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Effectiveness of Using Kosurasi Media to Improve Basic Math Skills in Children Aged 5-6 Years.

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Abstract: One aspect of development that must be well-stimulated in early childhood is cognitive development. Cognitive development can be stimulated through children's basic mathematical skills. These skills can be enhanced through the application of Kosurasi media. This study aims to determine the effect of applying Kosurasi media in improving basic mathematical skills in children aged 5-6 years at TK Dharma Wanita Bandung Wonosegoro. This study used a quantitative method with a one-group pretest-posttest research design. The population and sample consisted of 30 children aged 5-6 years at TK Dharma Wanita Bandung. Data collection was conducted through observation, interviews, and documentation. The collected data were analyzed using normality tests, homogeneity tests, paired sample t-test hypothesis testing, and finally, N-gain score tests with the help of the SPSS V.26 data processing application. The average pretest score was 76.10, while the average posttest score was 115.33. A paired sample t-test hypothesis test yielded a significance result of 0.000 < 0.05, indicating that H0 was rejected and Ha was accepted. This means there was a significant difference in the children's basic mathematical skills before and after the intervention. Furthermore, the N-gain test produced a score of 57.76%, suggesting that the application of Kosurasi media has a moderately effective impact on improving the basic mathematical skills of children aged 5-6 years.

Keywords: *learning media, Kosurasi media, basic math, children aged 5-6 years.*

INTRODUCTION

Early Childhood Education (PAUD) refers to the stage of education before reaching elementary education. This education aims to nurture children from ages 0 to 6 by providing stimuli to support their physical and mental growth and development, preparing them for the next stage of education. According to Hasanah, 2016 (Pramesti & Waluyo, 2023), early childhood is an ideal stage for learning because, during this period, children experience significant growth and development. PAUD can be implemented through formal, non-formal, and informal education pathways. Children's cognitive development at the kindergarten or preschool age shows significant improvement. Intellectual development occurs rapidly from birth to preschool age, often referred to as the golden age.

During the golden age, there are six aspects of a child's development that need to be optimally nurtured. These aspects include cognitive, language, physical-motor, social-emotional, religious and moral values, as well as art. All these aspects must be stimulated to prepare children for the next level of education. One of the crucial aspects to stimulate is the cognitive development of early childhood. According to Sujiono (Nurhatijah et al., 2022;8), cognitive development in early childhood plays a significant role because cognition is closely related to daily activities. Stimulating cognitive abilities in children is essential to help them build a foundation for critical and creative thinking, problem-solving, focus, language development, and emotional management. Cognitive skills in children can be developed through various methods. These include providing educational toys that stimulate cognitive abilities, such as puzzles, reading

storybooks, role-playing, and engaging in outdoor activities that allow children to learn new things from their surroundings (Yusmaliana & Zakaria, 2022).

Seefeldt & Wasik, 2008 (Cahaya & Poerwati, 2017) stated that early childhood experiences rapid changes and development in thinking and reasoning. Cognitive development aspects in children serve as the foundation for their intelligence (Alviani et al., 2021). Therefore, cognitive development skills in early childhood are very important. John W. Santrock (2007) mentioned that, according to Jean Piaget, there are four stages of cognitive development in children: the sensorimotor stage (ages 0 to 2 years), the preoperational stage (ages 2 to 7 years), the concrete operational stage (ages 7 to 11/12 years), and the formal operational stage (ages 11/12 to 14/15 years). Piaget, in the book titled Developmental Psychology by Yudrik Jahja (2011), also stated that children begin to use logic when they are 6 years old and above. At this age, they start to recognize and learn various skills related to mathematics, such as classification, seriation (ordering), decentration, conservation, and reversibility.

Mathematics is one of the key aspects that can be used to stimulate the cognitive development of early childhood. Mathematics education is provided to equip learners with the ability to think logically, analytically, systematically, critically, creatively, and collaboratively (Nasri et al., 2022). According to Mutiara (2021), mathematics for early childhood encompasses skills that a child can master to solve various problems encountered in daily life. In line with the opinion of Maulida et al. (2022), mathematics learning for early childhood serves as a means to develop thinking abilities, hone the various intellectual potentials children possess, and assist them in solving everyday problems. The development of mathematics learning for early childhood is fundamentally aimed at stimulating children's thinking skills to prepare them for further mathematics learning in the future and applying it to their daily lives.

