

The Effect of Interactive Video Use on Early Childhood Cognitive Ability

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Received April 02, 2022;

Revised April 30, 2022;

Accepted May 10, 2021;

Published Online 2022-05-25

Conflict of Interest

Disclosures:

The authors declare that they have no significant competing financial, professional or personal interests that might have influenced the performance or presentation of the work described in this manuscript.



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Abstract: This study aims to determine the effect of using interactive video on the cognitive abilities of early childhood in Bukittinggi City. The research method used is the Mixed Method with the type of research Sequential Explanatory Design, with the first testing phase using quantitative methods and then deepening with qualitative methods. Data collection techniques for quantitative data using questionnaires and qualitative data with observations and interviews. Quantitative testing was carried out with Pearson's product moment while qualitative data testing was carried out by data triangulation. The results of the coefficient test indicate that between the independent variable and the dependent variable there is a strong and positive and significant relationship between the use of interactive videos on early childhood math skills. The results of qualitative tests from observations and interviews conducted showed that the use of interactive videos was very effective in influencing early childhood math skills. Based on the results of the research above, it can be concluded that there is a positive and significant effect between the use of interactive videos on the math skills of early childhood in Bukittinggi City.

Keywords: interactive video, cognitive abilities, early childhood.

How to Cite: Wahyuni, Rakimahwati. 2022. The Effect of Interactive Video Use on Early Childhood Cognitive Ability. Bisma, 6 (1): pp. 73-82, DOI: [10.23887/bisma.v6i1.47046](https://doi.org/10.23887/bisma.v6i1.47046)

Introduction

Mathematics is very important in everyday life (Nurlaily, 2019). From waking up while looking at the clock, then doing routine daily activities, such as working in all fields, exercising and even worshipping, the use of mathematics is not spared from minute to minute (Cellini, 2020). Shopping, counting objects, time, place, distance and speed are mathematical functions (Singh, 2020). In other words, mathematics is very important in human life (Boaler, 2019). Given the importance of mathematics, mathematical abilities need to be stimulated to everyone from the earliest age possible (Reikerås, 2020). Stimulation to develop mathematical abilities in early childhood can be done either formally, informally or non-formally. (Montessori 2011) defines early childhood education as a dynamic process in which children develop

according to their terms and nature in themselves and their lives (Yoosefi, 2020). Mayar (2018) states the principles of early childhood learning are "child-centered learning, life skills, creative play based on multiple intelligences". According to (Latif, Mukhtar 2014), early childhood education is carried out gradually and repeatedly with reference to the principles of child development, among others, education is oriented and focused on children, the world of children is the world of play, so the concept of early childhood education should be designed in the form of play, learning activities are designed carefully and creatively (Yelland, 2018).

The function of mathematics is actually not just to count, but to develop various aspects of child development, especially cognitive aspects (Passolunghi, 2019). One aspect of improving children's cognitive abilities is by optimizing math skills in early childhood (Jirout, 2019). Given the importance of mathematics in life, the concepts in mathematics need to be introduced from an early age (Papadakis, 2018). Mathematical concepts that are expected to need to be introduced to early childhood include early mathematical abilities such as matching, classifying, comparing and sorting (Smith, 2009) which need to be stimulated by educators in the daily learning process (Molenaar, 2018).

The purpose of studying mathematics is to prepare children to be able to face changing circumstances in life and in a world that is always developing rapidly (Szabo, 2020). Through early mathematics learning because it will act on logical, rational, critical, careful, honest, effective and efficient thinking. prepare a person to be able to use initial mathematics and mathematical thinking in everyday life and in studying other sciences (Xu, 2021).

Children's early mathematical abilities in Kindergarten can be seen when playing and doing activities. For example, when distributing cakes to each of his friends, pouring water from one container to another, collecting large beads in one container and smaller beads in another, or clapping according to a rhythm pattern, and when getting used to independence, for example, through wearing one's own shoes. The researcher saw that the children divided the cakes unfairly to their friends, pouring water into the glasses was the most and the less in each glass. There are still some large and small beads in the wrong container. When clapping some children have not followed. This illustrates that early childhood mathematical abilities are not yet optimal and make children unable to solve problems according to their age.

