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Herman Herman

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The Effect Of Constructive Play With Block Media On Mathematical Logic Ability in Kindergarten

Herman[1], and Herlina[2]
Universitas Negeri Makassar
Email: herman.hb83@gmail.com

Abstract. The problem in this study is how does the description of children's mathematical logic abilities before and after stimulating constructive play activities using blocks media, does constructive play with block media affect children's mathematical logic abilities? The purpose of this study was to describe the mathematical logic skills of children before and after being given constructive play with block media, and to determine the effectiveness of constructive play with block media in early childhood education children. The type of research used in this study is a Quasi Experimental Design research type. The population in this study were all children in group B, totaling 96 children in PAUD Terpadu Teratai. Determination of the sample using nonprobability sampling technique with purposive sampling so that the selected sample is group B1, amounting to 20 students as the experimental class and the sample for the control class is group B2 totaling 20 students. Data collection techniques through test and documentation techniques. The data analysis technique used is descriptive statistical analysis and nonparametric statistical analysis. The results showed that the mathematical logic skills of children before being given treatment were in the category of starting to develop and after being given the treatment they were in the developing category as expected, it can be concluded that there was an effect of constructive play with block media on the mathematical logic skills of children in group B PAUD Terpadu Teratai, Makassar.

Keywords: constructive play, block, mathematical logic ability

INTRODUCTION

The world of children is a world of play which has been a very interesting phenomenon for educators, psychologists, and philosophers since ancient times. They are challenged to better understand the meaning of play in terms of children's behavior. Although the concept of play has been in use for many years, it is more difficult to define than most other psychological ideas. [1] said that playing is a child's way of thinking and how children solve problems. Young children are not able to think abstractly because for them, meaning and objects mingle into one. Constructive play is "a way of playing for children that is directed to create something that is truly original and creates or builds something. Through

imagination, children can gain experience with objects that are beyond their real reach "[2].

Rodgers, Erikson, Piaget, Vygotsky, and Freud [3] said that "there are at least three types of play activities that support children's learning, namely, functional or sensorimotor play, role playing, and constructive play". Constructive which means building or arranging according to Carin [4] that constructive is learning which emphasizes that students, as learners, do not just accept the knowledge they find, but they actively build knowledge individually. Meanwhile, according to Seiffert & Hoffnung, [5] states that "constructive play is a form of play by using physical objects to build or create something. This type of game is very common among pre-school children ". [6] Constructive play provides children with experiences to link functional play with more complex forms of play, namely symbolic play. In this game, children use concrete objects to represent other objects, for example, blocks as a substitute for a car. At this stage the object used should be an object that has almost the same characteristics as the object being replaced. Playing through block games means learning using educational game tools made of pieces of wood, plastic which have various shapes, and how to play them are arranged / connected according to their imagination so that they form a building or resemble objects such as houses, bridges, fences, and so on. other. This game, in addition to training the development of creativity and cognition, also trains muscle strength and can help children improve their imagination. Maybe the child will just arrange it up, sideways, or just throw it around. At this age, children are having fun playing rough. For example, if it had been arranged high, it was even torn down. For children, it is very fun. In fact, from there the children also learn that when an object is dropped in layers, what was at the top now becomes scattered.

The concept of numbers is a basic skill in mathematics. This ability develops gradually starting from the child's ability to explore and manipulate objects and then followed by the child's ability to coordinate with their environment through mathematical logic [7]. Patterns and their relationships constitute an arrangement of objects, form numbers. Understanding of patterns helps children understand the relationships that exist between objects, shapes and numbers that have been combined into certain patterns. Geometry and spatial orientation, related to the ability to understand the forms and structures that exist in the environment. Children learn to understand three-dimensional shapes when they are given small blocks that can be used as play tools and create various shapes such as houses, buildings, and so on.

Mathematical logic knowledge is built when children play or manipulate materials / objects around them [8]. In addition, the interaction of children with adults can also build this knowledge. When an adult guides, asks, responds, reacts to children when they manipulate objects, the desire to learn mathematical logic will arise. Children's abilities related to mathematical logic can be improved from an early age.