The National Council of Teachers of Mathematics (NCTM) states that there are five basic mathematical concepts that can be introduced to children: numbers and operations, algebra, geometry, measurement, as well as data analysis and probability (Azhima et al., 2021). Basic mathematics in early childhood involves activities such as grouping objects, matching numbers with their symbols, recognizing number concepts, and developing simple addition and subtraction skills. These aspects help build a cognitive foundation for children and prepare them for further learning. Moreover, understanding basic mathematical concepts also helps children in solving problems in everyday life.

Based on the results of the PISA survey, mathematics proficiency among children in Indonesia remains relatively low. PISA (Programme for International Student Assessment) is a program that evaluates the performance of 15-year-olds in mathematics, science, and reading literacy (Hewi & Shaleh, 2020). In 2018, Indonesia ranked 7th from the bottom (73rd) in the mathematics category, with an average score of 379 (Tohir, 2019). Most children exhibit low interest in learning mathematics. The exact causes of this issue are not yet clearly understood; however, one contributing factor is that mathematics is rarely taught in an engaging manner or through activities that are enjoyable for children, where they cannot actively participate in the learning process. Wijayanti & Suswandari (2022) stated that teaching mathematics requires more in-depth attention. Fundamental mathematical concepts must be taught in a way that is easy for

students to understand, as these concepts form the foundation for learning other materials. According to Farhin et al. (2023), education in the 21st century is marked by rapid advancements in technology and information, necessitating the adaptation of educational methods to identify appropriate teaching strategies. Nonetheless, challenges in education today are highly diverse and complex. One of the primary challenges is how to motivate students to actively engage in the learning process and understand concepts deeply.

One of the schools that require stimulation of basic mathematical skills for children aged 5–6 years is TK Dharma Wanita Bandung,Wonosegoro. Based on observations, interviews, and child development reports, the majority of children fall into the "Still Developing" (MB) category. This is supported by a statement from one of the class teachers, who noted that the basic mathematical skills of children in the TK B class need improvement, especially at the beginning of a new semester after a long holiday. Additionally, alternative methods are needed to teach mathematics in a way that captures children's interest. At TK Dharma Wanita Bandung, some educators are less effective in developing early childhood numeracy skills. Some teachers tend to deliver lessons in a conventional manner without utilizing effective supporting media. The use of monotonous and less varied teaching methods can hinder the development of children's understanding of basic mathematical concepts. If these methods continue to be applied, they could negatively impact children's cognitive abilities and mathematical understanding in the future.

One way to introduce basic mathematics to early childhood is by using concrete learning media. Concrete media are physical and tangible teaching tools, such as toys, teaching aids, or other physical objects that can be touched and seen directly. Learning media are one of the essential elements in the teaching and learning process. According to Wulandari et al. (2023) (Firmansyah et al., 2024), teachers use learning media to deliver material so that students can understand it more easily and to increase their interest and motivation in learning. By using concrete media, children can more easily visualize abstract concepts and develop practical skills. This makes the use of concrete media an effective approach in the learning process across various educational levels. Examples of concrete media include the Smart Jar from the study by Chafiyah et al. (2022), Arithmetic Slide from the study by Nurhatijah et al. (2022), and Box of Numbers from the study by Ulfah et al. (2019).

In this study, the introduction of mathematics to children aged 5-6 years utilizes the Kosurasi media. Kosurasi is an acronym for Kotak Surprise Numerasi (Numeracy Surprise Box). This media was initially created by Mrs. Wahdah Fitriana, S.Pd., a teacher at Muhammadiyah Kebumen Elementary School. It was introduced in 2023 under the name Kosurasi on her YouTube channel, "Wahdah Fitriana," and her TikTok account, @fitri___ana. The Kosurasi media used in this research is a development of the media previously created by Mrs. Wahdah Fitriana, S.Pd. The development aims to adapt its use. This version of Kosurasi is designed to improve the basic mathematical skills of children aged 5-6 years, or kindergarten-aged children, differing from the previous Kosurasi media designed for elementary school students. The current Kosurasi media has been adjusted in terms of content to suit children aged 5-6 years and the materials used. The primary material for this version is wood, while the previous version was made from cardboard.