According to (Malik, 1994) the notion of learning media is everything that is used to distribute messages (learning materials), so that it can stimulate attention, interests, thoughts and feelings (Puspitarini, 2019). According to (Gerlach & Ely, 1971) learning media are graphic, photographic or electronic tools for capturing, processing, and rearranging visual and verbal information (Yunus, 2020). According to (Rusman, 2012) learning media is a tool or form of stimulus that serves to convey learning messages (Widodo, 2018).

In introducing initial mathematical skills, learning media such as video or audio-visual media such as interactive videos are needed (Fadillah, 2012). Audiovisual-based learning media is a medium for channeling messages by utilizing the senses of hearing and sight (Sukiman., 2012). Some of the advantages or uses of audiovisual media in learning according to (Fazriah, 2011) are clarifying the presentation of messages so that they are not too verbalistic (in the form of words, written or spoken only) so that learning is more lively or interactive and can overcome the boundaries of space, time and senses, such as: objects that are too large are replaced with realities, pictures, frame films, films or models. small objects assisted by micro projectors, film frames, films or pictures.

So it is necessary to package the learning process as attractive as possible in accordance with the objectives of the initial mathematics learning itself (Suarsana, 2021). So that it is easier for children to understand early mathematics learning which is the basis of children's mathematical abilities (Mutaf-Yıldız, 2020). Which later can make early childhood motivated and grow their skills and improve aspects of early childhood development as desired. (Kustandi, 2011)

Research by Nur Ainy FN (2006) in his research entitled "The Effect of Learning with Multimedia on Improving the Cognitive Ability of Kindergarten Students" concludes that there are differences in cognitive abilities between groups of Kindergarten students who receive multimedia learning and those who do not receive multimedia learning. The group of Kindergarten students who received multimedia learning showed higher cognitive abilities than the group of Kindergarten students who did not receive multimedia learning. So the researcher was interested in conducting a research entitled "The Effect of Using Interactive

Video to Improve Early Childhood Mathematics Ability in Early Childhood in Bukittinggi City”, as an alternative introduction and learning of early mathematics for early childhood.

Method

Research Design

The research was conducted at 3 Kindergartens in Bukittinggi City, namely Melur Putih Kindergarten on Friday, October 1, 2021, State Kindergarten 1 Bukittinggi on Saturday, October 2 2021, and Kindergarten Aisyiyah IV on Monday, October 4, 2021. The number of samples studied was 85 children. Prior to the research, the researchers had made initial observations in several Kindergartens in Bukittinggi City which were the population of this study. The research method used is mixed methods with a combination research model or sequential explanatory design, namely quantitative and qualitative research methods sequentially, where in the first stage the research was carried out using the quantitative stage and in the second stage the qualitative method was used (Sugiyono, 2011). Researchers prepare questionnaires, interview grids and videos that will be shown as well as the tools needed to document research in order to obtain maximum data. The data sources of this research are principals, teachers and children with quantitative data collection techniques using questionnaires and qualitative data using observations and interviews. Analysis of quantitative research data using analysis prerequisite tests consisting of normality and linearity tests, hypothesis testing using bivariate tests. Qualitative data analysis was carried out by data reduction, data presentation and drawing conclusions.

Results and Discussion

Description of Quantitative Data

In the description of the quantitative data, the results of the distribution of the X variable are found as follows,

Table 1 Variable Frequency Distribution X

Frequency Distribution Table			
Interactive Videos			
interval	Category	F	100%
40-45	Very high	18	21%
34-39	Tall	47	55%
29-33	Low	17	20%
24-28	Very low	3	4%
Total		85	100%

From the frequency distribution table for the interactive video variable data presented in the table above, it can be explained that the distribution of variable data distribution lies in the high category with a total frequency of 47 children out of 85 children with a percentage of 55% and the descriptive data for variable Y the results are as follows;

Table 2 Variable Frequency Distribution Y

Frequency Distribution Table			
Early Childhood Mathematics Ability			
interval	Category	F	100%
49-55	Very high	14	16%
42-48	Tall	45	53%
35-41	Low	21	25%

27-34	Very low	5	6%
Total		85	100%

From the data frequency distribution table for Variable Early Childhood Mathematics Ability data presented in the table above, it can be explained that the distribution of variable data distribution lies in the high category with a total frequency of 45 children from 85 children with a percentage of 53%.

