Introduction to Counting Symbols in Early Childhood with Stick Math (STIKMA) Educational Tool Games

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ABSTRACT: This research aims to improve the ability to recognize the number symbols 1-10 using the Stick Math educational game tool (ETG STIKMA). This research method uses a quasi-experimental design with a control group to test the effectiveness of using ETG STIKMA on the ability to recognize numbers. ETG STIKMA learning media has been tested by material experts and media experts who are experienced and competent in their fields. Data collection techniques use questionnaires and observation. The material expert's validation results were 80%, then the media expert gave a result of 97%, which means that the media and materials contained in STIKMA media are suitable for use to improve the cognitive abilities of children aged 5-6 years at Fatimah Az-Zahro Kindergarten. The effectiveness test results show that children's cognitive abilities in recognizing numbers 1-10 have increased by 10.50% with a positive rating of 210.00. So, this game is appropriate and efficient for improving cognitive abilities regarding the number symbols 1-10.

Keywords: educational tool games, counting symbol, early childhood

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1 INTRODUCTION

Early childhood refers to children aged 0 to 8 years who are in a unique phase of growth. A person has interests, qualities, abilities, and history. Children aged 0-8 years are included in child care, private and public preschool, kindergarten, and basic education programs throughout childhood (Zahara et al., 2023) Education plays an important role in human life. Education is the government's effort to promote individual potential to develop the country. Education is expected to be able to form human beings into the next generation and equip them with the information and skills needed for the progress of the nation, state, and even human existence itself. Different levels of education from elementary school, junior high school, high school, and continuing education all contribute to obtaining this information.

Children must have completed the previous introductory level and continue to the elementary school level so that their education runs as smoothly as possible. Early Childhood Education which will serve as the basic building block for the education of the next child, is a matter of level of education. Early Childhood Education is a platform in education for children from birth to the age of six that aims to promote children's growth and development and is regulated by law (Lumbin et al., 2023) . Growth can be measured in meters, but development can be measured by the level of psychological and psychological maturity of a child. The development and growth of a child occurs due to factors that influence both internally or from within the child as well as from external or from outside himself, for example, the environment.

At the age of 0-6 years, necessary aspects developed cover moral religious values, physical motor, cognitive, language, artistic, and social-emotional. Plus, ability cognitive is one must aspect developed. This is because development cognitive related to the performance academic child. Performance academic influenced by several factors including social and economic status, the atmosphere heart students, motivation, interaction Friend peers, and parental support (Simon et al., 2017). Environmental factors can also influence the motivation of children which will impact their performance academic (Reuben et al., 2019) .

Development cognition needs to be stimulated early that is introduction to mathematics basic. Mathematics is one branch of universal science, so has a very important role in the formation of the character of a child's development ability he thought (Aziza et al., 2020). Elliot (Warmansyah et al., 2023) say mastery of good math early will impact positively ability in an organized environment. One draft base must math developed from an age early that is introduced draft number (Utoyo & Arifin, 2017). Capability Children know the draft number is a base strong start so children are capable of mastering understanding and learning more math (Shah et al., 2018).

Several results from studies study previously state that There is a benefit from the development ability to know draft numbers from an early, like developing the ability to know numbers, mention numbers, and compare numbers and calculations (Yilmaz, 2017),

there are linkages between learning numbers with sum child vocabulary (Sarnecka & Lee, 2019), gift symbolic and non-symbolic programs influential positive enhancement ability to introduce numbers and arithmetic in children age preschool (Herwegen et al., 2018). Introduction draft number can done with fun activities. Based on the results study by Syofriend et al., (2023) which produced activity singing can increase ability numeracy in kindergarten children because singing can interest children when learning going on.

In addition to singing, tool games educational too results study (Royani & Suryana, 2023) obtained results that are game snake ladder can used as one alternative in learning that can motivate the child involved in a manner active learning and Not direct the child to know draft numbers through fun activity. Introduction Symbol numbers through the media can help children become more understanding Because involve sense vision and hearing (Rahayuningsih et al., 2019). This is because educational game tools can help develop aspects of child development. Educational game tools are tools that are deliberately specifically designed to develop aspects of child development. That is, educational game tools are game tools designed for the learning needs of early childhood (Widayati et al., 2021).

