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Visual Thinking Profile of Deaf Students in Calculation

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ABSTRACT
The purpose of this study was to obtain a visual thinking profile of deaf students in counting. The research method used is qualitative research. The research subjects were students of SLBN Karangrejo Wungu Madiun. Data were collected through a task-based interviews in a semi-structured manner. Time triangulation was used to obtain saturated and valid data. Data were analysed through the stages of data exposure, interpretation, categorization, and drawing conclusions. Results of this study indicate that the stages of visual thinking of deaf students to addition namely: making lines/dots, making lines/dots again, counting lines/dots as a whole, so get the answer, while the stages of visual thinking of deaf students to subtraction, namely: making lines/dots, subtracting by crossed out, counting lines/dots that are not crossed out, so get the answer. In addition, the stages of visual thinking of deaf students to multiplication, namely: making groups, making lines/dots on groups, counting lines/dots as a whole, so get the answer, while the stages of visual thinking of deaf students to division, namely: making lines/dots, grouping, counting the/dots on group, so get the answer. To indicate the subject's profile on calculation, lines represent the mental imagery of sticks, while dots represent mental imagery of small stones or marbles.

Keywords: *Visual thinking, Deaf students, Counting.*

1. INTRODUCTION

It is undeniable that some students are deaf. Deafness is a disorder or obstacle experienced by children so that it is difficult to hear. The result of listening difficulties is that students have difficulty imitating. The next result, deaf students also have difficulty in verbal communication. Some deaf students also become speech impaired. Because of this disorder, deaf and speech-impaired students have difficulty communicating so it is difficult for their interlocutors to understand.

Deaf students can still learn mathematics well. Deaf students can still learn to count. Students with hearing impairment can learn to add, subtract, multiply, and divide. These basic mathematical skills are needed in life. Most people judge deaf students like idiots. Deafness experienced by students is often judged to cause difficulties to develop like other students of their age. Like students in general, deaf students also learn through concrete, visual, symbolic, and formal stages. In this article, we will discuss the visual thinking profile of deaf students in counting.

Visual thinking is important because it can help students in learning mathematics. Visual thinking can help students understand the concept of [1]. Visual thinking can help students in solving math problems [2]. However, in learning, we often focus on formalities so that many students are less skilled at visual thinking [3]. Visual thinking is often used by ordinary students in counting [4].

Counting skills are needed in everyday life. Numeracy skills can be learned. The subject matter that focuses more on increasing numeracy is mathematics. Basic numeracy skills can be categorized into 4 groups, namely: adding, subtracting, multiplying, and dividing. Besides being used for everyday life, these basic counting skills are also used as the basis for learning advanced mathematics. An educational curriculum for children with special needs is very necessary so that children with special needs can prove that they can live a normal life and also have abilities like those of others [5].

Basic numeracy skills are also very much needed by deaf students. Maybe because it is a minority group, so there has never been a study on the numeracy skills of deaf students. At least, researchers have never gotten an article regarding this. The purpose of this study was to obtain a visual thinking profile of deaf students in counting, namely: 1) to obtain a visual thinking profile

of deaf students in adding, 2) to obtain a visual thinking profile of deaf students in subtracting, 3) to obtain a visual thinking profile. deaf students in multiplying, and 4) to get a visual thinking profile of deaf students in dividing.

Several experts have developed learning tools for students with special needs. There is developed a mathematics textbook that can be used in class XII SLB for deaf students [6]. In general, the sentences used by deaf students are very simple with less regular sentences so that the meaning of the sentences cannot be understood by others [7].

This research is important to obtain a visual thinking profile of deaf students in counting. The results of this study provide an overview of the visual thinking process of deaf students in counting. The results of this study provide an overview of teachers to know the visual thinking process of deaf students so that they can make the right decisions in using learning models or methods. The results of this study provide an overview of parents to know the visual thinking process of deaf students so that they can be more patient when guiding students to learn.

2. METHODS

The research method used to obtain a visual thinking profile of deaf students in counting is qualitative. The research subjects were students of SLBN Karangrejo, Wungu District, Madiun Regency, East Java Province, Indonesia. The research time is July 2021.

The purpose of this study was to obtain a visual thinking profile of deaf students in counting addition, subtraction, multiplication, and division. Therefore, it is necessary to develop instruments, collect data, triangulate data, and analyze data.

The instruments needed are question sheets and interview guidelines. Questions are used to obtain field notes and the subject's initial answers. Before being used, the questions were consulted with the class teacher to ensure that data was obtained and it was not too difficult or easy for students. The result of the consultation is in the form of a wide validation of the questions that will be given to the subject. The interview guide was developed based on the interview process. The interview guide is structured so that the interview questions are structured and ensure that the data is natural, broad, and comprehensive.

