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The Influence of Number Dice Games in Improving Early Childhood Mathematical Logic in Early Childhood Education

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ABSTRACT

Purpose of the study: The aim of this research is to determine the effect of the number dice game in improving the mathematical logic intelligence of young children in Early Childhood Education.

Methodology: The method used in this research is quantitative with an experimental research design, the sampling technique is purposive sampling, with post test and pre test research instruments, the data analysis used is inferential statistics.

Main Findings: The results of this research show that Early Childhood Education Teachers use the number dice game media used in mathematics learning, which is a game that children like because it is very easy and interesting to play. In order to stimulate various areas of development such as cognitive, language and social. Social skills trained in this game include the willingness to follow and obey the rules of the game, playing in turns. Mathematical cognitive skills that are stimulated are stating the order of numbers, recognizing number symbols and number concepts.

Novelty/Originality of this study: The use of a number dice game introduces a novel and engaging way for young children to interact with mathematical concepts. It offers an enjoyable learning experience that can potentially enhance children's motivation and interest in mathematics, establishing a positive foundation for learning.

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1. INTRODUCTION

Kindergarten education aims to help lay the foundation for education, attitudes, behavior and basic abilities that students need in adapting to the environment as well as growth and development in all aspects of subsequent development [1], [2]. The developmental aspects that are expected to be achieved include moral aspects, religious values, social, emotional and independence, language, cognitive, physical/motor and artistic [3]–[5]. Everything can be seen through the activities carried out in the learning process which are designed using a thematic approach and moving from themes that interest children. [6], [7]. Theme as a tool/means or container for introducing concepts to children.

Basically every child is blessed with logical mathematical intelligence. defines logical mathematical intelligence as the ability of scientific reasoning, mathematical calculations, logical thinking, inductive/deductive reasoning, and sharpness of abstract patterns and relationships [8]. It can also be interpreted as the ability to

solve problems related to the need for mathematics as a solution [4]. Children with this ability will enjoy formulas and abstract patterns. Not only in mathematical numbers, but also increases in analytical and conceptual activities. According to Gardner there is a link between mathematical intelligence and linguistic intelligence. In mathematical abilities, children analyze or explain logical reasons, as well as the ability to construct solutions to problems that arise. Linguistic intelligence is needed to explain it in language form [9].

One of the abilities that can be developed is children's cognitive abilities by playing counting games. Cognitive refers to the mental activity of how information enters the mind, is stored, and transformed as well as recalled and used in complex activities such as thinking [10], [11]. Cognitive is a thinking process, an individual's ability to connect, assess and consider an event or event [12]. Cognitive development describes how a child's mind develops and functions so that he can think.

The cognitive process is related to the level of intelligence that characterizes a person with various interests, especially aimed at ideas and learning based on observations that researchers found in the field, precisely in the learning process, it appears that children do not understand simple concepts in everyday life, especially in counting, children less able to connect the concept of numbers with number symbols, pairing the number of objects with numbers, so that the expected indicators have not been achieved [13]. Education in Kindergarten is carried out with the principle of playing while learning, or learning while playing [14], [15]. In accordance with development, it is therefore expected that an educator will be creative and innovative so that children can feel happy, calm, safe and comfortable during the teaching and learning process. [16], [17].

In the early childhood education curriculum competency standards, it is stated that the aim of education in kindergarten is to help develop various children's potential, both psychological and physical, which includes moral and religious values, social emotional, cognitive, language, physical/motor, independence, and arts to enter primary education [18]. To develop children's basic abilities seen from their physical/motor abilities, early childhood education teachers will help improve children's mathematical logic abilities, in this case introducing and training children's mathematical logic intelligence abilities by playing dice, by using this play approach system it is hoped that will achieve an increase in mathematical logic intelligence in children [17].

This research has previously been carried out by [20] explained that this shows a significant improvement. The average number of activities before treatment (pretest) was 8.82 and the average after treatment (posttest) was 13.18. The data was then analyzed using the Wilcoxon signed rank test so that it can be seen that Tcount = 0 is smaller than Ttable with a significance level of 5% with N = 17.

