

## RESEARCH ARTICLE

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# Changes in Numeracy Skills of Deaf Students at Malang Special Primary School in Mathematics Learning using Ice Cream Stick Media

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## ABSTRACT

The hearing impairment can result in students having difficulty accepting learning. Obstacles Students in special schools when observing the understanding the numeracy skills. Students have problems sorting numbers and adding numbers from 1 to 10. Numeracy skills are an introductory lesson in learning mathematics. Several studies have shown that the media positively influences and can help teachers learn. In this study, the media selected were media that students generally liked and were very easy to obtain, namely ice cream sticks media. Based on this description, this study aims to see the improvement in students' numeracy skills by using ice cream sticks as the media. The research method to see an increase in numeracy skills is the experimental method. This study uses a single subject research (SSR) method with an A-B-A design. One deaf student in grade IV in special school who had difficulty in numeracy at the initial observation was selected as the research subject. The measurement instrument used a pre-test and post-test. The results showed that there was a change in the ability of deaf students before and after being given to learn using ice cream stick media. Numeracy skills of deaf students before intervention 60%-40% (pre-test). Meanwhile, the numeracy ability of deaf students after the intervention was 80%-93% (post-test). These results indicate that the students' numeracy skills in the post-test were higher than in the pre-test.

**Keywords:** ice cream stick media, numeracy skills, deaf students.

## INTRODUCTION

Elementary school is a period of child development at about 6-11 years old. At that time, children begin to master reading, writing, and arithmetic skills (Santrock, 2010). Numeracy skills are a unique factor that can affect the potential of children (Spearman in Agustina, 2006). The numeracy skills is the basis of several sciences used in human activities ranging from addition, subtraction, division, and multiplication (Susanto, 2011).

Importance of numeracy skills (such as addition, subtraction, division, and multiplication) is needed by every child, including children with special needs. In this regard, when observations were made at the Special School in Malang Regency in September-August 2021, the problem of numeracy occurred in one Deaf student. The results of the provisional diagnosis, one of nine deaf students in the class cannot count more than 10. The problem of students' numeracy is evidenced in Figures 1(a) and 1(b). During the observation, students used the concept of numeracy using 1 number 1 finger, so for numbers, one of ten students in the class is still unable to. Students can write the numbers 1 to 20 correctly, but the following number is still wrong, as in the example in Figure 1(a). In addition, the addition and subtraction of students are still unable; sometimes, he calculates correctly, but sometimes not.

Based on the Deaf curriculum for special education issued by the Ministry of Education and Culture of the Republic of Indonesia, one of the material studies that must be mastered by fourth-grade students with mathematics subjects in

essential competencies is understanding simple addition and subtraction arithmetic operations, using media objects in the surrounding environment. Deaf students on the observation results need assistance to count well according to their level of education. In line with the observations, Suaeni (2022) explained that many children with hearing impairment have not been able to perform arithmetic operations of addition and subtraction

In several previous studies, the problem of numeracy can be solved by learning media. Good media in learning influences were increasing numeracy skills. One media that can be chosen is the media of ice cream sticks. According to Sari (2016), learning mathematics using ice cream stick media in grade IV SD can increase student learning activities. In addition, playing with sticks can help improve students' initial

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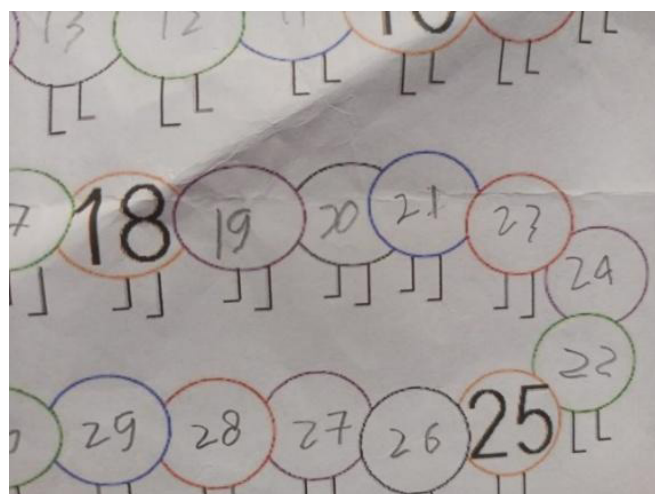
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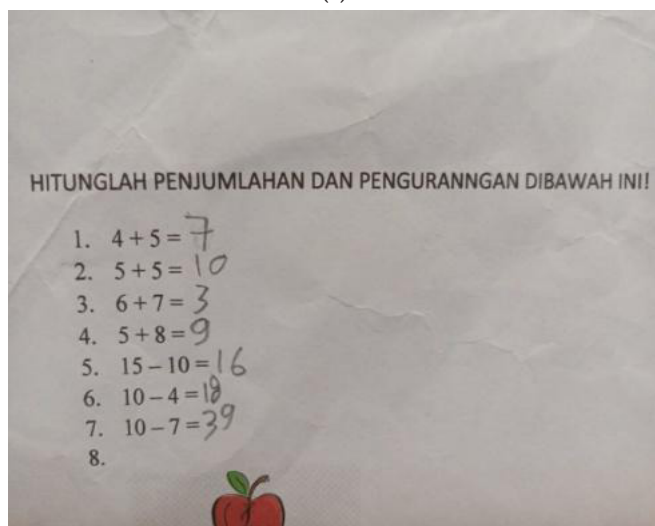
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(a)