After the auxiliary instrument is ready, data collection is carried out. The first step of data collection is to give questions to students. While working on the problem, documentation is carried out. Furthermore, the results of student work are used as a reference for interviews. When interviewing, an interview guide was used. During the interview, the recording was done. Interviews were conducted in a semi-structured manner. This is intended to be able to follow the subject's line of thought.

Furthermore, the data from the interviews were triangulated. Data triangulation is used to obtain valid data. The triangulation technique used is time triangulation. At an interval of 2 weeks, subjects were asked the same or almost the same questions according to the interview guidelines. Time triangulation was also carried out to obtain saturated data. During triangulation, data exposure, coding, and categorization were carried out.

After obtaining valid data, data analysis was carried out. Data analysis was carried out by interpreting, searching data, categorizing, and drawing conclusions. Data interpretation was carried out based on field notes and interview results. Data tracing is carried out to confirm the correctness of the data with the help of coding. Categorization is done based on the problem or research focus. Conclusions were drawn to get the thinking profile of deaf students in counting.

3. RESULTS AND DISCUSSION

The results of the study provide a visual thinking profile of deaf students in counting. The research subject was named Abrori. Abrori is a deaf student at SLBN Karangrejo, Wungu District, Madiun Regency, East Java, Indonesia. His hearing loss caused him to also have a speech impediment. With the help of the teacher and the willingness of the subject to communicate, we can obtain a visual thinking profile of deaf students in counting addition, subtraction, multiplication, and division.

3.1. Visual Thinking Profile of Deaf Students in Addition Counting

To get a visual thinking profile of the subject in calculating addition, the subject is given the following problem.

$$3 + 4 + 5 + 7 = \ldots.$$

After understanding, the subject plans and implements the problem solving which is represented in the form of III + IIII + IIIIII + IIIIIII = 19.

The field notes above are a representation of the subject's answers. There are several steps taken by the subject to calculate the sum above. The subject's first step is to make 3 straight lines, make 4 straight lines, make 5 straight lines, and make 7 straight lines. The second step is to make one of these lines (this step is represented by giving a + sign between the parts). The third step is to calculate the overall straight line. So, the subject has 19 answers for the calculation of the sum above.

The results of more in-depth interviews showed that students imagined straight lines such as sticks or logs used for counting above. This shows that the subject thinks visually because students have used mental imagery in the thinking process. The mental image of straight lines of the subject is a stick. Representation of the mental image of straight lines of the subject is in the form of a straight line.

On several occasions, the subject did not use a straight line as above in calculating the addition. On several occasions, the subject uses dots. Student representation of 3 + 4 + 5 + 7 is ֍ ֍ ֍ + ֍ ֍ ֍ ֍ + ֍ ֍ ֍ ֍ ֍ + ֍ ֍ ֍ ֍ ֍ ֍ ֍. When finished drawing the points or small circles. The subject counts the number of existing points or small circles. In the final calculation, the subject does not pay attention to the "+" notation. The subject only pays attention to the points or small circles made. So, the result of calculating the sum above is 19.

The results of in-depth interviews showed that students imagined these points as small stones or marbles used to count additions. This shows that students think visually because students have used mental imagery in the thinking process. Students' mental images are small stones or marbles represented in the form of dots or small circles.

The results of further interviews showed that the subject imagined sticks or wooden sticks or small stones or marbles in counting additions because in the previous lesson, namely early counting, the teacher often used sticks or small stones or marbles. This shows that students' mental imagery is influenced by previous learning.

In the final calculation, the subject does not pay attention to the "+" notation. Subjects only pay attention to straight lines or points or small circles made. This shows that the subject chooses the thought process. This is in accordance with the results of Darmadi's research that the visual thinking process of students is through the stages of building mental imagery, processing (complete and perfecting) mental imagery, and representing mental imagery.

In multiplication counting, deaf students think visually. Deaf students are said to think visually because they use mental imagery in processing information in the mind. The mental imagery of deaf students is a straight line or point. A straight line is a representation of a stick or stick. The dot is a representation of a small stone or marble.

