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Pictorial Number Sandpaper Media in Recognizing Number Symbols and Training Children's Fine Motor Skills

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ABSTRAK

Masih banyak anak yang perkembangannya belum maksimal, terutama pada perkembangan sensorik, motorik halus, dan kognitif dalam memahami simbol bilangan. Oleh karena itu penelitian ini bertujuan untuk menganalisis keefektifan media amplas bilangan bergambar dalam mengembangkan kemampuan sensorik, motorik, dan kognitif siswa dalam mengenal lambang bilangan 1-10. Metode yang digunakan dalam penelitian ini adalah metode campuran (mixed method) yang memadukan metode kuantitatif dan kualitatif dengan pendekatan sekuensial. Subyek dalam penelitian ini adalah siswa Taman Kanak-Kanak Tingkat A Sekolah Islam yang berjumlah 20 orang. Teknik pengumpulan data dalam penelitian ini melalui observasi dan dokumentasi. Teknik analisis data yang digunakan adalah teknik deskriptif-analitik, yaitu menganalisis variabel-variabel yang terdiri dari peningkatan kognitif, dan keterampilan motorik halus melalui permainan sandpapper bilangan bergambar. Hasilnya menunjukkan adanya peningkatan kemampuan motorik halus dan pemahaman simbol bilangan. Hasil analisis kuantitatif menunjukkan adanya peningkatan efektif pengenalan simbol bilangan dari 25% menjadi 100% yang berarti anak dapat mengenal simbol bilangan dengan baik. Begitu pula untuk hasil data observasi dalam melatih motorik halus siswa mengalami perkembangan yang efektif pada motorik halus yaitu siswa dapat meningkatkan konsentrasi dan fokus, meningkatkan koordinasi tangan dan mata, meningkatkan keterampilan desain visual, meningkatkan kemampuan pengendalian.

ABSTRACT

There are still many children whose development is not optimal, especially in sensory, fine motor, and cognitive development in understanding number symbols. Therefore this study aims to analyze the effectiveness of pictorial number sandpaper media in developing students' sensory, motor, and cognitive abilities in recognizing number symbols 1-10. The method used in this research is mixed method, which combines quantitative and qualitative methods with a sequential approach. The subjects in this study were 20 kindergartens level-A students at Islamic School. Data collection techniques in this study through observation and documentation. The data analysis technique used is the descriptive-analytic technique, which analyzes the variables consisting of cognitive improvement, and fine motor skills through pictorial number sandpapper games. The results showed an increase in fine motor skills and understanding of number symbols. The results of quantitative analysis show an effective increase in the recognition of number symbols from 25% to 100%, which means that children can recognize number symbols well. Likewise, for the results of observational data in training fine motor skills, students experience effective development in fine motor skills, namely, students can improve concentration and focus, improve coordination between hands and eyes, improve visual design skills, improve the ability to control hand and finger movements.

1. INTRODUCTION

Learning activities are activities that are usually carried out in the process of transferring knowledge. This activity has a very important role, in fact in this learning activity, it can be said to determine the success of a lesson. Learning will be said to be successful if the learning objectives can be achieved well.

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Achievement of this learning objective can be seen based on the results of the assessment carried out. Assessment is also often referred to as assessment (Alenezi, 2020; Fatimah & Santiana, 2017). Assessment is a measure of the success of learning. Therefore, the assessment must be carried out fairly. Appropriate assessment according to assessment rules and principles will produce valid data according to each individual's achievements, so that the results obtained are truly accurate (Chasanah et al., 2022; Wei et al., 2021). The results of this assessment will be used as evaluation material and provide feedback. Teachers, students, and parents to be able to maintain success or to improve the learning process if results are still not optimal. In children, several aspects need to be improved, including aspects of sensory, motor, and cognitive development. The development of motor skills is the process of acquiring skills and movement patterns that children can use to control their bodies (Krüger & Bodemer, 2022; Sutapa & Suharjana, 2019). Motor skills in children are divided into two, namely, fine motor development and gross motor skills, both of which have very important benefits in children's development. Training fine motor development is certainly beneficial for children, namely, it can improve children's life skills, stimulate nerve development in the brain, increase children's self-confidence, help children focus and concentrate better, train coordination between organs in the body, improve children's cognitive abilities (Iswahyuni et al., 2023; Yan Nurjani et al., 2019). The same thing was also conveyed that fine motor skills and independence can be trained with simple daily activities or practical life that has important benefits in future life (Irawati, 2023). Not stopping there, the development of fine motor skills can also be stimulated through sensory activities.