The choice of wood as the primary material is based on the durability of the media. Using wood ensures the media is not disposable and can be used for a longer period. Moreover, the current Kosurasi media has also been developed in terms of functionality. In addition to introducing basic mathematical concepts to children, this media can also be used as a table, and its lid can serve as a whiteboard, making it a multifunctional tool.

The researcher chose to use the Kosurasi media to enhance basic mathematical skills in children aged 5–6 years because this media has not been widely developed by other researchers. Additionally, there are no articles discussing the use of Kosurasi media in education, particularly in early childhood education (PAUD). This media offers advantages through its diverse range of content and activities, consisting of five different types of activities. The purpose of incorporating five types of activities in one box is to provide variety, ensuring children do not easily get bored while learning mathematics. The picture cards included can also be adjusted to match the current theme being taught.

Based on the background above, this study focuses on the development of Kosurasi media as a learning tool to enhance basic mathematical skills in children aged 5–6 years and to assess the effectiveness of Kosurasi media in improving basic mathematical skills in early childhood. This research aims to demonstrate that the use of a numeracy surprise box can improve basic mathematical skills in young children, as well as provide an alternative and more effective teaching method for educators. Therefore, it is expected that the development of children's understanding of basic mathematics will be more optimal and have a positive impact on their academic achievements in the future.

METHODS

This study uses a quantitative approach. According to Moh. Kasiram (Waruwu, 2023:2902), quantitative research is a process of seeking knowledge that utilizes numerical data to analyze information. The method used in this study is experimental quantitative, aiming to determine whether there is a difference before and after the treatment is given. This research employs a Pre-Experimental Design with a One Group Pretest-Posttest Design type. The study only uses an experimental group without a control group for comparison. The experimental group is then given treatment using the Kosurasi media. The research design to be used is as follows.

Table 1: One Group Pre-test and Post-test Design

O_1	X	O_2

Explanation
01: Pre-test (initial observation before the treatment)
X: Treatment (application of Kosurasi media)
02: Post-test (final observation after the treatment)

The data in this study consists of the mathematical ability results from the TK B children and the teachers at TK Dharma Wanita Bandung. In this study, data collection was conducted using direct observation. The researcher obtained data by visiting TK Dharma Wanita Bandung and

observing the children's mathematical abilities, conducting interviews with the children while using the Kosurasi media, and interviewing one of the class teachers regarding the children's basic mathematical skills. Additionally, data collection was also carried out through documentation. The required documentation includes respondent data, activity documentation, and the media used during the research.

The researcher used a research instrument in the form of a questionnaire administered twice, namely before treatment (pre-test) and after treatment (post-test). This research instrument utilized a Likert scale with a checklist format consisting of four answer options: strongly agree, agree, disagree, and strongly disagree. The instrument included statements classified as favorable and unfavorable. Favorable statements are those that support, while unfavorable statements do not support, the research variable, which focuses on improving basic mathematical abilities in children aged 5-6 years. During the pretest and post-test, children were asked to perform activities corresponding to the statements in the research instrument. For example, they were instructed to arrange the ABCD-ABCD pattern using Kosurasi media. While the children carried out the activity, the researcher conducted interviews and observations on the outcomes of their work. The results from these interviews and observations would then serve as the basis for the researcher to mark checklists on the research instrument.

To verify the validity of the data obtained in the study, data validity testing was conducted. According to Sugiyono (2019), the technique for testing data validity is a method to determine how trustworthy and authentic the data obtained from the research is. This study employed data validity tests, including validity and reliability tests. The validity test is a process aimed at assessing how precise and accurate an instrument is in measuring the intended variable, with the objective of determining whether the instrument is valid or not (Pramuaji et al., 2018). The validity test was conducted on 30 children aged 5-6 years in a kindergarten. The research instrument consisted of 46 statement items. After performing the validity test using SPSS, 10 statement items were found to be invalid. This was due to the calculated r-value of these 10 items being lower than the r-table value, which was 0.361, with n = 30 and a significance level of 5%.