3.2. Visual Thinking Profile of Deaf Students in Subtraction Counting

To get a visual thinking profile of the subject in subtraction counting, the subject is given the following problem.

$$19 - 7 = \ldots.$$

After understanding, the subject plans and implements problem-solving which is represented in the form of I I I I I I I I I I I ~~I I I I I I~~ = 12. For this, first the subject gives 19 lines "I I I I I I I I I I I I I I I I I I I". Then, the subject crossed out the 7 lines "I I I I I I I I I I I ~~I I I I I I~~". Then, the subject counted the lines that were not crossed out "I I I I I I I I I I I I I". So, students get the answer that "19 – 7 = 12".

The field notes above are a representation of the subject's answers. There are several steps taken by the subject to calculate the multiplication above. The subject's first step is to make 19 straight lines. The second step is to subtract the lines (this step is represented by crossing out 7 straight lines). The third step is to calculate the straight line that is not crossed out. So, the subject has 12 answers for the calculation of the subtraction above.

The results of more in-depth interviews showed that students imagined straight lines such as sticks or logs that were used to calculate subtraction. This shows that the subject thinks visually because students have used mental imagery in the thinking process. The students' mental images are sticks or sticks that are represented in the form of straight lines.

On several occasions, the subject did not use a straight line as above in the calculation. On several occasions, the subject uses dots. Student representation of 19 – 7 is ֍ ֍ ֍ ֍ ֍ ֍ ֍ ֍ ֍ ֍ ֍ ֍ ~~֍ ֍ ֍ ֍ ֍ ֍ ֍~~. When finished describing the points, students count the number of points that are not omitted or that are not crossed out. In the final calculation, the subject did not pay attention to the crossed-out points. Subjects only pay attention to the points that are not crossed out ֍ ֍ ֍ ֍ ֍ ֍ ֍ ֍ ֍ ֍ ֍ ֍. So, the subject's answer is 12.

The results of in-depth interviews showed that students imagined these points as small stones or marbles used to learn to count. This shows that students think visually because students have used mental imagery in the thinking process. Students' mental images are small stones or marbles represented in the form of dots or small circles.

The results of further interviews showed that the subject imagined sticks or sticks or small stones or

marbles in multiplication counting because, in the previous lesson, namely early counting, the teacher often used sticks or sticks or small stones or marbles. This shows that students' mental imagery is influenced by previous learning.

In the final calculation, the subject does not pay attention to the crossed outline or point. Subjects only pay attention to straight lines or dots that are not crossed out. This shows that the subject chooses the thought process. This is in accordance with the results of Darmadi's research that the visual thinking process of students is through the stages of building mental imagery, processing (complete and perfecting) mental imagery, and representing mental imagery.

In multiplication counting, deaf students think visually. Deaf students are said to think visually because they use mental imagery in processing information in the mind. The mental imagery of deaf students is a straight line or point. A straight line is a representation of a stick. The dot is a representation of a small stone or marble.

3.3. Visual Thinking Profile of Deaf Students in Multiplication Counting

To get a visual thinking profile of the subject in multiplication counting, the subject is given the following problem.

3 x 4 = ?

After understanding, the subject plans and implements the problem solving which is represented in the form of III + III + III + III = 12 or IIII + IIII + IIII = 12.

The field notes above are a representation of the subject's answers. There are several steps taken by the subject to calculate the multiplication above. The first step of the subject is to make 3 straight lines in 4 groups. The second step is to make the lines one (sometimes this step is represented by putting a + sign between the parts). The third step is to calculate the overall straight line. So, the subject has 12 answers for the multiplication calculation above.

The results of more in-depth interviews showed that students imagined straight lines such as sticks or sticks used to learn to count. This shows that students think visually because students have used mental imagery in the thinking process. The students' mental images are sticks or sticks that are represented in the form of straight lines.

On several occasions, the subject did not use a straight line as above in the calculation. On several occasions, the subject uses dots. Student representation of 3 x 4 is ֍ ֍ ֍ + ֍ ֍ ֍ + ֍ ֍ ֍ + ֍ ֍ ֍ or ֍ ֍ ֍ ֍ + ֍ ֍ ֍ ֍ + ֍ ֍ ֍ ֍. When finished describing the points, students count the number of dots that exist. In the final calculation, the subject does not pay attention to the + notation. The subject only pays attention to the points made ֍ ֍ ֍ ֍ ֍ ֍ ֍ ֍ ֍ ֍ ֍ ֍. So, the subject's answer is 12.

The results of more in-depth interviews showed that students imagined these points as small stones or marbles used to learn to count. This shows that students think visually because students have used mental imagery in the thinking process. Students' mental images are small stones or marbles represented in the form of dots or small circles.

The results of further interviews showed that the subject imagined sticks or sticks or small stones or marbles in multiplication counting because, in the previous lesson, namely early counting, the teacher often used sticks or sticks or small stones or marbles. This shows that students' mental imagery is influenced by previous learning.