Based on observations made by researchers on December 20, 2020, in Siwalanpanji Village, data was obtained that most children aged 5-6 years still had difficulty using number symbols to count them. This is caused by a lack of teachers and parents in providing an understanding of number symbols. Evidenced by the findings of observations of teachers and parents using the method of giving examples of counting numbers 1-10 with their fingers, besides that in the implementation of learning using LKA teachers rarely use ETG facilities that allow in the learning process. The ETG used in introducing number symbols is relatively small. Researchers have an interest in making educational teaching aids for early childhood. With this teaching aid, the process of developing the cognitive abilities of children aged 5-6 years will find strength and be motivated to go even deeper. The name of this educational game tool is STIKMA (Stick Math) which can improve the cognitive abilities of children aged 5-6 years, especially in recognizing number symbols. With this, children can also calculate more concretely than by reading the pictures in LKA. So, this is an original work, and it is hoped that it can help children with arithmetic problems. Study This aims to develop the ability of children 5-6 years old at Fatimah Az-Zahro Kindergarten to know symbol numbers.

2 THEORETICAL STUDY

2.1 *Counting Symbols in Early Childhood*

Learning mathematics child age early covers Lots draft that is count, measure, estimate, probability, form geometric, temporal, and spatial position. One draft mathematics learned in early childhood education, namely count. Count is involving abilities number in correct order, using each item in the Number Set, and counting every object (Kesicioğlu, 2021). Introduction beginning about numbers and operations count is very important for obtain ability Skills more math complex. Numbers are symbol that is not

Once free life every day. Every activities carried out everything use number as a symbol (Warmansyah et al., 2023). As example, when a child makes tea or milk, then child they will arrange the amount of sugar or milk used. They must use number for measure it one spoon of sugar or One spoon of milk.

Counting stages beginning in children begins with rote counting and rational counting. Rote counting or recalculation is counting by saying the names of the numbers in the order from the child's memory. Child says one, two, three, four, five, six, seven, eight, nine, ten counted correctly by rote from one to ten (Fathonah & Syafdaningsih, 2021). Meanwhile, rational counting or rational counting is counting using numbers sequentially and using objects when counting. Introduces the concept of starting counting on children can be done by parents and teachers, either through direct learning with the media as well learning through videos (Lee & Md-Yunus, 2015).

The concept of numbers is one material that can stimulate cognitive development. Children aged 5-6 years can count rhythmically (for example by singing), count according to the sequence of numbers, numbers, know cardinality rules, reveal the next number, know abstractions, and recognize numbers (Kesicioğlu, 2021). In studying numbers, son need object real in understand it. When they Study counting things real , the kids started to understand numbers it. In addition, five-year-old can understand more concepts and learn less through singing which is common in kindergarten. There are many songs that contain number recognition material for children. Songs and rhythms can help children recognize and understand numbers and how they work (Svalina & Vukelić, 2020).

The ability to learn number symbols is also able to influence a child's ability to continue education to the next level. That the understanding of the concept of numbers in learning mathematics occurs not only through verbal expressions, but also must combined with toys, media, models, and images (Indrawati et al., 2021). Many events around children are related to number symbols. Understanding number symbols can foster cognitive development of children later, so that children can use these number symbols in their daily activities (Rahma & Widyasari, 2023).

The low ability to recognize number symbols in children is associated with several factors, and this is just one of the many difficulties found. Extrinsic factors, such as the use of traditional media to introduce number symbols, which tend to make children bored and less enthusiastic, can cause children to be less able to recognize these symbols, children are also less interested, less attractive or fun, less varied and less innovative and monotonous. The current educational climate is a challenge for educators because it demands the use of media that can inspire children to learn more and invest in the material being taught. About sixty percent of children have problems in saying the sequence of number symbols from one to ten, matching number symbols with number symbols, using number symbols for counting, and making rows of number symbols from one to ten. In addition, children still seem to feel lacking and have difficulty understanding what the teacher conveys in class due to the lack of use of real and concrete learning media as a tool during the learning process (Rosalianisa et al., 2023).

The concept of numbers as one of the foundations in mathematics must be mastered by children from an early age. The introduction will be better if it is done in a fun way like playing. Playing closely with the world of children will lead to opinions in children that this material is easy and fun to learn. If the teacher is unable to create this atmosphere, the child may not be interested and find it difficult when asked to count. This is supported by previous studies which state that anxiety in mathematics can appear from the early years of entering school (Lu et al., 2021) .