Test reliability is related to the level of stability, consistency, repeatability, and accuracy (Pramuaji et al., 2018). To test the reliability in this study, Cronbach's Alpha was used with an alpha value of 0.60. If the alpha value is greater than the output result, the instrument is considered reliable. Conversely, if the alpha value is smaller than the output result, the instrument is considered unreliable. The guidelines for interpreting the level of instrument reliability refer to Arikunto (1998). In the reliability test conducted by the researcher, the obtained Cronbach's Alpha value was greater than 0.60, specifically 0.858. This indicates that the instrument used is reliable and can be utilized in the study.

The data collected were processed using normality tests, homogeneity tests, hypothesis testing with paired sample t-tests, and finally, N-gain tests, all with the assistance of SPSS V.26. The population and sample in this study consisted of 30 children aged 5–6 years from TK Dharma Wanita Bandung Wonosegoro.

RESULT AND DISCUSSION

Development of Kosurasi Media as a Learning Tool for Children Aged 5-6 Years.

Kosurasi media is a type of media that can be categorized as visual media. According to Ariyanti (2022), visual media, also known as media for sight, allows individuals to understand it through their sense of vision. Visual media is a type of media that can be accessed and enjoyed through the sense of sight (Sahuni et al., 2020). Masani (2021) states that visual media differs from print and audio media, but this type of media has been proven to support children in understanding the material being taught. Based on these definitions, it can be concluded that Kosurasi media is visual media that allows early childhood children to understand the content or material through their sense of sight. With this media, it is expected to help or make it easier for children to learn basic mathematics.

The Kosurasi media is an innovative learning tool that adapts the concept of the Magic Box. The Magic Box is a learning medium in the form of a box or cube that contains learning materials inside. These materials can only be seen when the box is opened, so students will not know the contents while the box is still closed (Sari et al., 2023). A-Zahro et al. (2023) explained that the Magic Box as a learning medium is a cardboard box modified with attractive decorations to create a sense of mystery. The name "Kosurasi" is an acronym for "kotak surprise numerasi" (numeracy surprise box), which gives a mysterious impression as children must open the box to see its contents. Kosurasi media contains activities designed to support basic mathematical abilities in early childhood, particularly children aged 5-6 years.

Fig. 1. Kosurasi Media during the Initial Creation Process

The Kosurasi media unfolds into a long box resembling a net structure, consisting of five square boards when opened. Each board is equipped with activity materials specifically designed to stimulate children's basic mathematical skills. This concept not only provides interactive and enjoyable learning but also helps enhance their cognitive skills. In addition to being a learning tool, Kosurasi can also function as a table, and its lid can be used as a whiteboard. Thus, Kosurasi becomes a multifunctional media that supports education and is useful in daily life.

Fig. 1. Kosurasi Media When Unfolded

When the Kosurasi media is unfolded, it presents five activities inside. Each activity in the Kosurasi media is made from materials that are easy to find and have been selected with consideration for children's safety. The materials used include pom-poms, geometric chains, color windmills, images printed on thick and glossy ivory paper, erasable colorful markers, and used cardboard. These materials are easy to find and replace if damaged, ensuring that the Kosurasi media can be used for a long time.

The Kosurasi media is designed to stimulate basic mathematical abilities in children through five activities, including number recognition, image comparison and sequencing, object classification based on shape, color, and size, pattern recognition, and simple addition. Each activity is accompanied by instructions and rules designed to help children gradually understand basic mathematical concepts. These activities strongly support the development of children's mathematical skills for more complex stages. Early mathematical abilities in children, as explained by Mahaputri et al. (2024), begin with the introduction of number concepts, number symbols, colors, shapes, sizes, and space, which form the foundation for further mathematical development. Nurhidayah and Astari (2019) stated that mathematical abilities in children include aspects such as sorting or classification, addition, and number recognition, all of which are essential components in building an initial understanding of mathematics. This aligns with research by Oli et al. (2024), which emphasizes that mastering numeracy concepts at an early age provides a strong foundation for achieving more complex mathematics in later educational stages.