METHOD

This research is classified in the type of experimental research that is categorized into quasi-experimental research. Because this design has a control group, but it cannot fully function to control external variables that affect the implementation of the experiment. However, this design is better than pre-experimental design. As with Best's [9] opinion, this study has better control than the pre-experiment, but there are still weaknesses, because usually it does not reach equivalence between the experiment and the control group. The research design used was the Nonequivalent Control Group Design where measurements were carried out involving 2 groups, namely the experimental group and the control group. The design is described as follows [10]:
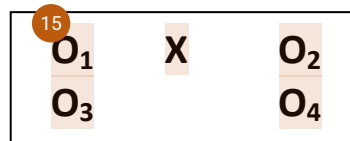
$$O_1 \quad X \quad O_2$$
$$O_3 \qquad O_4$$

Figure 1. The Research Design

Description:
O1: The pretest results of children's mathematical logic skills before being given constructive play method treatment with beam media.
O3: Pretest results of children's mathematical logic abilities that are not given constructive play method treatment with beam media.
X: Constructive play method treatment with beam media.
O2: The results of the observation of the mathematical logic skills of the treated child constructive play method with beam media.
O4: The results of the observation of children's mathematical logic abilities that were not given constructive play method treatment with beam media.

Population is a generalization area consisting of objects or subjects that have certain qualities and characteristics that are determined by the researcher for study and then draw conclusions. As for the population of this study were 96 children of group B Integrated PAUD Teratai Makassar. The sample is part of the number and characteristics possessed by the population, or a small part of the population members taken according to certain procedures so that it can represent the population.

Sampling is done by purposive sampling technique (sampling consideration), namely a sampling technique in which the sample members are selected deliberately on the basis of the knowledge and beliefs of the researcher. Where the sample size is, 20 children in the control class (B1) and 20 children in the experimental class (B2) in PAUD Terpadu Teratai Makassar.

Data collection techniques used in this study were: tests and documentation. The test is a series of questions or exercises that are used to measure the knowledge possessed by individuals. while documentation is a technique used to obtain data

directly from the research site. In this study, the documentation in question is data of students and photos of learning activities

The data obtained before and after the use of constructive playing method with block media were analyzed using descriptive statistical analysis techniques and inferential statistical analysis techniques. Descriptive statistical analysis is intended to describe the mathematical logic skills of students using the Wilcoxon test. In this study using the Wilcoxon test to analyze paired data because of the two different treatments. Furthermore, in order to obtain an overview of the average level of children's mathematical logic ability, the average calculation is done using the following formula:

$$P = \frac{\sum X}{N} \quad [10]$$

Description:

  P = Average

  $\sum x$ = Value / price x

  N = Amount of data

The analysis technique used in this research is nonparametric statistical analysis. Nonparametric statistics are used when the sample size is so small that the distribution of the sample or population is not close to normal, it can handle ordinal scale or rank data. So, for the analysis of the difference test, the Wilcoxon Signed Rank Test analysis is used with the following formula:

$$Z = \frac{T - \dfrac{N(N+1)}{4}}{\sqrt{\dfrac{N(N+1)(2N+1)}{24}}}$$

Description:

  Z = Test foundation

  T = The total number of rankings with the same sign

  X = Number of samples

The test decision criteria are:

  H0: There is no influence between constructive play and logic skills

  matematia children group B in PAUD Terpadu Teratai Makassar

  H1: There is an influence between constructive play and mathematical logic skills

  children of group B in Integrated PAUD Teratai Makassar.

  H0: Accepted if Tcount <Ttable and Zhitung <Ztabel, it means that there is no intermediate influence

  constructive play with the mathematical logic skills of group B children

  at PAUD Terpadu Teratai Makassar.

  H1: Accepted if Tcount≥Table and Zhitung≥Ztabel, meaning that there is an intermediate influence

  constructive play with the mathematical logic skills of group B children

  at PAUD Terpadu Teratai Makassar

RESULT AND DISCUSSION

Result

a. The posttest results of the experimental class

In constructive play activities, researchers provide treatment to all research objects. After the researchers treated the data collected regarding the posttest results of children's mathematical logic abilities, the smallest value was 16 and the highest value was 24. From these data, it was obtained an average value of 21.2 and a standard deviation of 0.91. The distribution of the categorization of the posttest results of children's mathematical logic abilities can be seen in the following table:

Table 5.1 Observation Results of the Teratai Makassar Integrated Early Childhood Early Childhood Experiment Class

No	Nilai	Kategori	Frekuensi	%
1	23-25	BSB	3	30
2	20-22	BSH	2	20
3	17-19	MB	2	20
4	14-16	BB	3	30
	Jumlah		10	100

Based on the table above, it can be seen that the 10 children who were used as the experimental group were 3 children who had a percentage of 30% who were in the very well developed category. Then there are 2 children with a percentage of 20% who are in the developing category as expected. And 2 children with a percentage of 20% who are in the developing category and 3 children with a percentage of 30% are in the underdeveloped category. Thus the mathematical logic abilities of the experimental group children after being treated in the form of an experimental method showed that of the 10 children 30% developed as expected, 20% developed very well, 20% began to develop and 30% did not develop.