(b)

**Fig.1:** (a) Students have not been able to sort numbers 1-20.  
(b) Students have not been able to add and subtract numbers 1-20.

numeracy skills (Farihah, 2017). The numeracy skills such as give name, sort, pair, and add up symbols and objects between 1-10. Suaeni (2022) added that the application of number stick media in learning could help teachers improve the ability to add arithmetic to Deaf students. The ability to count can be increased if the ice cream stick media is repeated. Addition and subtraction using ice cream stick media can positively impact students. Students are happier and have an increased interest in participating in mathematics learning. This ice cream stick media is a media that is easy to get and often used by students to play.

The numeracy skill is one of the most critical abilities for children. So the use of learning media is essential to solving problems for one deaf student in class IV Special School in Malang Regency. Based on the preceding, this study aims to see changes in the numeracy skills of deaf students at Malang Special Primary School in learning mathematics using ice

cream stick media. In connection with the theory that ice cream sticks can improve numeracy skills, the hypothesis we propose is that there is a change in the numeracy skill of deaf students before and after using Ice Cream Stick Media, whereas after using the media, it is better than before using the media.

## Research methods

This study uses an experimental approach to see changes in the numeracy skills of deaf students in learning. The type of experimental method used is single-subject research (SSR). This study determines changes in numeracy skills in learning with the help of ice cream stick media. One way of SSR research can use the A-B-A design (Sunanto, Takeuchi, & Nakata, 2006). The use of the A-B-A design to be implemented in sequence, (a) baseline-1 (A1) is carried out to determine the numeracy skills before learning, (b) implementation of the intervention (B) in this case learning using ice cream stick media, (c) baseline-2 (A2) was conducted to determine the numeracy skills after learning.

The research subject used is one of the deaf students who have problems with numeracy skills. The numeracy skills can be observed in the preliminary studies that have been carried out. The subject has been unable to count more than ten and sort the numbers correctly. So the subject is very suitable for this study because of the lack of numeracy skills. The study was conducted for two months, namely February and March 2022. A1 was carried out four times, B was carried out six times, and A2 was five times.

One deaf student who has not mastered numeracy skills is the subject of this study. The methods of collecting numeracy data are pre-test (A1) and post-test (A2). The test is adjusted to the students' initial conditions: the test questions, sorting, counting, addition, and subtraction. Two experts and three teachers validated the test instrument with results of 97.5% and 98.2%, respectively. So it can be concluded that the research test instrument is feasible.

Data analysis is done by looking at the conditions under conditions and between conditions. Analysis under conditions was carried out by describing six indicators, namely the length of the condition, the estimation of the direction of the trend, the trend of stability, the data trail, the level of stability and range, and the level of change in students' numeracy skills. At the same time, the analysis between conditions describes five indicators, namely many variables, changes in trend direction and their effects, changes in stable trends, changes in level, and percentage of overlap.

## RESULTS

### Implementation of Ice Cream Stick Media in Learning

Ice cream stick media is used in an integrated way in learning. The media steps in the learning used are (1) the teacher

distributes the media to the students; (2) the teacher explains the types of media used, such as colours (red, yellow, and purple), number boards, and counting boards; (3) the teacher writes examples of addition and subtraction problems up to 50 on the blackboard for practice using ice cream sticks; (4) students count ice cream sticks that have been colour according to the numbers to calculate addition and subtraction; (5) students write in the book the amount of the results of the assignments given by the teacher.