2.2 *Game Tools Educative (ETG) Stick Math (STIKMA)*

In creating quality education in activities learning can done with develop Educational Tool Games (ETG). Game tool educative in a manner general interpreted as tool deliberate game designed special For objective learning and stimulating development child (Guslinda, 2018). Game tool educative is all something that can used as a medium or tool play containing mark educative (Diningrat et al., 2019). ETG is very fun activity so that tool This characteristic educate. (Warmansyah et al., 2022). Based on a few opinion, so can concluded that the ETG is a game tool that is deliberately designed in an attractive way increase aspects development child age early .

The purpose of educative game tools in the early childhood learning process is as a tool to help parents and teachers or educators to provide motivation and stimulate children to carry out various activities in order to find new experiences that are useful for exploration and experimentation in placing the basis for the growth and development of language, intelligence, physical, social and emotional children, clarifying the subject matter given by children, and giving pleasure to children in playing or study (Hasanah, 2019).

Game tool educative have characteristic features namely, it is intended for kindergarten children, it functions to develop aspects of the development of kindergarten children, it can be used in various ways, forms and for various purposes, aspects of development or are multi-purpose, is designed to encourage activity and creativity is constructive or something is produced (Hayati, 2019). Game Tools Educative has an important role, namely in fostering ECE children, independent facilities and infrastructure are needed, to complement game tools in ECE and Kindergarten. For this reason, this educational game tool is intended to complement children's games in ECE and kindergarten as a step towards creating healthy, intelligent, and cheerful children. He hopes that the game tools can be used properly for ECE and Kindergarten children (Hayati, 2019).

There needs to be inventive and creative action from ECE, kindergarten teachers, they need to be trained to think creatively so they can make their own ETG according to the child's development according to existing needs, such as the curriculum, the child's character. It is difficult to come up with creative ideas to create simple ETG, so there is a need for training from scratch starting with prospective ECE teachers, to be able to create simple ETG from used materials. The use of educational game tools that are appropriate to the child's developmental level can assist teachers in developing all the basic abilities of children in kindergarten .

3 METHOD

This research method uses a quasi-experimental design with a control group to test the effectiveness of using ETG STIKMA on the ability to recognize numbers. Participants in this research were children aged 5-6 years in Kindergarten in Siwalanpanji Village, Buduran District, Sidoarjo Regency, namely Fatimah Az-Zahro Kindergarten, taking a sample of 20 children from 2 classes, namely Kindergarten B1 and Kindergarten B2. Previously, a validity test of the ETG STIKMA (Mathematical Stick) product had been carried out by material experts and media experts. Meanwhile, product trials on children aged 5-6 years are to measure the ability to recognize numbers in children aged 5-6 years through ETG STIKMA using observation sheets or direct implementation on children.

3.1 *Data Analysis*

Preliminary data analysis is carried out with the aim of collecting information on existing problems and then how to create products that can overcome these problems. At this stage the researcher made observations of 5 children aged 5-6 years in Siwalanpanji Village RT 20 RW 04. From the results of the analysis, it was found that of the five children, four of them had difficulty using number symbols in their calculations. Lack of understanding and the lack of ETG facilities provided could be one of the factors causing this problem. At the ETG STIKMA design stage, researchers begin to design a concept in the form of a blueprint as a reference in making products according to the problems that have been analyzed and then determine the purpose of making the product. At the development stage, researchers began to develop the ETG STIKMA product, then the product was tested for validity and reliability by media experts and material experts before being implemented on a limited basis. At the product effectiveness testing stage, researchers began to apply the ETG STIKMA product to children aged 5-6 years to determine the effectiveness of the product that researchers had developed and validated by experts. In the final stage, researchers evaluated the reactions of ETG STIKMA users through formative evaluations which were carried out continuously to find out whether the development product was valid for application in learning. Data analysis using the Wilcoxon test to see the effect of ETG STIKMA on children's ability to recognize number symbols. The Wil-coxon test was carried out using SPSS 24.

4 RESULT AND DISCUSSION

4.1 *Results*

This research issued the development of STIKMA media which aims to develop cognitive abilities in recognizing number symbols for children aged 5-6 years. By using the STIKMA media it is hoped that children will be able to calculate more concretely than reading the pictures in LKA. Results obtained namely at the needs analysis Stage, in this case the researcher develops product requirements, product feasibility, and product development requirements, is the first stage. It is known from small research activities from 5 children 4 children have difficulty using number symbols in counting them.