Motor skills have a strong relationship with children's thinking skills. Students' thinking abilities or intelligence are part of the development of cognitive abilities. Good motor competence can have an impact on several aspects, especially on the cognitive aspect of students having problem solving skills (Cahyani, 2020; Syamsuddin et al., 2019). According to Jean Piaget's theory of development, the cognitive development stage of children aged 2-7 years is at the preoperational stage (Juwantara, 2019). At this stage children have high curiosity, so children tend to try everything to find answers. At this stage, it is very important to assist in providing activities that can stimulate children's thinking patterns in terms of cognitive abilities. Training cognitive abilities can develop children's basic thinking abilities, so that children have creativity, that is appropriate to their developmental stage. The development of cognitive abilities can also be seen through the child's ability to integrate the basic knowledge, they already have with newly acquired information (Bayley, 2022; Fitriani & Maemonah, 2022).Training the development stage of preoperational abilities in children can also be done with various concepts, one of which is playing while learning in which religious, moral, cognitive, physical motor, language, social-emotional, and artistic values are applied. The development of interesting learning activities will be in line with the theory of constructivism, where children can build new concepts or ideas based on the knowledge they have acquired (Sugrah, 2019). When children actively construct their activities, they will be able to select, change the form of information, make hypotheses, and be able to draw conclusions based on the theoretical structure they find. Another similar learning theory is Vygotsky's learning theory, that children will learn from symbols made to make it easier to think (Suryana et al., 2022). Based on some of these learning theories, it can be concluded that cognitive abilities are one of the basic abilities that need to be trained in children as early as possible and helped to be prepared by teachers to improve children's abilities and creativity according to their developmental stage. The development of cognitive abilities also aims to enable children to process their learning gains, find a diversity of alternative problem-solving, develop mathematical logic skills, knowledge of time and space, and the ability to sort, classify, and prepare for the development of meticulous thinking skills (Erbil, 2020; Fitriyani et al., 2019).

However, in the field conditions there are still many children whose development is not optimal, especially in sensory, fine motor, and cognitive development in understanding number symbols. Some of the problems seen in children related to weak sensory development are, children become weak in responding to the information conveyed, for example children still have difficulty recognizing number symbols (Stevani & Karisma Erikson Tarigan, 2022; Tama & Rosyadah, 2023). Weak sensory abilities also make children have a higher level of anxiety so that they easily give up or despair until they are not confident, for example children often do not want to repeat the introduction of number symbols that are still difficult to understand and there are also some similarities between symbols, so they still have difficulty in distinguishing number symbols, especially in numbers 6 and 9. Many children are not confident to show the number symbols asked by the teacher, children also tend to be silent because they feel they don't know what to answer. In addition, some children tend to avoid crowded classroom situations, especially those related to sensory (Craik & Rose, 2012; Sharfi et al., 2022). These sensory problems certainly have an influence on children's weak motor skills, including children who are easily frustrated when they see number symbols, children are also weak in imitating the direction of writing number symbols. So that the weak ability of children in sensory and motor abilities is directly proportional to the cognitive abilities of

children, namely children so unable to recognize the number symbols that have been delivered by the teacher (Agustina et al., 2018; Hite et al., 2019).

Seeing the above problems, it is necessary to have the right solution related to learning strategies. One way that can be done is to determine learning strategies by using interesting media and can stimulate children's sensory, motor and cognitive development. Pictorial number sandpaper media was chosen by researchers as a strategy to overcome the above problems. According to previous study sandpaper letters are letters that are textured and made from emery paper (Rahmadani et al., 2019). Sandpaper letters are usually used as learning media in the Montessori method to help children recognize letters and numbers in an interactive and fun way. Sandpaper letters are used in the form of colorful alphabet and number writing cards. Sandpaper media can invite children to feel and move their fingers in accordance with the direction of writing letters or numbers (Ningrum et al., 2022; Sayekti & Laili, 2023). So that the use of the latter sandpaper media can stimulate children's sensory senses, especially the sense of touch by touching the shape of letters or numbers. This is in line with the research which states that the latter sandpaper media can provide interesting sensory experiences for students (Sayekti & Laili, 2023). In addition, the sandpaper later media can also stimulate children's fine motor development when children touch letters or numbers while moving their finger muscles in the direction of writing the letters or numbers. This is in line with the research which states that fine motor is one of the developments that is the main focus in supporting the achievement of learning by training movements that involve small muscles in the fingers (Syahraeni & Amri, 2024). In addition, the development of fine motor skills is also closely related to the achievement of cognitive abilities. As described previously in the cognitive phase, children try to understand concepts through examples of movement (Kaplan et al., 2016).

