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Improving the Number-Concept Recognition of Children Wth Autistic Spectrum Disorder Using Modified Abacus

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ABSTRACT

The purpose of this study was to examine the effect of abacus modification media on the ability to recognize the concept of numbers in children with autism spectrum disorder (ASD). This study used a research approach that combines quantitative and qualitative approaches, with the type of pre-experiment research with the One Group Pre-test - Post-test research design. Data collected were obtained from written tests and observations. The findings reported that there was an increase in the ability to recognize the concept of numbers in children with autistic spectrum disorder (ASD) after being treated 8 times with modified abacus media. This is evidenced by the results of the pre-test the ability to recognize the concept of numbers which is still low, then after being given treatment with modified abacus media, the post-test results showed an increase. It can be concluded that modified abacus media is effective in improving the ability to recognize number concepts in children with ASD.

Keywords: *modified abacus, number-concept recognition, children with autistic spectrum disorder*

1. INTRODUCTION

In daily, humans need reasoning and numeracy knowledge and skills are needed, such as when calculating the price of goods to be purchased and calculating the amount of money that should be given. Departing from this, humans need knowledge and skills related to reasoning and counting through subjects in school, namely mathematics. In addition, mathematical competence involves conceptual knowledge and process of knowledge [1].

As stated in Permendiknas Number 22 of 2006 concerning Content Standards, one of the general objectives of learning mathematics is that students can understand mathematical concepts, explain the relationship between concepts and apply concepts or algorithms in a flexible, accurate, efficient, and precise way to solve problems.

However, before learning further mathematical concepts, children should master the concept of numbers first. The concept of numbers is part of a very important mathematical concept that must be mastered by children because the concept of numbers is a provision for mastering other mathematical concepts [2].

Mathematics learning given at school is not only intended for regular children but is also given to children with special needs. However, the implementation must still be adjusted to the needs, constraints, and characteristics of each child. The types of children with special needs in the community include (1) children with visual impairment, (2) children with hearing loss, (3) mental retardation, (4) children with physical and health disorders, (5) learning difficulties, (6) slow learning, (7) hyperactive children, (8) children with superior abilities, (9) communication disorders, (10) autistic children, (11) children with multiple disorders [3].

Of the several types of children with special needs mentioned above, autistic children are one type of children with special needs who need mathematics learning in school. Autistic children are the same as children with special needs and normal children in general, autistic children also need educational services that are tailored to the interests, needs, and abilities of children [4].

With the advancement of Science and Technology (Science and Technology), it makes it easier for us to know and identify the characteristics of autistic children who are around us. The characteristics of children with autism that can be seen immediately include behavior, social interaction, and communication, and language [5]. Furthermore, another expert

said that most of the main cases in autistic children's developmental disorders are cognitive problems, not solely due to withdrawal from the community environment [6]. It can be said that in addition to having barriers to behavior, social interactions, and communication as well as language, autistic children also have cognitive barriers.

Some of these things can have an impact on delays in the learning process of children with autism. Permendikbud No. 137 of 2014 explained that children aged 4-5 years should be able to recognize the concept of numbers. The concept of numbers is part of a very important mathematical concept that must be mastered by children because the concept of numbers is a provision for mastering other mathematical concepts [2].

Based on preliminary observations that were carried out on January 14-16 2019 in a school in the city of Sidoarjo, Indonesia, at the kindergarten level, it was found that 8 autistic children aged 5-6 years experienced obstacles in learning mathematics. Among them, 4 students were already able to count numbers when a number symbol was appointed and 4 other students still had to be guided. Even though these students can count numbers, they still experience confusion in understanding the concept of numbers. This is because students recognize numbers only through the symbol of numbers, but in introducing the concept of number itself it is said to be lacking.

Based on the description above, it can be seen clearly that there is a gap that occurs in 8 autistic children aged 5-6 at the school. If this problem is not resolved immediately, it will cause difficulties for children to get to know mathematical concepts further.

Based on the findings from the results of these preliminary observations, to help children with autism receive material on the concept of numbers, it is necessary to have learning media that is suitable for learning activities in the classroom. In the introduction of mathematics, especially the concept of numbers, the selection of suitable media has a very big role.

The learning resources other than teachers are referred to as channels or liaisons for teaching messages that are held and / or created in a planned manner by teachers or educators, usually known as "learning media" [7]. Then another expert explained that learning media is one of the learning resources that can transmit messages to help overcome obstacles that occur [8]. Such as differences in learning styles, interests, intelligence, limited sensory power, bodily abnormalities, or barriers to geographical distance, time spacing, etc. can be helped to overcome by using learning media.

In providing learning about the concept of numbers in children with autism, one of them can use learning media in the form of an abacus. Abacus is a calculating tool made of wood or plastic, which has the same function as a calculator [9].

Abacus media itself has several advantages in its use, including those that are concrete and practical in use, have variations and techniques, can be prepared by the teacher himself, can overcome limited space and time, are cheap, can be used and obtained easily, can provide an understanding of addition and reduction [10].

Apart from some of the advantages of the abacus above, the researcher chose the abacus media and modified its shape to make the material about the concept of numbers easier to understand and understand by autistic children. Because this modified abacus media can help autistic children to think more concretely about the introduction of the concept of numbers.