The implementation of learning is done repeatedly. The teacher explains the operations of adding and subtracting numbers from one to 50 based on predetermined steps. Ice cream stick media is used so that students learn while playing.

During the first session, students were still less thorough when working on questions, but students were able to respond well. Students are still trying to count using fingers. In the second session, improvement was seen in counting, although he still needed help. Before being given a question, students work on the counting board on the media, matching the numbers on the number of ice cream sticks. During the work on the students' counting mistakes, the teacher must remind the students several times. The responses given by the students during the second session were very good. Then in the third and fourth sessions, students worked on the counting board. Almost all students' answers were correct and careful when matching numbers. When working on the questions, students have an increase in counting, and the responses given by students are very good. Finally, in the fifth and sixth sessions, students worked on the questions correctly and carefully sorting and adding up questions.

### Data analysis

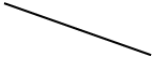





The results of the analysis of this study can be seen in Table 1 for analysis under conditions and Table 2 for analysis between conditions. At the baseline-1 stage (A1) the data changed from 60% - 40%, in the intervention (B) the data changed from

78% - 96%, while at baseline-2 (A2) the data changed from 80% - 86%. the baseline-1 (A1) condition, the baseline-1 (A1) condition is marked with a blue line which has the lowest value of 40% and the highest value of 60%. The intervention condition (B) is marked with a red line which has the lowest value of 78% and has the highest score of 96%, while baseline-2 (A2) is marked with a green line which has the lowest score of 80% and the highest value of 93%. The overall results for conditions A1 (blue line), B (red line), and A2 (green line) can be seen in Figure 2.

In the implementation of the first session, second session, third session, and fourth session on baseline-1 (A1) conditions, students when given a question immediately worked on it. During the working time on the sorting question, the numbers 1 to 50 students were quite calm even at the time of correction. The condition of students when working on addition and subtraction arithmetic problems are quite calm, and counts using their fingers even though there are still many wrong answers. In addition, when working on addition and subtraction counting problems using pictures, students count using pictures correctly but experience errors when writing numbers. Students have low numeracy skills before being given the intervention (B) in the baseline-1 condition (1A). The length of the condition at baseline-1 (A1) was four sessions with scores of 60%, 46%, 53%, and 40%.

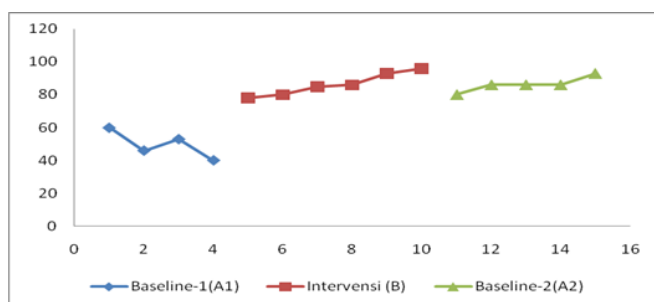
The intervention condition (B) was carried out for six sessions. In the learning process, the intervention condition (B) increases enthusiasm for learning. Before working on the questions, the students played and counted using ice cream sticks. Students are very enthusiastic and very thorough in working on the questions. And the students' responses throughout the session were very good. Students have increased numeracy skills after being given learning using ice cream stick media (intervention B). The length of the condition until the data is stable is six sessions, with the acquisition of learning implementation scores obtained at 78%, 80%, 85%, 86%, 93%, and 96%.

**Table 1:** Analysis of Deaf Students' Numeracy Skills Conditions in Mathematics Learning by Using Ice Cream Stick Media

Condition	A1	B	A2
Condition Length	4 times	6 times	5 times
Estimation of Directional Tendency	 (-)	 (+)	 (+)
Stability Tendency	75% Unstable	83% Stable	100% Stable
Trace Data	 (-)	 (+)	 (+)
Stability Level and Range	Unstable 60%-40%	Stable 78%-96%	Stable 80%-93%
Change Level	-20% (60→40)	+28% (78→96)	+13% (80→93)

**Table 2.** Analysis of Deaf Students' Numeracy Skills Conditions in Mathematics Learning by Using Ice Cream Stick Media

Condition	B/A1	A2/B
Variables	2	2
Changes in Direction and Effects	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <math>\diagup</math> (+) </div> <div style="text-align: center;"> <math>\diagdown</math> (-) </div> </div>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <math>\diagup</math> (+) </div> <div style="text-align: center;"> <math>\diagup</math> (+) </div> </div>
Stable Trend Change	Stable to Unstable	Stable to Stable
Level Change	-56% (96→40)	3% (93→96)
Overlap Percentage	0%	0%