This research is in line with research conducted by Warmansyah et al [21] which states that dice number games influence the logical-mathematical intelligence of children aged 5-6 years. the novelty of this research is the use of a number dice game introduces a novel and engaging way for young children to interact with mathematical concepts. It offers an enjoyable learning experience that can potentially enhance children's motivation and interest in mathematics, establishing a positive foundation for learning.

The urgency of this research is early identification and intervention in developing mathematical logic are crucial. Research on effective interventions like number dice games can facilitate the early cultivation of essential mathematical skills, preventing potential learning difficulties in the future. so the aim of this research is to determine the effect of the number dice game in improving the mathematical logic intelligence of young children in Early Childhood Education.

2. RESEARCH METHOD

2.1. Research Design

In this research, the method used is the experimental method. The experimental research method is a research method used to find the effect of certain treatments on others under controlled conditions [22], [23]. The experimental method is part of the quantitative method, and has its own characteristics, especially the presence of a control group [21], [22]. In the field of science, research can use experimental design because variables can be selected and other variables that can influence the experimental process can be strictly controlled [23], [24]. So in this method, the researcher manipulates at least one variable, controls other relevant variables, and observes their effect on the dependent variable. This manipulation of independent variables is one of the characteristics that differentiates experimental research from other studies.

2.2. Data Collection Techniques

This research was carried out in Early Childhood Education. In this research, samples were taken using a purposive sampling technique. Purposive sampling is a technique for determining research samples with certain considerations with the aim of making the data obtained later more representative.

2.3. Research Design

In this research design, there are four groups selected at random, then given a pretest to find out whether there are initial differences between the two groups being compared. According to Sugiyono, the research design is described as follows:

Table 1. Research design

Group	Variable	Treatment	Test
Experiment	Y1	X	Y1
Control	Y2	X	Y2

Ket :
Y1 : Pretes
Y2 : Postest
X : Treatment with a number dice game

2.4. Data Analysis Techniques

The instruments for collecting data in this research used documentation techniques, test techniques and observation. Meanwhile, data analysis using inferential statistics includes a normality test. In carrying out this research, a normality test is needed to investigate that the samples taken for research purposes come from a normally distributed population. And carry out a homogeneity test. Basically, the homogeneity test is carried out to investigate whether or not the homogeneity characteristic is fulfilled in variations between groups. In looking for instrument reliability, the author used the Kolmogorov-Smirnov formula in the Statistical Product for Servicer Solution (SPSS) Program. If the significant value is higher than 0.05, then the sample value taken for research purposes is homogeneous. After that, proceed with hypothesis testing. To test the hypothesis in this research the author used the t test formula in the Statistical Product for Servicer Solution (SPSS) Program.

3. RESULTS AND DISCUSSION

Based on the research that has been carried out, the following are the results of the frequency distribution table for experimental class data

Table 2. Frequency distribution of pre-test and post-test experimental class data

No.	Interval Class	Frequency	Median (X)	FX	FX^2
Pre Test	11-15	3	1,5	4,5	20,25
	16-20	3	1,5	4,5	20,25
	21-25	2	1	2	4
	26-30	3	1,5	4,5	20,25
	31-36	4	2	8	64
Post Test	11-15	0	0	0	0
	16-20	2	2	1	2
	21-25	2	2	1	2
	26-30	3	3	1,5	4,5
	31-36	8	8	4	32

Furthermore, the research results from the control class can be seen in the distribution table below:

Table 3. Frequency distribution of control class observation data

No.	Interval Class	Frequency	Median (X)	FX	FX^2
Pre Test	15-18	4	2	8	64
	19-22	2	1	2	4
	23-26	3	1.5	4.5	20.25
	27-31	4	2	8	64
	32-36	2	1	2	4
Post Test	11-15	2	1	2	4
	16-20	4	2	8	64
	21-25	3	1.5	4.5	20.25
	26-30	4	2	8	64
	31-36	2	1	2	4

3.1. Normality

Based on the normality test results obtained, below is the normality test table for the experimental class and control class

Table 4. Normality

Class	Test	Normal Parametersa		Asymp. Sig. (2-tailed)
		Mean	Std. Deviation	
Experimental Class	Pre test	24.73	8.022	0.590
	Post test	30.73	6.353	0.407
Control Class	Pre test	23.33	6.377	0.986
	Post test	23.80	6.224	0.991

The results of the table above show that the data is normally distributed, it can be seen that Asymp sig. > from 0.05, which means the scores for the experimental class and control class in the pre-test and post-test sections are normally distributed.

3.2. Homogeneity

Based on the homogeneity test results, the following table shows the homogeneity test in the experimental class and control class.

Table 5. Homogeneity

Class	Lavene Statistic	df1	df2	Sig.
Experimental Class	1.319	5	9	.338
Control Class	3.545	4	10	.058

The homogeneity of variance test on the experimental value shows that the significance value is 0.338. It can be seen that if it is higher than 0.05, it can be concluded that the data is homogeneous. The homogeneity of variance test on the control value shows that the significance value is 0.058. It can be seen that if it is higher than 0.05, it can be concluded that the data is homogeneous.

Based on the results of calculations using SPSS by comparing the t value resulting from the tcount calculation with the ttable value, the tcount value is 3.961 > the ttable value, namely 1.753, so Ho is rejected and Ha is accepted, which means there is an influence of the number dice game in increasing the mathematical logic intelligence of children aged early childhood (Early Childhood Education Case Study) with a significance value of 0.001 < α value, namely 0.05

Based on the results of calculations using SPSS by comparing the t value resulting from the tcount calculation with the ttable value, the tcount value is 0.923 < the ttable value, namely 1.753, so Ho is rejected and Ha is accepted, which means there is an influence of the number dice game in improving the mathematical logic intelligence of children aged early childhood education (Early Childhood Education Case Study) with a significance value of 0.372 < α value, namely 0.05.

Education for early childhood is providing efforts to stimulate, guide, nurture and provide learning activities that will produce children's abilities and skills [25], [26]. Early childhood education is a form of education that focuses on laying the foundation for physical growth and development (fine and gross motor coordination), intellectual and intelligence [27]. According to theory [28], [29] multiple intelligence, each child is unique, each child has their own intelligence, in this case it shows that all children are essentially intelligent, the difference in intelligence lies in the level of intelligence of each child, many factors determine this difference, one of which is stimulation given to children at an early age.

The process of developing mathematical logical intelligence is greatly influenced by the environment in which the child lives, both the family environment, society and the environment of the Early Childhood Education institution itself [30]. It is hoped that early childhood education, which is one of the institutions where children are guided, can play a good role in increasing the mathematical logic intelligence of young children. Mathematical logic intelligence is important for preschool children, so as a preschool teacher Nurul Iman is creative in presenting learning that takes place in kindergarten, one method that can be used is the game method, one of the games that can be used to improve mathematical logic intelligence is games. number dice.

Early Childhood Education Teachers use the media of the number dice game which is used in mathematics learning, which is a game that children like because it is very easy and interesting to play. In order to stimulate various areas of development such as cognitive, language and social. Social skills trained in this game include the willingness to follow and obey the rules of the game, playing in turns. Mathematical cognitive skills that are stimulated are stating the order of numbers, recognizing number symbols and number concepts.

The above is supported by the results of research conducted by Nisa et al [30] which states that one of the media that can improve mathematical logical intelligence in children is dice numbers. The implications of this research are based on positive findings showing that combining number dice games effectively supports the development of early mathematical logic in young children. This can improve numeracy skills, problem-solving abilities, and logical thinking. A limitation of this study is that the study participants may not represent the diversity of the early childhood population. Limited sample diversity in terms of socio-economic background, cultural diversity, or learning ability may limit the broader applicability of the findings.

4. CONCLUSION

Based on the results of research that researchers have conducted regarding the influence of the number dice game on the mathematical logical intelligence of early childhood in Early Childhood Education, it can be concluded that the results of calculations using SPSS by comparing the tcount calculation with the ttable value, the tcount value is 3.961 > The ttable value is 1.753, so Ho is rejected and Ha is accepted, which means there is an influence of the number dice game in increasing the mathematical logic intelligence of early childhood (Early Childhood Education Case Study) with a significance value of 0.001 < α value, namely 0.05. The recommendation from this research is that it is hoped that future research will carry out long-term studies that track children's mathematical development over several years after being exposed to the number dice game. This may provide insight into the ongoing impact of these games on mathematical logic.

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