Hypothesis Testing Results Data

Table 3 Normality Test Results

One-Sample Kolmogorov-Smirnov Test			Unstandardized Residual
N			85
Normal	Mean		0,000000
Parameters ^{a,b}	Std. Deviation		3,99706888
Most Extreme Differences	Absolute		0,072
	Positive		0,052
	Negative		-0,072
Test Statistic			0,072
Asymp. Sig. (2-tailed) ^c			,200 ^d
Monte Carlo Sig. (2-tailed) ^e	Sig. 95% Confidence Interval	Lower Bound	0,335
		Upper Bound	0,326
			0.344

a. Test distribution is Normal.
 b. Calculated from data.
 c. Lilliefors Significance Correction.
 d. This is a lower bound of the true significance.
 e. Lilliefors' method based on 10000 Monte Carlo samples with starting seed 1314643744.

Based on the results of the Normality Test, it is known that the significance value of 0.210 is more than 0.05, so it can be concluded that the residual value is normally distributed. From these data it is known that the calculated F value = 57,188 with a significance level of < 0.001 which is small from 0.05, then the linear regression model can be used to predict or in other words there is an influence between the interactive video variable (X) on the variable of early childhood mathematics ability. early (Y).

Table 4 Linearity Test Results

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	924,675	1	924,675	57,188	<.001 ^b
	Residual	1342,031	83	16,169		
	Total	2266,706	84			

a. Dependent Variable: beginning mathematics
 b. Predictors: (Constant), interactive video

From these data it is known that the calculated F value = 57,188 with a significance level of < 0.001 which is small from 0.05, then the linear regression model can be used to predict or in other words there is

an influence between the interactive video variable (X) on the variable of early childhood mathematics ability. early (Y).

Table 5 Bivariate Test Results

Correlations			
		Interactive videos	beginning math
Interactive videos	Pearson Correlation	1	,639 **
	Sig. (1-tailed)		0.000
	N	85	85
beginning math	Pearson Correlation	,639 **	1
	Sig. (1-tailed)	0.000	
	N	85	85

** . Correlation is significant at the 0.01 level (1-tailed).

Relationship degree guidelines:

Pearson Correlation value 0.00 to 0.20 = no correlation.

Pearson Correlation value 0.21 to 0.40 = weak correlation.

Pearson Correlation value 0.41 to 0.60 = moderate correlation.

Pearson Correlation value 0.61 to 0.80 = strong correlation.

Pearson Correlation value 0.81 to 1.00 = perfect correlation.

In the interactive video variable there is a strong correlation and in the early childhood mathematical ability variable there is a strong correlation. From the table it is evident that the relationship between the independent variable and the dependent variable is positive. So the result of testing the bivariate hypothesis is that the better the application of interactive video learning in kindergarten, the better the understanding of early mathematics in early childhood or the lower the application of interactive video learning in kindergarten, the lower the understanding of early mathematics in early childhood.

The results of the initial assessment (pretest) of 85 children in 3 kindergartens in total were only 4,128 and after the application of learning media with interactive videos, the children were given the same questions again or the final assessment (posttest) and found an increase in the child's score to 6,688. This can also be seen from the percentage of the overall N-Gain value of 56.9%, so according to the interpretation of the effectiveness the N-Gain value is quite effective. So it was found that the application of interactive video was quite effective and had an effect on increasing early childhood math skills.

Qualitative Research Results

This research was conducted by means of participatory observation conducted at 3 Kindergartens in Bukittinggi City. The first is Melur Putih Kindergarten located in Aur Birugo Tigo Baleh District, on Friday, October 1, 2021. With this interactive video media, children are more motivated in learning and their enthusiasm and concentration will increase. With this video, it will be easier for children to understand the mathematical material explained and will create a child's fondness for early mathematics learning.