Based on the explanation above, it is known that the sandpaper latter has many benefits in learning. The media can be said to be one media that has an important role in creating more meaningful, creative, and fun learning for children, and helps improve concentration (Ningrum et al., 2022; Rahmadani et al., 2019). In addition to the numbers using sandpaper, the cards are also equipped with pictures. This image aims to show the meaning of the numbers listed. Images also function as semi-concrete media compared to delivery in words or lectures, which can provide relevance and real context, provide visual means, encourage active participation until children are able to think critically. So that the sandpaper media latter pictorial numbers are expected that children will be able to understand the value of numbers in the number symbol. As described by previous study namely the number card game as a tool to introduce the concept of semi-concrete number symbols can be trusted as a fun learning tool to facilitate understanding of concepts (Ameilia et al., 2020). Not only that, the presence of textured shapes and colors that are able to provide attractiveness will be able to attract children's attention. So that students will be more enthusiastic in following the learning delivered by the teacher and the material presented will also be more easily absorbed by students. This is in line with the research that, stating that using the latter sandpaper media can increase student enthusiasm well (Ningrum et al., 2022).

The use of media that has been designed in overcoming the above problems, is expected to be able to develop sensory skills, fine motor skills, as well as children will be able to understand the meaning and recognize the number symbol until they are able to rewrite the number symbol. The success of children in recognizing, understanding, and rewriting these number symbols is an achievement of cognitive abilities. This is reinforced by the research state using sandpaper has a great influence on cognitive achievement (Rahmadani et al., 2019). Other research related to pictorial number card media also shows supportive results, namely with pictorial number card games can improve the ability to recognize number symbols in kindergarten children (Sari & Fauziddin, 2017). Similar research was also presented stating that number card media can stimulate the ability to recognize number symbols 1-10 in children aged 4-5 years (Fransiska & Khotimah, 2023). Another similar study also stated that the illustrated number card media has a good category and is suitable for use in children aged 5-6 years (Tai et al., 2021).

Learning activities using this pictorial number sandpaper media are complex activities, because they can stimulate children's thinking to process motor development, sensory, emotional, social development, and cognitive development. So that it can make learning more fun and meaningful. Children are also able to explore their imagination by recognizing number symbols to find simple number concepts. Based on some of these explanations, this study aims to analyze the effectiveness of the sandpaper latter pictorial number media in training sensory, fine motor, and cognitive abilities of students in recognizing number symbols. The novelty of this study is sandpaper media use as media in training sensory and fine motor skill of early childhood students.

2. METHOD

This research uses mixed methods, combining quantitative and qualitative methods with a sequential approach. This approach is used to conduct a more comprehensive and in-depth analysis by combining overview quantitative data and in-depth qualitative data (Creswell, 2013). The subjects in this study were 20 students who were kindergarten A level students at RA Mumtaza Islamic School, Cirendeu, Pisangan Ciputat, South Tangerang City. The subject chosen is the material of number symbol recognition, this is because the number symbol is an important basic ability to be recognized and owned by students in their daily life skills. Data collection techniques in this study through observation and documentation. The data analysis technique used is descriptive analytic technique, which analyzes the variables consisting of sensory skills, fine motoric, and improvement of cognitive abilities, in playing media Sandpapper Latter illustrated numbers. Quantitative data analysis techniques obtained from observation results are then processed using percentage descriptions. The reference of the ability to recognize number symbols will be measured based on several indicators, namely (1) Ability to recognize numbers 1-10, (2) Accuracy in showing numbers 1-10, (3) Ability to sort numbers 1-10, (4) Ability to match numbers and numbers of objects. These indicators are contained in the cognitive ability observation sheet instrument, as in Table 1.