b. The results of the control class posttest

After the researcher gave treatment to the control group, then the researcher gave a posttest to all research subjects. The data collected regarding the posttest results of children's mathematical logic skills obtained the smallest value of 14 and the highest score of 22. And the data was obtained from an average value of 17 and standard deviation of 0.9. The distribution of the categorization of children's mathematical logic abilities after being given treatment in the form of conventional methods can be seen in the following table:

Table 5.2 Observation Results of the control class in PAUD Terpadu Teratai Makassar

No	Nilai	Kategori	Frekuensi	%
1	20-21	BSB	2	20
2	18-19	BSH	2	20
3	16-17	MB	3	30
4	14-15	BB	3	30
	Jumlah		10	100

Based on the table above, it can be seen that the 10 children who were used as the control group were 2 children who had a percentage of 20% who were in the very well developed category. Then there are 2 children with a percentage of 20% who are in the developing category as expected. And 3 children with a percentage of 30% who are in the developing category and 3 children with a percentage of 30% are in the underdeveloped category. Thus the mathematical logic skills of the control group children after being treated in the form of conventional methods showed that out of 10 children 20% developed as expected, 20% developed very well, 30% began to develop and 30% had not developed.

c. Non-parametric statistical analysis

Based on the research results obtained from the data from the initial and final observations, it can be seen that the effect of the application of the experimental method on the mathematical logic skills of children after testing the hypothesis with the Wilcoxon test analysis. The steps taken are as follows:

1. Data before (O1-O2) treatment is determined by the difference in score difference
2. Make a ranking of the total number of children (regardless of the sign) by sorting the values from highest to lowest, then from the top given a number that shows the ranking starting from 1,2,3,4 onwards. The same value must be given the same ranking, that is, by dividing the ranking value numbers equally among all owners of the same value. Put on each ranking sign (+ or -).
3. To determine the T-value, the smallest sign value is added from the two ranking groups that have the same sign, and N is obtained from the number of samples studied.
4. Then a comparison is made between the T value obtained and the T value on the Wilcoxon signed test. The results of the data obtained can be seen in the following table

Table 5.3. The results of the T value analysis on the Wilcoxon signed test

No	Nama Anak	Kemampuan Logic Matematika		Selisih Nilai (O1 -O2)	Rangking	Tanda Rangking	
		Pre	Post			+	-
1	ATP	21	24	3	5	5	
2	NA	18	24	6	2	2	
3	PS	16	21	5	3,5	3,5	
4	RS	19	24	5	3,5	3,5	
5	NA	16	23	7	1	1	
6	DRU	21	22	1	8	8	
7	MFAFZ	19	20	1	8	8	
8	ZN	17	18	1	8	8	
9	FPI	20	20	0	10	10	
10	R	14	16	2	6	6	
Jumlah		181	121			T = 55	

Based on the table above, the mathematical logic skills of children found in the control group and the experimental group through trial activities show the number of rankings marked (+) = 55 and the number of rankings marked (-) = 0. In decision making if T count < T table = H0 accepted H1 is rejected. This means that there is no effect of constructive play with the media on the mathematical logic skills of Group B at PAUD Terpadu Teratai, Makassar. If Tcount ≥ Ttable = H0 is rejected, H1 is accepted. This means that there is an effect of constructive play with the media on the mathematical logic skills of Group B at PAUD Terpadu Teratai, Makassar. If Z count <Ztable = H0 is accepted, H1 is rejected, it means that there is no effect of constructive playing with the media on the mathematical logic skills of Group B in Teratai Integrated PAUD, Makassar. If Z count ≥ Ztable = H0 is rejected, H1 is accepted, it means that there is an effect of constructive playing with the media on the mathematical logic skills of Group B in Teratai Integrated PAUD, Makassar.

As for the value of tcount obtained, namely 55 and ttable 8, the results obtained tcount (55)> ttable (8) H1 is accepted and H0 is rejected, meaning that there is an effect of constructive playing with block media on the mathematical logic skills of group B in PAUD Terpadu Teratai, Makassar. While the Z count value obtained is 2.80 and Ztable is 1.645, the result is Z count (2.80)> Ztable (1.645). H1 is accepted and H0 is rejected, which means that there is an effect of constructive playing with block media on the mathematical logic skills of Group B at PAUD Terpadu Teratai, Makassar. Based on the description above, it can be concluded that constructive playing with block media affects the mathematical logic skills of Group B in PAUD Terpadu Teratai, Makassar.