Besides that, there is a lack of understanding and at least ETG media given to children. Design Stage, at this stage the researcher begins to develop a plan that is used as a way out or the first step in solving existing problems through the development of a new product called STIKMA. The following is an example of an STIKMA image in one of the treatments (see figure 1 & 2).
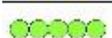

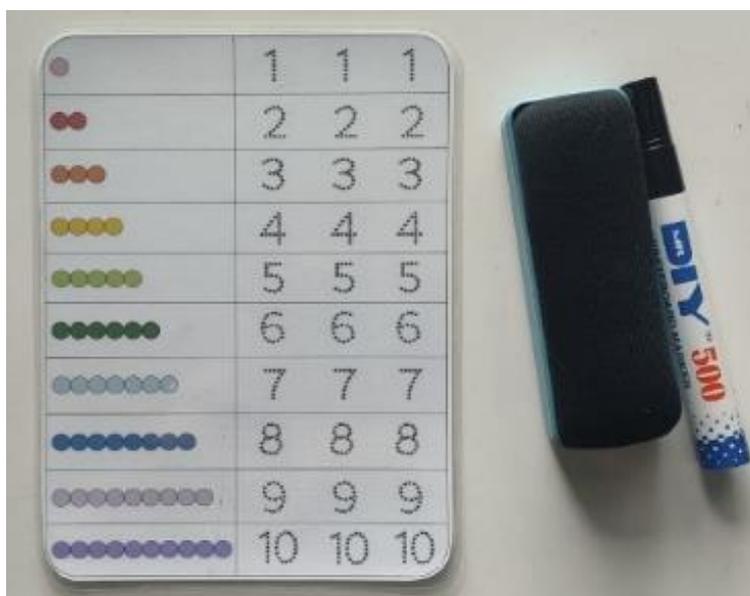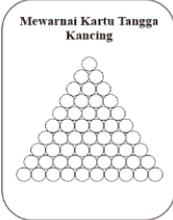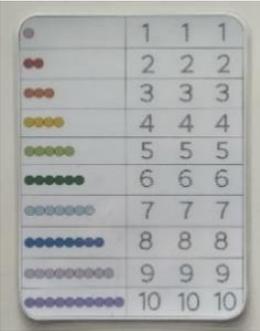Figure 1. Design Beginning Treatment 3 at STIKMA (Stikma Mathematics)

Figure 2. Final Design of Treatment 3 at STIKMA (Stik Mathematics)

ETG used for learning media in help know symbol numbers 1-10. this ETG made from colored sticks and buttons colorful. Button with pink color indicate number One with amount button one. Button with Red color indicates say Two with amount button two. So on until number ten in accordance with order from color basic stage, stages this done for develop as well as give media results in the form of STIKMA (see Table 1).

Table 1. Improvement of STIKMA Media (Mathematics Stick)

No	Media	Information
1	Treatment 1	
		Treatment 1 The initial design was colored in circles and the circles on the buttons did not match the number of numbers.
		Then revised to be replaced by matching the amount number and tighten the circle to make it more precise
2	Treatment 2	
		There were no revisions to the colors and materials in treatment 2, so the design was not changed
3	Treatment 3	
		The numbers in bold consisting of 4 columns seem too many so it is recommended to reduce them
		After considering the researcher's suggestion to revise it into 3 columns

treatment 4

On the treatment of 4 number cards are written the names of the numbers so that media experts suggest removing the name of the number

After changing the design, the researchers removed the names of the numbers on the number cards, this was done so that the children would remember the numbers and the number of buttons with sticks.

The Implementation stage, which is the stage carried out to determine the level of effectiveness of a product, namely STIKMA media with children aged 5-6 years as many as 20 children who are in the kindergarten area of Siwalanpanji Village, Buduran District, Sidoarjo Regency, namely Fatimah Az- Zahro. Prior to testing it on children, there were several validation stages including media expert validation, material and assessment items that would be used to collect data in the field. The developed media would be validated by material experts and facilities experts. The goal is to identify whether the media is feasible to be tested. If it is later deemed inappropriate, the verifier will improve or evaluate it until the media is deemed appropriate and can be tested on children aged 5-6 years. Sri Widayati, mother of PG-PAUD FIP lecturer at Surabaya State University who is undoubtedly an expert in her field, oversees the verification process for material experts and media experts. Following are the results of the verification of STIKMA media material.