Based on the background of the problem above, the researchers are interested in researching with the title "Improving Number Concept Recognition of Children with Autistic Spectrum Disorder Using Modified Abacus".

2. METHOD

This research was approved by the school principal. The principal and teachers agreed to participate in assisting this research. This research was approved by the Faculty of Education, Deputy Dean of Academic and Student Affairs.

There are many types of methods that can be used in a study but in this study, researchers used a combination approach that combines quantitative and qualitative approaches. The research model or design used is a concurrent embedded strategy.

Concurrent embedded strategy or a combination model research method embedded model is a research method that combines the use of quantitative and qualitative methods simultaneously, but with different method weights [11]. In this research model, using two methods, one of which is more dominant. In this study, researchers used quantitative methods more dominantly than qualitative methods. So that quantitative data becomes primary data and qualitative data becomes secondary data [11].

This research was conducted at one of the schools in Sidoarjo, Indonesia. The researchers choose this school because there are problems to be studied. Children with ASD have difficulty understanding the concept's number. The teacher is still having trouble providing media for those problems because children with ASD are not interested and are easily bored when lessons are in progress. The subjects in this study were 8 children with ASD.

The research process is preparation (collect the information about the school, research permission, observation at school, determining the research schedule), give treatment to children with ASD, then collect the data, data analysis, and concluding. Data collected by observation and written tests. The written test is given out twice, that is before being given treatment and after treatment is given. The treatment was given out for 6 meetings by giving an abacus modification media to children with ASD.

This study use design was pre-experimental and in this study use the design model was a one-group pretest-posttest design because it was to compare conditions before and after treatment. There are three steps in taking the one-group pretest-posttest design, namely: accommodate pretest to measure the ability about concept's number before being given treatment (pretest), accommodate treatment (abacus

modification media) to the research subjects, and accommodate tests to measure the ability about concept's number after being given treatment (post-test).

3. RESULT AND DISCUSSION

In teaching the concept of numbers, teachers sometimes find it difficult because they have not found the right media to teach the concept of numbers. Children with ASD tend to get bored and lose concentration in the learning process. Then the researcher chose this abacus modification media so that the number concept recognition activity carried out by the researcher was more effective and fun for children, not monotonous, more real, and the activities carried out were activities to recognize the concept of numbers needed in daily activities.

The ability to recognize concepts number in children with ASD will be explained as follows:

3.1. Subject NB

1. *Initial ability to recognize the concepts numbers*

   NB was very enthusiastic when the researcher introduced the modified abacus media, this was seen when NB immediately played the beads. Although not yet able to adjust the color, NB was able to take the number of beads that match the number of cards (1 and 2) with a little help from researchers.
2. *Final ability to recognize the concepts numbers*
   At the last meeting, NB was able to mention the numbers exactly according to the number cards, NB was also able to take the beads with the number and color that match the number cards in 1-2 repetitions only, and when inserting beads into the abacus shaft NB was able to enter them one by one although researchers must continue to be reminded.

3.2. Subject AG

1. *Initial ability to recognize the concepts numbers*
   AG looked confused and curious when researchers introduced modified abacus media, this was seen when AG asked "what is this?" while playing with the beads. Similar to NB, AG has not been able to pick up beads of the right color, but AG has been able to take 1 and 2 beads according to a number card with a little help from researchers.
2. *Final ability to recognize the concepts numbers*
   At the last meeting, AG showed progress, namely being able to pronounce numbers on a number card clearly and precisely, AG was also able to take beads according to the number and color on the number card without the help of researchers, and when inserting beads into the axis of the AG abacus. able to enter them one by one even though several times wrong in counting them.

3.3. Subject RH

1. *Initial ability to recognize the concepts numbers*
   When the researcher introduced the modified abacus media, RH was immediately interested in number cards, so he immediately took and compiled them. Even though RH was still confused when picking up the beads, after several repetitions RH was able to pick up the beads with the number and color that matched the number card
2. *Final ability to recognize the concepts numbers*
   At the last meeting, RH was able to pronounce the numbers correctly, even in taking the beads RH was able to adjust the number and color of the number card well, but when inserting beads into the axis of the abacus RH still had to be reminded to insert them one at a time. One

3.4. Subject AR

1. *Initial ability to recognize the concepts numbers*
   When the researcher introduced the modified abacus media, AR looked curious and immediately held parts of the modified abacus media. AR has not been able to take the beads according to the number card independently, the researcher must helpfully when AR is instructed to pick up beads.
2. *Final ability to recognize the concepts numbers*
   At the last meeting, AR was able to pronounce numbers correctly even though they was looked doubtful, when instructed to pick up a bead, AR was able to pick it up according to the number and color on the number card, and when inserting it into the axis of the abacus AR was still overwhelmed and sometimes he entered it arbitrarily. Simultaneously then after that AR calculates it.