**Fig. 2:** Conditions score of A1, B, and A2 in Deaf Students

Baseline-2 condition (A2) is a condition that is carried out to describe how much influence the intervention (B) has on the difference after receiving treatment in the form of learning using ice cream stick media. The baseline-2 (A2) condition was carried out for five sessions. During the learning process, the numeracy skills of deaf students tend to increase. In this condition, students work smoothly and carefully in this condition, and there are not so many questions. The students' numeracy skills did not find an extensive modification of the intervention condition (B). The length of the condition until the data stabilized was five sessions with scores of 80%, 86%, 86%, 86%, and 93%. Based on the data findings, there is a change in the numeracy skill of deaf students before and after using Ice Cream Stick Media. Students' numeracy ability from one to ten is better after using Ice Cream Stick Media, so the hypothesis is accepted.

## DISCUSSIONS

This study found that there were problems with the numeracy skills of the Deaf students. The numeracy skills is one of the essential skills that can be implemented in everyday life. Numeracy skills are a sic to learning mathematics (Aisyah, 2007). The numeracy skills require reasoning and algebraic skills, including arithmetic operations (Sukardi in Sulis, 2007). Every child to develop numeracy skills starts from the environment closest to him (Susanto, 2011). Efforts to overcome the problem of numeracy in students need to pay attention to the stage of cognitive development so that the

learning method presented can facilitate students in the learning process.

In this study, it was proven that the ability of deaf students to learn using ice cream sticks media had increased. In line with this, learning mathematics using ice cream stick media can increase learning activities (Sari, 2016) and improve students' initial numeracy skills (Farihah, 2017; Suaeni, 2022; Tahir, 2022). In addition, learning about increasing the ability to recognize number concepts through the media of ice cream sticks in Kindergarten stated that there was an increase in cognitive ability and had a good influence on increasing students' numeracy skills (Nurhayati & Kharizmi, 2020). Another option, effective learning media, to improve cognitive abilities in elementary school students' teaching and learning process are traditional games (Nataliya, 2015), Jarimatika approach (Al Musthafa, & Mandailina, 2018), Sempoa (Rahmi, Saputra, Desriati, & Fatmawati, 2020), Card Game (Singh et al., 2021).

The numeracy skills is a very important material in the learning process at school because numeracy skills are essential in learning mathematics. However, deaf children have not been able to do well, so appropriate learning media assistance is needed to handle these problems. Learning media such as teaching aids can increase enthusiasm in learning mathematics; children are happier, stimulated, interested, and have a positive attitude toward teaching (Arsyad, 2017; Sri, 2008). In addition, the application of discussion methods and ice cream stick media in learning has greatly influenced student learning outcomes and motivation (Arsyad & Suhaemi, 2019). Ekayani (2017) also said that learning media can improve student learning achievement.

Learning by using ice cream stick media, the material presented can be easily understood by students, student responsibility for assignments is high, and it helps students be actively involved. In addition, teachers efficiently provide learning materials to students (Arsyad & Suhaemi, 2019). Beside to efficiently provide learning materials, learning by ice cream stick media can combine with Problem Based Learning model to improve students' communication skills in primary school (Kusmiatin, 2019).