Table 1. Cognitive Ability Observation Sheet

No.	Indicator	Achievement			
		BM	MM	BSH	BSB
1.	Able to recognize numbers 1-10				
2.	Precise in showing numbers 1-10				
3.	Able to sequence numbers 1-10				
4.	Able to match numbers and number of objects				

Description: BM: Not yet emerged, if the child does it must be guided or modelled by the teacher; MM: Starting to emerge, if the child does it still has to be reminded or helped by the teacher; BSH: Developing as expected, if the child can do it independently and consistently without having to be reminded or modelled by the teacher; BSB: Developing Very Well, if the child has been able to do it independently and has been able to help his friend who has not achieved the ability according to the expected indicators.

While the qualitative data analysis technique is obtained from the results of observations and documentation during the activities of playing sandpaper latter pictorial numbers in recognizing the number symbols 1-10. The data will be analyzed descriptively by involving comparison of theoretical sources by identifying similarities and emerging patterns. The observation sheet instrument for sensory and fine motor skills can be seen in Table 2.

Tabel 2. Observation Sheet for Sensory and Fine Motor Skills

No	Indicator	Achievement			
		BM	MM	BSH	BSB
1.	Happy and able to interact with the surrounding environment while participating in activities using pictorial number sandpaper media				
2.	Able to focus and concentrate during activities using picture number sandpaper media				
3.	Able to identify the texture of the number symbols on the pictorial number sandpaper media				
4.	Able to do tracing on the number symbols in the pictorial number sandpaper media				

3. RESULT AND DISCUSSION

Result

Based on the results of research from a series of sensory, motor, and recognition of number concepts in group A children at RA Mumtaza Islamic School using pictorial number sandpaper media, qualitative and quantitative results were obtained.

Sensory and motor abilities of children at the beginning of the observation obtained data that many students have not developed. Base on initial observation results show that out of 20 students who scored BM were 11 students, and scored MM were 9 students, and no one scored BSH or BSB. So that it can be accumulated in the percentage of the average value of BM 55% and MM 45%. The existence of this initial data made researchers to apply pictorial number sandpaper media. After the application of pictorial number sandpaper learning media in the classroom, the results of students' sensory and motor abilities were

obtained. The post-treatment results of 20 students who did not get BM and MM scores, while those who got BSH scores were 6 students, and got BSB scores were 14 students. Based on this data, if the percentage is obtained, the average BM score is 0%, MM 0%, BSH 30%, and students who get 70% BSB scores. So it can be concluded that the application of pictorial number sandpaper media can help improve students' sensory and fine motor development. This can be seen in the initial ability there are still 11 students in the BM category and 9 students in the MM category. Meanwhile, in the BSH and BSB categories, which initially did not exist, there were 6 BSH students and 14 BSB students.

Cognitive ability to recognize number symbols 1-10

Based on the results of pre-observation observations that have been carried out, the data obtained from the observation of the ability to recognize children's number symbols can be seen in Table 3.

Table 3. Percentage of Children's Learning Completeness at Pre-Observation

No	Completeness Criteria	f	Percentage
1	Completed	5	25 %
2	Almost Complete	9	45 %
3	Not complete	6	30 %
Amount		**20**	**100%**

Based on Table 3, it can be seen that 5 children, or 25% are complete, 9 children, or 45% are almost complete, and 6 children, or 30% are not complete. So it can be concluded that only 25% of children are complete in the introduction of number symbols. While the learning completeness that must be achieved is 75%, it can be said that the results of quantitative data analysis in pre-observation show that children's cognitive abilities in recognizing number symbols have not been achieved. The ability to recognize number symbols in pre-observation still needs to be improved, because out of 20 children, there are only 5 children who are complete. The non-achievement of cognitive abilities in the recognition of number symbols encourages researchers to provide stimulus by designing pictorial number sandpaper media. The main media of this illustrated number sandpaper card will be used by researchers during learning and as a game media that contains number symbols from numbers 1-10 along with the object. A brief example (numbers 1-4) of the media can be seen in Figure 1.