The second research is the State Kindergarten 1 Bukittinggi located in Mandiangin Koto Selayan District, on Saturday, October 2, 2021. When the video was shown the children were very diligent in

answering questions with enthusiasm and it was shown on their faces that they wanted to continue learning like that. The third study was Aisiyah IV Kindergarten located in Guguk Panjang District, on Monday, October 4, 2021. At that time, the researcher noticed a child who did not want to go to class. The teacher explained that the boy did not want to read short verses and al-fatihah because he always wanted to go out. However, when the video started showing, the child automatically entered the classroom and sat watching until the video finished playing.

So it can be concluded that this study resulted in the finding that the effect of interactive video is clearly visible from the learning activities that take place in the classroom. With interactive videos, early childhood math skills are more developed and their level of understanding increases.

Data Triangulation Results

In order to obtain credible data, the researchers conducted in-depth interviews with teachers, principals, and children in the 3 kindergartens that were the sample of this study. On Thursday, October 7, 2021, researchers returned to 3 Kindergartens to conduct interviews with teachers, school principals and children.

Table 6 Triangulation Test Results Data Sources

Research question	Informant		
	Teacher	Headmaster	Child
Why is the video that is made not in accordance with the learning resources	The inability of educators to prepare learning materials with videos because there are still educators who cannot make their own interactive videos	Teachers sometimes take videos that already exist and it is difficult to find videos that match the child's learning resources	Does not match the theme
Why is the music and material in the video shown less attractive	Because the interactive videos displayed are not videos made by the teacher, videos are obtained from other sources such as youtube, brainly, etc.	Because there is no training for teachers in developing interactive videos for children's learning media, teachers have not been able to maximize the videos displayed	The music on the video is unattractive and less fun
Why are there still children who don't watch the video shown?	There are some children who have a habit of not being sociable and busy with themselves and that makes them easily bored and less focused on one thing	Sometimes there are many factors that cause children to not care about learning such as lack of attention from parents. He prefers to play alone and does not want to pay attention to learning	The videos shown are not their favorite cartoons and the animations are less attractive

Expansion of Quantitative and Qualitative Research Data

Results of Quantitative and Qualitative Data Analysis was carried out by comparing the Quantitative Data of Research Results in the first stage with Qualitative Data on Research Results in the second stage. Through this data analysis, information can be obtained whether the two data complement each other, expand, deepen or even contradict.

Table 7 Quantitative and Qualitative Data Interactive Video

No	Category	Quantitative data (% value)	Qualitative data	Conclusion
1	Compatibility with early childhood mathematical concepts	88%	The learning shown in the video is in accordance with the child's early mathematical concepts	Deepen and expand quantitative data
2	Suitable for children's age	95%	The videos shown are in accordance with the age standards of kindergarten children	Deepen and expand quantitative data
3	Compatible with	81%	The videos shown are not	Deepen and expand

	learning resources		entirely in accordance with the learning resources used	quantitative data
4	Included in math material	88%	The material displayed is mathematics learning material	Deepen and expand quantitative data
5	Increase children's understanding	94%	The video shown aims to increase children's understanding	Deepen and expand quantitative data
6	Improve children's understanding of mathematics	86%	The videos shown increase children's understanding and interest in mathematics	Deepen and expand quantitative data
7	Easy to understand language	99%	The language used is easy for children to understand	Deepen and expand quantitative data
8	Shows interesting things	85%	The video is loaded with interesting music and material but still needs to be developed	Deepen and expand quantitative data
9	Nice and fun animation	75%	The video uses animation that attracts children's interest to listen to the video that is displayed but there are still those who pay less attention	Deepen and expand quantitative data
10	Get kids excited about learning	99%	Children are excited to learn because of the interactive video	Deepen and expand quantitative data

Overall the Quantitative value of Interactive Video Variable is 90% (very good category) and qualitatively, Interactive Video Variable in Kindergarten in Bukittinggi City is declared Good. Thus this qualitative data supports quantitative data, because there is no difference between quantitative data and qualitative data.