In the final calculation, the subject does not pay attention to the "+" notation. Subjects only pay attention to straight lines or points made. This shows that the subject makes a choice in the thought process. This is in accordance with the results of Darmadi's research that the visual thinking process of students is through the stages of building mental imagery, processing (complete and perfecting) mental imagery, and representing mental imagery.

In multiplication counting, deaf students think visually. Deaf students are said to think visually because they use mental imagery in processing information in the mind. Mental imagery of deaf students is a straight line or point. A straight line is a representation of a stick or stick. The dot is a representation of a small stone (gravel) or marble.

3.4. Visual Thinking Profile of Deaf Students in Division

To get the visual thinking profile of the subject in the calculating division, the subject is given the following problem.

12: 4 =?

After understanding, the subject plans and implements the problem solving which is represented in the form III III III III so that 12: 4 = 3.

The field notes above are a representation of the subject's answers. There are several steps taken by the subject to calculate the division above. The subject's first step is to make 12 straight lines. The second step is to group the lines into four sections (several occasions this step is represented by assigning a circle to each section). The third step is to calculate a straight line on one of the sections. So, the subject has 3 answers for the calculation of the division above.

The results of more in-depth interviews showed that students imagined straight lines such as sticks or sticks used to learn to count. This shows that students think visually because students have used mental imagery in the thinking process. The students' mental images are sticks or sticks that are represented in the form of straight lines.

On several occasions, the subject did not use a straight line as above in the calculation. On several occasions, the subject uses dots. Student representation is ֍ ֍ ֍ ֍ ֍ ֍ ֍ ֍ ֍ ֍ ֍ ֍. When finished describing the points. Students count the number of dots that exist. In the final calculation, the subjects just have to pay attention to the number ֍ on each part (on several occasions this step is represented by assigning a circle to each section). The subject only pays attention to the points made. So, the subject's answer is 3.

The results of more in-depth interviews showed that students imagined these points as small stones (krikil) or marbles used to learn to count. This shows that students think visually because students have used mental imagery in the thinking process. Students' mental images are small stones or marbles represented in the form of dots or small circles.

The results of further interviews showed that the subject imagined sticks or small stones or marbles in multiplication counting because, in the previous lesson, namely early counting, the teacher often used sticks or sticks or small stones or marbles. This shows that students' mental imagery is influenced by previous learning.

In the final calculation, the subject did not pay attention to the distance or the circle mark. Subjects only pay attention to straight lines or points made. This shows that the subject chooses the thought process. This is in accordance with the results of Darmadi's research that the visual thinking process of students is through the stages of building mental imagery, processing (complete and perfecting) mental imagery, and representing mental imagery.

In multiplication counting, deaf students think visually. Deaf students are said to think visually because they use mental imagery in processing information in the mind. The mental imagery of deaf students is a straight line or point. A straight line is a representation of a stick or stick. The dot is a representation of a small stone (gravel) or marble.

4. CONCLUSION

The results of the study provide a visual thinking profile of deaf students in counting. There are several steps that deaf students take to calculate addition, namely: making straight lines or points according to what will be counted, making these lines (usually represented by giving a + sign between the parts), calculating straight lines or points. -point as a whole, so that students get answers. There are several steps that deaf students take to calculate subtraction, namely: making straight lines or points as many as the number to be subtracted, subtracting the line or points (usually represented by crossing out a number of subtracting numbers), counting straight lines that are not crossed out. So that students get answers to the calculation of subtraction. There are several steps that deaf students take to count multiplication, namely: making straight lines or dots as many as groups, making one of these lines (usually represented by giving a + sign between the parts), counting straight lines or dots. as a whole, so that students get answers.There are several steps that deaf students take to calculate division, namely: making straight lines or points, grouping these lines into parts (usually represented by giving a circle for each part), calculating straight lines or points on the division. one part so that students get answers. The results of more in-depth interviews showed that students imagined straight lines such as sticks or sticks used to learn to count. The students' mental images are sticks or sticks that are represented in the form of straight lines. The mental imagery of the students is small stones or marbles which are represented in the form of dots or small circles. The mental images of speech-impaired students are straight lines or dots. A straight line is a representation of a stick or stick. The dot is a representation of a small stone (gravel) or marble. Students think visually because students have used mental imagery in the thinking process. Another finding from this study is that students' mental imagery is influenced by previous learning.

AUTHORS' CONTRIBUTIONS

The author's contribution is as a researcher as well as correspondence in writing this article.

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