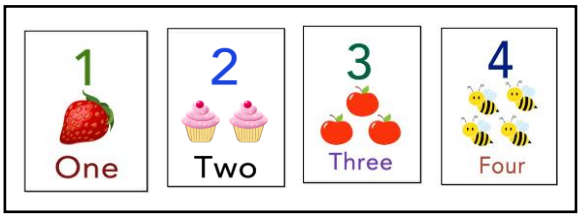

Figure 1. Picture Number Sandpaper Media

Based on the media that has been designed as shown in Figure 1, it is hoped that it can train the ability to recognize number symbols. The first step is for the teacher to introduce and give direction on the use of pictorial number sandpaper media during apperception. At the time of apperception, the teacher gives examples of activities to recognize number concepts by singing number-themed songs. In the second step, the teacher shows the pictorial number sandpapper media in front of the class. The card media used is made from concorde paper with the number symbols from numbers 1-10 plastered with sandpaper and added with cute pictures to trigger children's interest in the media. The teacher gives an explanation to the child while holding the pictorial number sandpapper media, then the child is instructed to touch, feel, and guess the numbers shown by the teacher. In the third step, the teacher calls children randomly to come to the front of the class and asks them to practice as exemplified. The activities that need to be done are: a) Touching, feeling, and mentioning sequentially the number symbols 1-10. b) Pointing out the numbers as asked by the teacher. c) Sorting the number symbols 1-10 correctly. d) Matching the number symbols with the number of pictures that match. In this activity the children looked so happy and enthusiastic. The teacher also always provides guidance and motivation to children who cannot practice directly.

The fourth step, assignment by giving worksheets (LK) to children. Children work on LK earnestly and are able to complete it well. After all activities are completed, the children are asked to sit neatly in their respective places, then the teacher provides a conclusion of the learning material that has been delivered. The teacher closes the class while giving advice so that children remain enthusiastic in learning to recognize the concept of numbers. At the end of the session the teacher does not forget to give awards to children who have been able to understand, show, sort, and match numbers according to objects.

After being given the treatment as described above, the researchers analyzed the quantitative data again to determine the effectiveness of the pictorial number sandpaper media in recognizing number symbols. The results of learning completeness after treatment is show in Table 4.

Table 4. Percentage of children's learning completeness

No	Criteria for Completion	f	Percentage
1	Completed	20	100 %
2	Almost Complete	0	0 %
3	Not complete	0	0 %
Amount		**20**	**100 %**

Based on Table 4, the completeness of learning the ability to recognize children's number symbols through pictorial number sandpaper media has increased, from 5 children or 25% of complete children to 20 children or 100%. The indicator completeness criterion in the study is 75% so that the completeness of the indicator has reached the specified target. Table 5 presents a comparison of quantitative data before observation and after treatment.

Table 5. Percentage Comparison of Children's Learning Completeness

Completion Criteria	Pre-Observation		Post-Treatment	
	Total Child	%	Total Child	%
Completed	5	25 %	20	100 %

Based on the comparison in Table 5, it can be concluded, that the use of pictorial number sandpaper media can improve children's cognitive abilities in recognizing number symbols 1-10. The statistical analysis shows a significant increase in children's cognitive ability to recognize number symbols using pictorial number sandpaper media. In the pre-observation the percentage of completeness was only 25%, after being given treatment, it increased to 100%. The results of these percentages show that children after being given sensory-motor activities with pictorial number sandpaper media have increased cognitive abilities, namely children can recognize, children can sort, connect or pair number symbols with objects around the numbers 1-10, and children have the provision of how to write number symbols.

Discussion

Sandpaper, which is, often referred to as sandpaper, is paper that has a rough surface texture. As revealed by study that said sandpaper is an emery paper media used in the Montessori method as an initial exercise by fingering to build the muscle mechanisms needed in advanced stage abilities, such as holding, using stationery, to the addition of children's visual knowledge related to the material poured on sandpaper media (Rahmadani et al., 2019). The existence of fingering activities, carried out by children shows indicators of sensory abilities. Sensory abilities have many benefits for children's development stages, one of which is to help improve fine motor skills in children. This of course, must also be balanced with the provision of, the right stimulus. The theory is similar to this statement, namely that fine motor skills, can be improved through sensory play activities that involve eye and hand coordination skills, and strength of the muscles of the hands and fingers on certain parts of the body (Tama & Rosyadah, 2023).

Based on the results of observations using sandpaper media attached to numbers on picture cards, the results show that children have been able to master the learning activities provided in training sensory and motor development. This can be seen during the activity, students feel happy and are able to interact with the surrounding environment, students are able to focus and concentrate during the activity, students are able to identify the texture of the number symbols on the pictorial number sandpaper media, students are able to do tracing on the number symbols on the pictorial number sandpaper media (Cox, 2019; Edirisinghe et al., 2018). Sensory and fine motor activities applied during the study focused on touch and trace sensory activities. In accordance with the opinions of several experts including, sensory play theory is an activity related to the senses in the body, one of which is the sense of touch which uses activities in the form of touch to find out the texture of an object (Agustina et al., 2018; Alamsyah et al., 2022). Meanwhile, fine motor skills are limited activities using muscles in certain parts of the body such as fingering activities (trace) using fingers.