Table 8 Quantitative and Qualitative Data on Early Childhood Mathematics Ability

No	Category	Quantitative data (% value)	Qualitative data	Conclusion
1	Match objects based on their pairs	88%	Children are able to match objects that match their partner	Deepen and expand quantitative data
2	Match objects by color	95%	Children are able to match objects that match the color	Deepen and expand quantitative data
3	Match objects by shape	93%	Children are able to match objects according to their shape or type	Deepen and expand quantitative data
4	Classify objects by color	99%	Children are able to classify objects according to their color	Deepen and expand quantitative data
5	Classifying objects by shape	88%	Children are able to classify objects according to their shape	Deepen and expand quantitative data
6	Classify objects by size	95%	Children are able to classify objects according to their size	Deepen and expand quantitative data

7	Comparing objects based on large-small size	94%	Children are able to compare objects according to their size	Deepen and expand quantitative data
8	Comparing objects based on length-short	89%	Children are able to compare objects according to their length and short size	Deepen and expand quantitative data
9	Comparing objects based on high-low	87%	Children are able to compare objects according to the size of their height and low	Deepen and expand quantitative data
10	Sort objects by shape	95%	Children are able to sort objects according to their shape	Deepen and expand quantitative data
11	Sort objects by color	95%	Children are able to sort objects according to their color	Deepen and expand quantitative data
12	Sort objects by size	82%	Children are able to sort objects according to their size	Deepen and expand quantitative data

Overall the Quantitative value of the Early Childhood Mathematics Ability Variable is 92% (very good category) and qualitatively, the Early Childhood Mathematics Ability Variable in Kindergarten in Bukittinggi City is declared Good. Thus, this qualitative data supports quantitative data, because there is no difference between quantitative data and qualitative data.

From the results of interviews and observations carried out to examine qualitative data, satisfactory results were obtained, because the reported data had been tested for the validity of the data. First, quantitative data was tested and it was found that interactive video had a positive and significant relationship and influence on early childhood math skills. As well as collecting qualitative data in the 3 Kindergartens obtained through observation and interviews so that the data obtained is sharper and more in-depth.

This study resulted in the finding that there is a positive and significant effect between the use of Interactive Video on the improvement of Early Childhood Mathematics Ability in Kindergarten in Bukittinggi City. Children's early mathematical abilities need to be stimulated and improved to make children more familiar with basic mathematical concepts because with mathematics children will have the ability to solve problems and make decisions. As concluded (Aryani, 2021) The development of interactive multimedia-based videos on cognitive aspects can be used as a solution to existing problems, which can be used in learning to improve children's cognitive aspects, one of which is classification. Dewi & Asril. (2021) in their research entitled Improving Early Counting Ability in Early Childhood Through Video Animation proves that animated videos provide benefits for learning numeracy for early childhood, namely learning basic mathematical concepts correctly and understanding basic concepts and problem solving abilities. From this research, it is evident that learning to use videos with animations that attract children's interest will help children understand the concepts of a lesson.

Conclusion

From the results of this study, it can be concluded that interactive video has a positive and significant influence on the surface mathematics ability of early childhood. Mathematics is a way to find answers to problems faced by humans. Beginning mathematics teaches basic mathematics that is easy for children to understand, namely matching, classifying, sorting and comparing. And interactive videos act as learning aids so that children can more easily understand early math learning.

The percentage level of influence of the Application of Interactive Video in Kindergartens of Bukittinggi City reached 90% with a good category and Early Childhood Mathematics Ability in Kindergarten of Bukittinggi reached 92%. The researcher also conducted an experiment by giving pretest questions to 85 children after that followed by the use of interactive video media, after the video was shown the children were asked to work on posttest questions and it was found that the score increased in children so it was interpreted that interactive videos were quite effective for improving early childhood math skills. So the higher the application of interactive videos in early childhood mathematics learning, the higher the level of children's understanding of early mathematics. The application of interactive videos in Bukittinggi City is getting better because the rapid development of technology requires teachers to be more creative and innovative in providing media learning to children. Especially for learning that is difficult to understand such as mathematics.

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Article Information (Supplementary)

Conflict of Interest Disclosures:

The authors declare that they have no significant competing financial, professional or personal interests that might have influenced the performance or presentation of the work described in this manuscript.

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First Publication Right: BISMA The Journal of Counseling

<http://dx.doi.org/10.23887/bisma.v6i1.47046>

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Word Count: