam, geometry flashcard, geometry footing, geometry robot, two-dimensional monster, snake geometry, strand geometry, necklace geometry, ice cream stick geometry, and matching geometry shapes.

RESULT AND DISCUSSION

The data from the results of the study are then recapitulated. Based on the pretest data, it shows that in terms of geometry abilities, 43.4% of students (13 children) are in the low criteria, 46.6% of students (14 children) are in the medium criteria, and 10% of students (3 children) are of high criteria. Then the lowest average score is 1.33 and the highest average score is 2.60. Based on the results of the pretest that has been elaborated, children have the ability to recognize low geometry forms in general. So, treatment is needed that the child's ability to recognize geometric shapes can be increased by using APE in the learning process.

The posttest data shows that there are 13.3% of the sample (4 children) in the low category, 63.4% of the sample (19 children) are in the medium category, and 33.3% of the sample (7 children) are in the high category. Then, the lowest mean score is 2.27 and the highest average score is 3.07. This shows a considerable increase in children's cognitive ability to recognize geometry. The results of the pretest and posttest can be seen in Figure 1.

Table 2. The Result of Pre-test and Post-test

Criteria	Students' Number Pretest	Students' Number Posttest	Before/Pretest	After/Posttest
Low	13	4	43,4	13,3
Medium	14	19	46,6	63,4
High	3	7	10,0	33,3

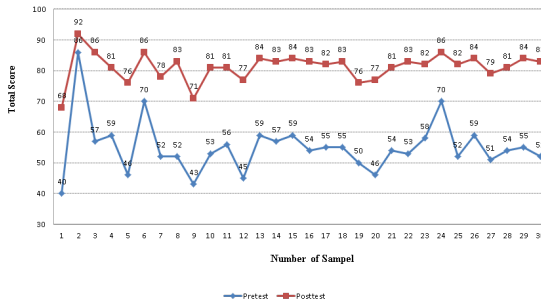

Figure 1. Pretest and Posttest Result

In the low category, it decreases from 43.4% (13 children) to 13.3% (4 children). In the medium category, there is an increase from 46.6% (14 children) to 63.4% (19 children). And the high category increases from 10.0% (3 children) to 33.3% (7 children). So, after being given treatment, some children's ability in recognizing geometry shapes have increased. The results of the pretest and posttest score can be seen in Table 2.

The obtained data is then analyzed to find out whether the data are normally distributed or not. In testing the normality, the researcher uses the One-Sample Kolmogorov-Smirnov Test method. The basis of the decision is if the probability value (Sig.) > Level of Significant = 0.05, can be seen in Table 3 as follows.

Table 3. The Result of Normality Test of Pre-test and Post-test Data

One-Sample Kolmogorov-Smirnov Test	
N	30
Test Statistic	,109
Asymp. Sig. (2-tailed)	,200[c,d]

Based on the results of the normality test, it shows that the probability of t-statistics is 0.200 > Level of Significant = 0.05. Thus, the data meet the assumptions of normality. Likewise, variables have a normal distribution.

After the normality test, the researcher conducts a hypothesis test using the paired sample t-test with the help of the SPSS 24.0 program. The results of the paired sample t-test output can be seen in Table 4.

Based on the Table 4, the results of paired sample hypothesis test t-test with a confidence level of 95% or α = 0.05, df = 29 is obtained t table = -2.0452. The table data shows that the value of t count = -28,358. From the analysis, it can be concluded that - t count > - t table is -28,358 > -2,0452 and sig (2-tailed) value 0,000 < 0,05 which means Ho is rejected and Ha is accepted. Thus, it can be concluded that APE influences children's cognitive geometry.

From the results of processing and analysis of the scores that have been done, the results are the pre-test average value is 1.83, and after being given treatment (post-test) become 2.71. Then it can be concluded that APE can improve children's cognitive abilities in recognizing geometry shapes in group A at Al Irsyad Pemalang Kindergarten.

From the presentation and data analysis above, it shows that the use of APE in play activities has a positive impact on children. A game tool that is able to hone thinking children will develop aspects of child development early through the learning process in school. With APE students can practice independently, develop problem-solving, practice language skills, and introduce colors and shapes. The use of APE in learning geometry recognition can provide convenience for teachers and students. For teachers, APE can be used to make it easier to give or explain material concretely. For students, it is used as a tool for learning by playing and understanding geometric concepts namely shapes, patterns, and colors.

The results of this study are in accordance with the results of Muloke, Ismanto and Bataha (2017) that there is an effect of APE (puzzle) on cognitive development aspects of children aged 5-6 years on results before and after treatment of cognitive development in TK. This is also in accordance with the results of Sain, Ismanto, and Babakal (2013) study that APE has an influence on aspects of pre-school child development.

Based on the results of observations, children have difficulty in mentioning the name and distinguishing characteristics of each two-dimensional figure that is asked by the teacher. The difficulties experienced by children in recognizing the concept of geometry can be influenced by several factors, namely cognitive factors (level

Table 4. The Result of Paired Samples T-test for Hipotesis Testing

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Internal of the Difference				
					Lower	Upper			
Pair1	post-test-pre-test	-,89933	,17370	,03171	-,96419	-,83447	-28,358	29	,000

of ability to remember) and environmental factors (school and family). The ability to remember children is a cognitive activity when children get knowledge or information from experiences obtained by children in the past (Syaodih, 2005).

Some children mention the two-dimensional figure name such as a square with a box name, a circle's name with a round name, a cone with a triangle name, the name of the cube's building with the name of the beam, and a cylinder's name with a circle. This problem has been identified in previous publications (Sulistiyorini, 2016) that the mistakes experienced by children in mentioning the names of three-dimensional building or building are due to a lack of children's understanding of drawing concepts and definition concepts which play a role in forming geometric concepts (Sulistiyorini, 2016). Whereas according to the researcher, children have a diversity of vocabulary in mentioning geometric names when in learning, but the technical and formal terms of mathematics make it seem wrong. The diversity of vocabulary that children have is obtained from information from teachers, parents, and people around them. This is in accordance with the results of a study from Muloke, et al (2017) suggesting that the environmental factors where children live have an influence on learning achievement.

Based on the discussion above, it can be concluded that APE can influence students' cognitive abilities in recognizing geometric shapes. The use of APE for teachers functions as a facilitator to deliver learning material so that children can understand independently in accordance with their respective abilities. The main purpose of using APE is to make it easier for students to understand the material, as a tool to convey learning material in a concrete and fun way, to encourage students to learn independently, and to improve children's learning outcomes in the learning process.

CONCLUSION

This study has shown that APE can improve students' cognitive abilities. Therefore, the introduction of geometry for kindergarten students should be more effective if using a more varied APE. The use of APE in learning needs to be encouraged in kindergarten in general in order to increase the level of students' abilities and make the learning situation more enjoyable. Providing adequate APE for all aspects and content of development can help teachers and students in the learning process. However, because the focus of research is limited to the influence of APE on cognitive abilities in the field of geometry, presumably further studies can examine APE's application of cognitive abilities to other learning content.

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