Discussion

Mathematical logic skills of children before being given treatment

Mathematical logical abilities of children based on the Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 146 of 2014 states that children aged 5-6 years are able to: a) Be able to recognize objects by grouping various objects in their environment based on size, pattern, function, nature, sound, texture, functions, and other characteristics; b) Identifying objects based on five or more series, shape, size, color, or number through the activity of sorting objects.

Based on the above, it shows that the mathematical logic skills of children aged 5-6 years should be able to do this, but if the provision of learning activities is less interesting, it will have an impact that will affect the child's mathematical logic skills. Before students are given treatment, children's mathematical logic skills are still lacking. Where in giving the pre-test, children still cannot recognize and mention some of the geometric shapes shown to the child. Likewise, in sorting numbers, children still find it difficult to sort numbers, especially to sort numbers from largest to smallest. This pre-test giving activity starts when the researcher has entered the room and conducted opening activities such as greeting students, singing, and doing questions and answers. After that, when entering this activity the researcher gave a

test to the child, this test was carried out by the researcher showing geometric shapes and then asking the child the name of the shape and also the color. During this pre-test giving activity, the researcher observed the child and made an assessment using the instrument that had been prepared

After this pre-test giving activity, the researcher can conclude that the children's mathematical logic skills are still lacking and based on this, the researcher at the next meeting will provide treatment / treatment to the child in the form of constructive play activities with block media where with this media it is expected to have an influence on the ability children's math logic.

Children's mathematical logic skills after being given treatment

After previously the students were given a pre-test and the researchers found that the students 'mathematical logic skills were still lacking, this made the researcher want to see the differences in the students' mathematical logic abilities before and after being given treatment in the form of constructive play activities with block media. In this activity, the researchers used beam media with unit beam type, where the unit block is easy to play and durable. The beam media has the following characteristics: 1) including three-dimensional media; 2) durable or long lasting; 3) easy to play; 4) relatively cheap manufacturing costs; 5) flexible, can be changed as you wish [12]

In this treatment activity, it begins with opening activities, such as greeting students, singing, and doing questions and answers. Then enter the core activities, the researcher provides play activities according to the scenario that has been made. In this scenario there are six activities that will be given to the child, then when carrying out this activity the researcher will begin to observe and assess the child one by one to later be able to conclude whether or not constructive play with block media has an effect on the child's mathematical logic skills. In using this unit beam, the researcher made several different shapes such as rectangles, squares, triangles, and parallelograms. With each form has a different number. Furthermore, this unit block apart from having a different shape also has a different color. Then on the block side of this unit, some are given a number on one side and some do not have a number. Because there are activities where the child will make a building / construction according to the object where this object is the child's free choice according to the child's wishes.

Then for the unit blocks that have numbers, the children will carry out the activity of sorting the numbers from the smallest to the largest and vice versa. Furthermore, the activities that will be carried out using unit blocks that have a number on one side are the activities of making a building / construction according to the object and in accordance with the sequence of the numbers, so that children will not carelessly construct a building but must be adjusted according to the sequence. In this activity, children are very enthusiastic when carrying out this activity, because this activity is a new activity for children because they have never had activities like this before. After the core activities are carried out, the researcher

then carries out closing activities according to the scenario that has been previously made. Where in this closing activity there is a question and answer activity regarding the activities that have been carried out.

The effectiveness of constructive play activities with block media on children's mathematical logic skills.

This study uses a quantitative research approach, where this research was conducted to analyze the effect of constructive play with blocks on the mathematical logic skills of children. Quantitative research is to generate the emergence of a situation or event, this research is intended to see a result or treatment [13]. With the provision of constructive play activities with block media, it can be seen based on the results of data analysis that there is a difference between before and after children are given treatment. These results were obtained based on the data that the researchers processed from the results of observations and assessments during the pre-test and post-test activities for students.

In this data collection technique, researchers used tests and documentation which were then processed using descriptive statistical data analysis techniques and nonparametric statistical data analysis techniques, using the Wilcoxon Signed Rank Test analysis. Then based on this analysis, it was found that the value of Tcount (55)> Ttable (8) and the value of Z count (2.80)> Ztable (1.645) means that there is an effect of constructive playing with block media on the mathematical logic skills of Group B in PAUD Terpadu Teratai, Makassar

CONCLUSION

Based on the results of the research that has been carried out, the following conclusions can be drawn:

The mathematical logic skills of children before being given the constructive play method with block media, obtained that the children's mathematical logic skills were still lacking.

The mathematical logic skills of children after being treated with constructive play methods with block media, there are differences that show children's logical abilities are more developed than before being given treatment.

Based on the above, it can be stated that there is an effect of constructive playing with block media on the mathematical logic skills of Group B at PAUD Terpadu Teratai, Makassar.

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