According to Berlian (2020), in the development of learning media, there are several principles that must be considered, namely the media developed should stimulate various aspects of child development, use easily accessible materials found around us, be safe for children, be usable individually or in groups, and be designed according to the child's developmental stage. Based on these principles, Kosurasi media has been developed in line with media development principles. In addition to stimulating children's mathematical abilities according to their developmental stage, Kosurasi media also uses materials that are easy to obtain, such as wood. The development of this media also considers the safety level for children, including the selection of materials, the use of paint, and the content of the media.

Fig. 2. Kosurasi Media After the Validation Process

The Kosurasi media was not created haphazardly but underwent a series of assessment and validation processes before being used as a learning tool in early childhood education institutions. The development of this media began with the formulation of an initial concept, which went through several stages of consultation with supervising lecturers to ensure its alignment with the learning needs of young children. Once the basic concept was approved, the next stage was to turn that concept into a tangible media that could be used directly in the learning process. The completed media then went through a validation process by expert lecturers and practitioners in the field of early childhood education. This validation aimed to ensure that Kosurasi media meets the quality and feasibility standards required for application in learning activities. As stated by Norita and Hadiyanto (2021), validity testing is crucial to determine the extent to which the designed interactive learning media can meet the necessary feasibility standards. The validation process involves competent experts in the field to provide feedback, improvements, and approval of the developed media. Thus, Kosurasi media not only meets feasibility standards but is also relevant to support an effective and enjoyable teaching and learning process for young children.

The Effectiveness of Kosurasi Media in Improving Basic Mathematics Skills in Children Aged 5-6 Years.

To determine whether the application of Kosurasi media can improve cognitive abilities in children aged 5-6 years, a series of tests were conducted. The first step was to perform validity and reliability tests on the research instruments. After the research instruments were validated and deemed reliable, the next test conducted was normality testing on the data obtained, namely the pretest and posttest data. To determine if the pretest and posttest data in this study follow a normal distribution, the results can be viewed from the normality test table using SPSS V.26. The Shapiro-Wilk test showed a significance value of 0.494 for the pretest (greater than 0.05) and 0.201 for the posttest (greater than 0.05), so it can be concluded that both the pretest and posttest data are normally distributed.

Table 2. Results of Normality Test

Test of Normality		
Shapiro-Wilk	Pretest	Post-test

Statistic	.968	.953
df	30	30
Sig.	.494	.201

The next test conducted was the homogeneity test to determine whether the data variance in this study is homogeneous (equal) or not. Based on the results of the homogeneity test, the significance value based on the mean was found to be 0.615 > 0.05, which allows us to conclude that the data in this study are homogeneous (equal).

Table 3. Results of Homogeneity Test

Tests of Homogeneity of Variance				
	Levene Statistic	df1	df2	Sig.
Based on mean	.776	7	17	.615
Based on Median	.547	7	17	.788
Based on Median and with adjusted df	.547	7	10.635	.783
Based on trimmed mean	.745	7	17	.638

Next, a hypothesis test was conducted using the paired sample t-test to determine whether there was a difference before and after the intervention. The decision rule for hypothesis testing is that if the significance value (2-tailed) < 0.05, the data can be considered effective (Ha is accepted). On the other hand, if the significance value (2-tailed) > 0.05, the data can be considered ineffective (Ha is rejected). From the results of the hypothesis test, the significance value (2-tailed) was found to be 0.000 < 0.05, which allows us to conclude that H0 is rejected and Ha is accepted, meaning there is a significant difference in the basic mathematics skills of 5-6-year-old children at TK Dharma Wanita Bandung.

Table 4. Hypothesis Test Results

Paired Sample Test		
	Paired 1	
	Pretest-Post-test	
Mean		-39.233
Std. Deviation		3.711
Std. Error Mean		.678
	Lower	-40.619

95% Confidence Interval of the Difference	Upper	-37.848
t		-57.907
df		29
Sig. (2-tailed)		.000

Then, to determine the effectiveness level of applying the Kosurasi media in improving basic mathematics skills for children aged 5-6 years, an N-gain test was conducted. Based on the data processing results of the N-gain test, it was found that the N-gain percentage score obtained was 57.7624 or 57.76%. According to the interpretation table for the N-gain score, the application of the Kosurasi media to improve basic mathematics skills for children aged 5-6 years falls into the "quite effective" category.