3.5. Subject AQ

1. *Initial ability to recognize the concepts numbers*
   AQ looked very enthusiastic when the researcher introduced the modified abacus media, this was seen when AQ kept asking "what is this mam?". AQ was able to pick up the correct number of beads, although AQ sometimes asked her hand to be led by the researcher.
2. *Final ability to recognize the concepts numbers*
   At the last meeting, AQ was able to say the numbers on the number card correctly, AQ was also able to take the beads according to the number and color on the number card independently, when inserting beads into the axis

of the abacus AQ did it one by one and was able to count them well.

3.6. Subject HN

1. *Initial ability to recognize the concepts numbers*
   HN did not look as enthusiastic as his friends, HN was just silent and daydreaming while playing with the chain arrangement he was holding. However, when the friend next to him played the beads, HN picked them up and played them. Not much different from AR, HN was not able to take the beads according to the number card independently, the researcher had to helpfully when HN was instructed to take the beads.

2. *Final ability to recognize the concepts numbers*
   At the last meeting, HN was able to say numbers correctly even though it still looked doubtful, HN was also able to take the beads according to the number and color of the number cards even though researchers had to continue to motivate them, and when inserting them into the abacus axis HN was still overwhelmed and sometimes he entered them together and did not count them as the researcher instructed.

3.7. Subject FR

1. *Initial ability to recognize the concepts numbers*
   Similar to NB and AG, FR also looked enthusiastic when the researcher introduced the modified abacus media. This was seen when FR immediately took the beads and played them. FR has not been able to pick up beads with the appropriate color, but FR has been able to take 1 and 2 beads according to the number card with a little help from the researcher.
2. *Final ability to recognize the concepts numbers*
   At the last meeting, FR was able to say numbers correctly, FR was also able to adjust the number and color of beads with a number card even though it had to be repeated once, and when inserting beads into the axis of the abacus FR was able to enter them one by one while counting them well.

3.8. Subject FH

1. *Initial ability to recognize the concepts numbers*
   FH tends to show an indifferent attitude when researchers introduce modified abacus media, but when the researcher starts learning with FH, the child looks excited and immediately puts the toy that he previously held. FH was able to take the correct number of beads, although sometimes FH was still waiting for the researcher to help pick up the beads. Because FH is a child who is very difficult to make a sound, the researcher changes the steps to mention the number on the number card, to point to the number card mentioned by the researcher. And FH can designate the number cards precisely.

2. *Final ability to recognize the concepts numbers*
   At the last meeting, FH was able to designate a number card correctly, FH was also able to take beads according to the number and color on the number card, and when inserting beads into the axis of the abacus, FH was able to insert them one by one and was able to make a sound at the time. count it even if the sound is very slow.

Based on the results of research that has been carried out, after giving the abacus modification media, the ability to recognize the concept of numbers in children with autism changes. Changes that occur in the ability to recognize the concept of numbers in children with autism can be seen from the difference in values obtained at the time of the pre-test and post-test, especially seen in each indicator. In the implementation of the pre-test, the indicator states the number gets an average value of 38.75 and the matching indicator gets an average value of 20, then after treatment or treatment is carried out on the post-test implementation the indicator says the number gets an average value of 43.75 and the indicator matching get an average value of 41.25. The pre-test and post-test were carried out to see or find out the ability to recognize the concept of numbers in children with autism before and after being given treatment or treatment using modified abacus media.

This study also found positive and negative findings, previously autistic children had never been given modified abacus media and this made children with autism feel confused and had difficulty following the material provided. After being given treatment, autistic children began to show their ability to recognize the concept of numbers by using modified abacus media. The positive findings of 6 autistic children who were used as research subjects were able to recognize the concept of numbers well, while the negative findings were 2 autistic children who were still having difficulty recognizing the concept of numbers using modified abacus media.

The results obtained during the pre-test showed that 8 children with autism before being given treatment or treatment using modified abacus media against the ability to recognize the concept of numbers were still low with an average gain of 61.25 and after giving treatment or treatment using modified abacus media to their recognition skills. The concept of the number means the result of the post-test score has changed, namely to be 85.

Similar to previous research by Khofidotur Rofiah, in this study she used uno modified card to improve the ability to recognize the concept of numbers in children with autism. The results showed that playing the uno modfied card activity could improve the ability to recognize the concept of numbers

in children with autism, namely by obtaining an average pre-test score of 65 which then after being given the treatment got an average post-test score of 87.5.

This research is also related to Alviana Rovita's research, in which she used scrapbooks as a medium to improve the ability to recognize the concept of numbers in autistic children. The results showed an increase in the post-test mean score of 78.33, which previously the pre-test mean score was 31.67.

Based on some of the research above, it can be concluded that to improve the ability to recognize the concept of numbers in children with autism, teachers need creative and innovative learning media for children to be able to learn. And the media above are some alternatives that can be used to teach the concept of numbers to children with autism.

4. CONCLUSION

The conclusion is based on the results of research that was carried out on June 17, 2019, to June 27, 2019, then H zero (Ho) is rejected and the working hypothesis (Ha) is accepted, Z count (Zh) = 2.521 is greater than Z table (Zt) = 1, 96 with a critical value = 5%. So it can be concluded that there is an effect of using modified abacus media on the ability to recognize the concept of numbers in children with autistic spectrum disorder (ASD).

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