Feasibility results provided by expert's material against ETG STIKMA is 80 percent, allowing the media to be declared valid and tested. Furthermore, based on the findings of STIKMA media material experts. STIKMA accepts suggestions and opinions, and the ETG STIKMA material is aligned for children aged 5-6 years. The feasibility results given by media experts to ETG STIKMA obtained score by 97%. Not only that, from the results of the expert approval of the ETG STIKMA facility obtain recommendations and input, namely that in totality it has been good and can be done used for this study should be considered in determining the color to be more attractive and not too dark. Future researchers pay more attention to color selection, product durability, and material content suitable for children aged 5-6 years.

In addition to the material and media that are validated, each child's assessment item is also validated. This is done with the aim of proving that the items used in the child's

assessment have low, medium, or high accuracy. Table 2 show the results of the expert justment test for each assessment item.

Table 2. Assessment Validation Results

Items 1-3	Conclusion						
	Evaluator						
	1	2	S1	S2	∑S	V	Ket
	29	30	26	29	55	3.055556	Tall

From the calculation above, it can be concluded that the assessment items used have high agreement so that the assessment items are feasible to use to collect data. After all the media and data collection tools used are valid, the next step is to collect data on children to see how efficient the STIKMA game is in increasing cognitive abilities in recognizing number symbols 1-10 through the Wilcoxon test. The following is the result of the Wilcoxon test SPSS calculation (Table 3).

Table 3. Wilcoxon Test Results

	Ranks			
		N	Mean Ranking	Sum of Rank
posttest - pretest	Negative Ranks	0 [a]	.00	.00
	Positive Ranks	20 [b]	10.50	210.00
	ties	0 [c]		
	Total	20		
a.posttest < pretest				
b. posttest > pretest				
c.posttest = pretest				

From the results of the calculation of the Wilcoxon test on positive rank, there were 20 positive data (N), which means that the 20 children experienced an increase in their cognitive ability to recognize number symbols 1-10 from the pretest and posttest scores. The mean rank or average increase was 10.50%, while the total positive ranking or sum of ranks is 210.00. So, it can be concluded that this game is appropriate and efficient for improving cognitive abilities (regarding the number symbols 1-10).

Figure 3. Children Playing STIKMA

Evaluation Phase, after undergoing several processes the last stage in this study is the evaluation stage. Evaluation from a facility expert, a lecturer at Surabaya State University, Mrs. Sri Widayati, showed that the material confirmation results obtained a percentage of 80% and media confirmation results obtained a percentage of 97%, both thought that the STIKMA media was appropriate and efficient for improving cognitive in recognizing the symbols of numbers 1-10 for children aged 5-6 years at Fatimah Az-Zahro Kindergarten, Siwalanpanji Village, Buduran District, Sidoarjo Regency.

Every treatment in the STIKMA media raises new challenges for children so that they hone the child's knowledge deeper to hone their mathematics. The existence of STIKMA brought fresh air to 20 children at Fatimah Az-Zahro Kindergarten, Siwalanpanji Village, Buduran District, Sidoarjo Regency because they were very enthusiastic about playing this game. This matter become a reference for teachers that they are not only motivated in LKA but can create ETG that is simple and able to increase children's interest in learning to improve aspects of child development.

4.2 *Discussion*

Based on the results of observations on December 20, 2020, in Siwlaanpanji Village, researchers assess that most children aged 5-6 years still have difficulty using number symbols for counting. On the other hand, because at school and at home children do not yet understand numbers because teachers and parents use examples of counting 1-10 with their fingers and learning is only limited to LKA. So that the researchers considered this to be less effective and less for children to introduce number symbols. The current research by Royani and Suryana (2023) obtained results that the ability to recognize the concept of numbers in early childhood increased after carrying out research actions through ETG snakes and ladders. It shows that ETG is able increase ability child in know draft number.

Development STIKMA media can develop the ability to understand numbers in children. Number Stick Media can be done through game activities, mentioning the order of numbers, and recognizing number symbols, connecting numbers with their writing. However, in this research media the researcher used sticks by changing the numbers on the sticks with colorful buttons. STIKMA media made from ice cream sticks. This can be interesting for children because children like a variety of shapes, sizes and colors including the shape of the length and the color of the attractive buttons. By playing STIKMA, the child will try to solve the problem, namely calling or getting to know the number symbol according to the number of buttons on the cream stick. This is in line with opinion Wardani and Suryana (2022), ETG which was deliberately created and structured to provide understanding and development of learning concepts for children, especially cognitive development.