Other observation results also show that children can coordinate their eyes and hands through the activity of touching or fingering the pictorial number sandpaper media. Children are also able to follow the direction of the number symbol writing pattern on the sandpaper media by optimizing the strength of the muscles in the fingers. The optimal coordination of the finger muscles shows that children are capable and skilled in fine motor skills (Sukaeti & Muslimat, 2021). In other words, the sensory play touch and trace

activity on pictorial number sandpaper media has a significant influence in training children's fine motor skills. This is in line with research conducted stating that the tracing the dots technique which is a technique by touching and following the direction of the number writing pattern on paper can train children's fine motor skills (Dinehart, 2015; Primayana, 2020). Therefore, the activity of training sensory abilities using pictorial number sandpaper media is the right stimulus to be able to help the development of fine motor skills.

Besides being used to stimulate children's sensory and motor abilities, pictorial number sandpaper media can also be used to train the introduction of number symbols, which is one example of cognitive ability. This is in line with the opinion, which states that some activities in stimulating fine motor development skills by linking eye and hand coordination have a relationship with cognitive abilities (Hakim et al., 2022). So that in this study not only focuses on sensory and motor skills, but cognitive abilities are also observed, especially in the ability to recognize number symbols. Observation of cognitive abilities in number symbol recognition begins with the pre-observation stage. At the pre-observation stage, researchers made the first observation to find out the extent of children's skills in recognizing the concept of number symbols (Gouet et al., 2020; Parwati & Suharta, 2020). Then the researcher conducted an assessment using an observation sheet during learning activities. The things that were observed were related to the indicators of the development of cognitive abilities that had been determined.

Based on the results of the research that has been carried out, it shows that children after being given sensory motor activities with pictorial number sandpaper media experience an increase in their cognitive abilities, namely children are able to recognize, children are able to sort, connect or pair number symbols with objects around the numbers 1-10, and children have the provision of how to write number symbols. This is by research Nayazik et al. (2019), which states that sorting number symbols through playing card activities can improve the cognitive abilities of children in group A of Handayani VI Bantar bolang Kindergarten (Nayazik et al., 2019). Similar research was also conducted by, which states that applying a learning model through card media can increase cognition number symbols (Puspita et al., 2022; Winda et al., 2022).

The determination of educational media certainly has a very important role in the achievement of learning. Illustrated number sandpaper card media is made by lifting the concept of fun and semi-concrete. Semi-concrete here in the sense that researchers try to add pictures of interesting objects that are adjusted to the number of numbers on the number card so that it can make it easier for children to interpret the number symbols. While fun here means that children can interpret and receive cognitive achievements through fun sensory-motor activities (Chafiyah, 2021; Kamtini & Sitompul, 2019). This is to, playing is a fun thing for children, so the need for play is very important for children's growth, therefore the teacher as a facilitator and motivator is very important in encouraging and providing various learning facilities that are fun according to children's pleasure.

4. CONCLUSION

The use of pictorial number sandpaper card game media can train sensory abilities by utilizing the sense of touch on textured sandpaper numbers. The existence of touch can train children's sensory development and help support motoric and cognitive abilities in recognizing number symbols in a fun way. Stimulus of sensory abilities through pictorial number sandpaper media in addition to helping improve cognitive abilities can also train fine motor skills. Fine motor skills with pictorial number sandpaper media can be trained by children trying to trace the numbers that have been provided, so that children are able to move the finger muscles in recognizing and knowing the direction of writing numbers. The existence of these two activities, the cognitive abilities of children also increase, students are able to recognize number symbols, students are able to sort number symbols, students are able to determine the number symbols according to the number of objects available until students are able to know the direction of writing the number symbols that have been learned. It can be concluded that the existence of this pictorial number sandpaper media has a level of effectiveness in improving children's sensory, motoric, and cognitive development abilities, especially in the recognition of number symbols 1-10. And with this research is expected to be able to be a recommendation for further researchers as a practical application in the context of children's education.

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