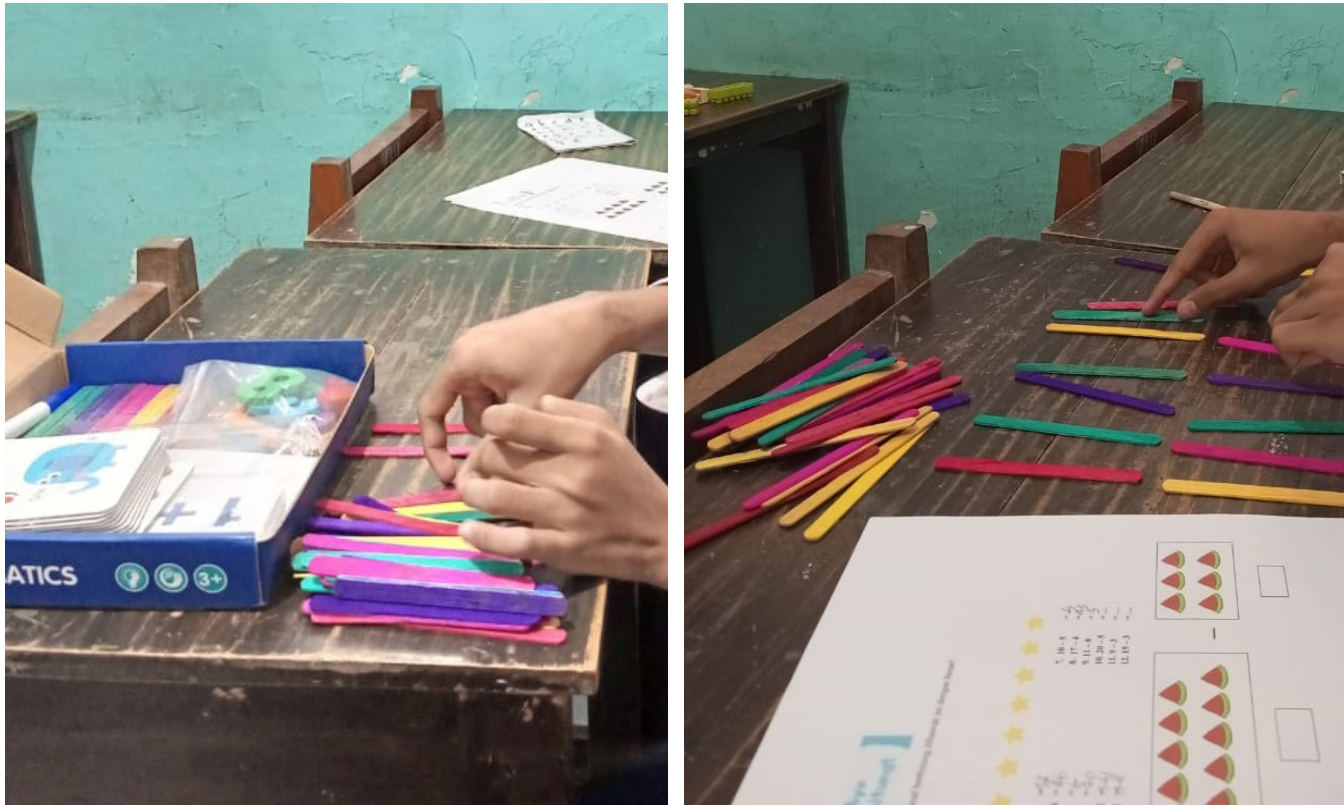


Fig. 3: Ice cream sticks media in learning

The current study measures the ability to count by using a test. The test can measure the knowledge and understanding of deaf students (Akram, Mehboob, Ajaz, & Bashir, 2013; Kurz, Schick, & Hauser, 2015; Mousley & Kurz, 2015). For example, in understanding the size of fractions, the results show that deaf students can compare two fractions (Mousley & Kurz, 2015). But they still have difficulty sorting some scraps from the smallest to the largest. Likewise, efforts to train students' mathematical numeracy skills have had mixed success (Kroesbergen et al., 2014; Raghubar & Barnes, 2017; Ramani et al., 2019). This success is based on children's mathematical knowledge that comes from the environment before formal schooling plays an important role in their future success. In particular, children's early-school mathematical knowledge varies widely (Starkey et al., 2004). These early math skills highly predict their subsequent math and reading skills (Duncan et al., 2007; Jordan et al., 2009; Nguyen et al., 2016; Watts et al., 2014).

In the current study, the media selected were in the form of ice cream sticks made of pine wood, measuring 12 cm x 1 cm x 1.8-2 mm, which had passed the refining stage, so it was safe and hygienic. In addition, ice cream sticks are very easy to get, the price is cheap, and can be used for other learning. Ice cream sticks media can also be made in attractive colors (as in Figure 3).

## CONCLUSION

Learning mathematics using ice cream stick media on deaf students at Special School in Malang can change their numeracy skills in a positive direction. The post-test results of students' numeracy skills were higher than the pre-test. The difference in numeracy skills of fourth-grade deaf students before and after learning to use ice cream stick media was 60%-40% and 80%-93%. The results of this study indicate that it is possible that learning by using ice cream stick media influences the numeracy skills of deaf students. Because it has not been analyzed statistically regarding the effect test, it is necessary to do further research. In addition, it is possible that ice cream sticks media can be used in heterogeneous classes (this research is in classes with deaf students), such as inclusive schools.

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