Before the media is applied to children, it requires a mature process including validation from media and material experts so that the STIKMA media is suitable for use. The validator for this media is Mrs. Sri Widayati, as a lecturer from Surabaya State University who is no doubt an expert in her field. Her job is to oversee the verification process for material experts and media experts. From the results of the material validation process it yielded 80%, it can be concluded that the material in the STIKMA media is feasible to use. Because STIKMA media raises mathematics material for children which is packaged in such a way according to the development of children aged 5-6 years because mathematics is a source of various knowledge that plays an important role in the knowledge needs and development of children.

After validating the next material is validating the media to be used. This is done so that the media used complies with ETG guidelines in terms of material, color, and media resistance. From the results of media validation showing 97% results, it was concluded that the STIKMA media was feasible because both the material, color and durability had been tested. After validating the material and media, the next step is validating each assessment item that will be used to retrieve data. From the results of the expert judgement test it showed that a score of V 3.5556 which means <0.8 was declared to have high agreement so that the assessment items were feasible to use to collect research data.

After obtaining all validation, the media is ready to be tested with 20 children at Fatimah Az-Zahro Kindergarten, Siwalanpanji Village, Buduran District, Sidoarjo Regency. The first time the child saw the STIKMA media showed a curious expression. This can be a refresher for children in Fatimah Az-Zahro Kindergarten in learning because the learning that has been carried out so far has only relied on LKA so that it does not provide an understanding for the child, especially in the cognitive development of children in recognizing number symbols.

The results of testing the STIKMA media on 20 children using the Wilcoxon test found that the 20 children experienced an increase in their cognitive ability in terms of numbers 1-10 from the pretest and posttest scores, the mean rank or average increase was 10.50% while the total positive ranking or sum of ranks is 210.00. This is in line with Hamalik's opinion that the introduction of numbers 1-10 is a benchmark for children to learning numbers so that later it can be adapted to their respective abilities. So that with STIKMA media which has treatment levels from 1-4 which can adjust to the child's ability so that children are able to understand and learn in detail from numbers 1-10. Apart from mentioning the numbers in the STIKMA media there is an aspect that is sorting the number of buttons 1-10. In this treatment activity 2 the children honed their concentration in sorting the buttons according to the picture of the buttons provided. This finding is in line with Bruner's opinion that learning numbers starts with real objects, then if it is felt that the child is capable, then he can be taught to relate the number of objects to the number symbols.

In the STIKMA media there is treatment 4 where children can connect or pair numbers with the same number. The child will roll the dice until the available numbers appear, then the child is asked to take a button stick with the number of numbers obtained from the dice, then the child takes a label and a card with the number that matches the dice. The results of this implementation are in line with opinion Umaternate et al., (2020) revealed that introducing the concept of numbers 1-10 to children as beginners requires important elements including names , sequences, numbers, and amounts. With the STIKMA media learning numbers, children also learn about the colors used in buttons. So that children learn many things from one media. For this reason, by refreshing the learning media at Fatimah Az-Zahro Kindergarten, it can bring motivation for the teacher to create other educational media so that the lessons carried out do not seem monotonous and are motivated by work sheet.

5 CONCLUSION

This research was tested on 20 children in Fatimah Az-Zahro Kindergarten, Siwalanpanji Village, Buduran District, Sidoarjo Regency. The results of the validation of material experts were 80%, then media experts gave 97% results. Then the results of the assessment item tests in this study had a result of V 3.5556, which means <0.8 was declared to have high agreement so that it can be concluded that the media and material both in ETG and the assessment sheets contained in the STIKMA media are appropriate to be used to improve cognitive abilities in recognizing the symbols of numbers 1-10 for children aged 5-6 years at Fatimah Az-Zahro Kindergarten, Siwalanpanji Village, Buduran District, Sidoarjo Regency. The results of trials conducted at Fatimah Az-Zahro Kindergarten, Siwalanpanji Village, Buduran District, Sidoarjo Regency, showed that 20 children had an increase of 10.50% in their cognitive ability to recognize number symbols 1-10 with a positive ranking or sum of ranks of 210.00 so that they can It can be concluded that this game is appropriate and efficient for improving cognitive abilities regarding symbol numbers 1-10.

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