Table 5. N-gain Test Results

Tests of Normalize Gain					
	N	Minimum	Maximum	Mean	Std. Deviation
N-gain Score	30	.46	.68	.5776	.04786
N-gain Persen	30	46.03	67.69	57.7624	478.634
Valid N (listwise)	30				

Efforts to enhance and stimulate early mathematical skills through the use of Kosurasi media involved 30 children as respondents. The results showed that the respondents' average (mean) pretest score was 76.10, while the post-test score increased to 115.33. The minimum pretest score was recorded at 70 and increased to 110 in the post-test, while the maximum pretest score was 81 and rose to 123 in the post-test. Based on statistical analysis, the average score of children's early mathematical skills in the post-test was higher than in the pretest, showing an increase of 39.23%. This confirms a significant difference in the application of Kosurasi media to improve early mathematical abilities in children aged 5-6 years at TK Dharma Wanita. These findings align with Nasriah's (2021) study, which also found an improvement in children's ability to recognize number symbols through the magic box game, with the post-test mean score (93.32%) being higher than the pretest (53.34%). Ansari & Sit (2024) also support the notion that children's ability to recognize patterns, arrange sequences, and solve mathematical problems can be effectively taught using smart box media. The use of magnetic number media is one of the activities that can stimulate children's mathematical abilities, such as matching, classifying, comparing, and seriation (Khoirunnisa et al., 2022).

The Kosurasi media as a learning tool is classified as moderately effective in improving basic math skills. This effectiveness can be influenced by the varying abilities of children. Additionally, the ability to understand and process information differs from one child to another, which often

results in different learning outcomes. Moreover, there are also differences in how quickly children can understand instructions some children are able to grasp concepts quickly, while others may take longer. Another factor affecting the effectiveness of the Kosurasi media is the child's basic mental condition. A child's mental state greatly influences how well they can adapt to and receive learning through the Kosurasi media. If a child experiences discomfort or lacks self-confidence, the use of the Kosurasi learning media will not be optimal, as the child may struggle to concentrate or feel pressured. This can hinder the child's ability to absorb the material presented, making it more difficult to achieve the learning objectives.

Based on the discussion above, it can be concluded that the use of Kosurasi media at TK Dharma Wanita, Wonosegoro District, is quite effective in improving basic math skills in children. This is evident from the children's ability to recognize numbers, perform simple addition operations, classify objects, sort objects, compare object sizes, and recognize geometric shapes. Furthermore, the implementation of Kosurasi media has proven to be quite effective in enhancing basic math skills in children aged 5-6 years, as evidenced by the better final results compared to before the intervention using this media.

CONCLUSION

Kosurasi media is an educational tool developed to enhance basic math skills in children aged 5-6 years. Kosurasi is a media that creates a sense of mystery for children. This media is in the form of a cube made from wood, with each side painted. It is also a multifunctional tool that can be used as a table. The media contains 5 activities aimed at stimulating basic math skills in children.

The application of the modified Kosurasi media from Magic Box to stimulate or enhance basic mathematics skills in children aged 5-6 years at TK Dharma Wanita Wonosegoro showed a significant improvement, with an increase of 39.23%, as observed from the difference between the pretest and post-test average scores. This is also supported by the hypothesis testing results, where the Sig. (2-tailed) value is 0.000 < 0.05, meaning that the null hypothesis (Ho) is rejected and the alternative hypothesis (Ha) is accepted. This indicates a significant difference in the children's basic math skills before and after the implementation of the Kosurasi media. The data analysis showed an N-gain of 57.76%, placing it in the "quite effective" category. The aspects that experienced improvement in the children's math abilities include number concepts (recognizing numbers), size comparison concepts, and object classification. Based on the data analysis, it can be concluded that the application of the Kosurasi media is quite effective in improving basic math skills in children aged 5-6 years at TK Dharma Wanita, Wonosegoro.

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