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Identification of Problem Solving Abilities of Deaf Students In Pictorial Math Problems

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Abstrak. Deaf students have limitations in language, so they have difficulty in solving story problems. The use of mathematical problems with pictures makes the information about the questions readable with the use of few terms and language. However, it is possible for deaf students to have different terms so that they have different misconceptions or ways of solving them. the approach used is qualitative research with case studies. The subjects involved were deaf students without mental and intelligence disorders as many as 5 students at SLB-B YPPALB Magelang City. Collecting data using written tests and interviews which are then analyzed through triangulation of sources. The results obtained are deaf students are not familiar with pictorial questions so it takes longer. Based on the indicators of problem solving ability, deaf students have difficulty in interpreting the meaning of the questions so that there are errors in working on the questions. Errors that occur are errors in the concept used, calculating errors, and errors in the use of formulas.

Key words: deaf students, problem solving skills, pictorial math problems

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INTRODUCTION

Deaf people are people who have lost the ability to hear so that they hinder the process of language information through their hearing, either using or not using hearing aids where the hearing limit they have is sufficient to allow the success of the process of language information through hearing (Hansen et al., 2018; Marschark & Knoors, 2012). Students with hearing loss have limitations in language and communication. However, deaf students without intellectual impairment actually have the same abilities as regular students. It's just that due to language and communication limitations, deaf students experience delays in knowledge compared to regular students up to 2-3 levels (Borgna et al., 2018; Frostad, 1999).

Based on data from the Central Bureau of Statistics in 2022, in Indonesia there are around 17 million people with disabilities entering the productive age. From this data, there are about 7% of people with hearing disabilities. These data indicate that there are still many student populations whose characteristics need to be understood. In addition to the inability to hear, the direct impact felt by deaf students is the limitation of communication and speaking (Ariapooran, 2017; Ismaili & Ibrahimi, 2017).

Deaf students have limitations in communication and knowledge resulting in hearing loss in learning mathematics. however, deaf students have good abilities in the visual aspect (Abdallah & Fayyoumi, 2016; Straetz et al., 2002). The characteristic that stands out from the physical aspect of deaf children is fast hand movements. This is because the hand is used as a communication tool. The second characteristic is the bent body shape. Deaf children often also experience disturbances in their body balance (Swanwick et al., 2016).

In learning mathematics, students are expected to be able to build new knowledge, solve problems that arise by involving mathematics in other contexts, apply and adapt various strategies that are suitable for solving problems, and observe and develop problem solving processes (NCTM, 2000). Problem solving ability is also a basic ability that needs to be achieved by students. The importance of mathematical problem solving skills has not been matched by Indonesia's achievements in mathematics (Runco, 2020). This can be seen from the results of Indonesia's participation in the major international assessments of the Program for International Students (PISA) and the Trend in International Mathematics and Science Survey (TIMSS).

According to NCTM (2000), problem solving ability can be measured by six indicators, namely 1) defining concepts verbally or in writing, 2) identifying and making examples and not examples, 3) using models, diagrams, and symbols to represent a concept, 4) changing one

form of representation to another, 5) recognizing the various meanings and interpretations of a concept, and 6) identifying the characteristics of a concept and recognizing the conditions that determine a concept. In this study, the indicators used are 1) identifying concepts, characteristics and requirements verbally or in writing, 2) identifying and making examples and not examples, 3) representing a concept in other forms, such as diagrams and symbols, and 4) know various concepts simultaneously.

Based on the explanation above, it can be seen that problem solving ability has an important role. Some conditions of deaf students refer to questions that stimulate their visuals with makeshift language conditions. Therefore, the questions used in this study are in the form of pictures with descriptions and simple language. Based on the above conditions, researchers are interested in describing the identification of the mathematical problem solving abilities of deaf students in solving pictorial math problems.

METHODS

This research was conducted with descriptive qualitative method. Descriptive method is the description of things that are done objectively with the aim of accurately representing the facts and quality of objects, while qualitative is research with the aim of interpreting various phenomena experienced by the subject with verbal descriptions. and language of a special nature with various appropriate methods. The approach taken is a case study. That is, this research activity aims to describe in depth related to the condition of problem solving abilities carried out by deaf students in mathematical problems in the form of pictures.

The research location is at SLB-B YPPALB Magelang City. The subjects involved were nine deaf students. The deaf students involved were deaf students with mild to severe categories without intelligence disorders. Deaf students can communicate using standard Indonesian sign language (SIBI) or sign language with local dialects (BISINDO). The research was conducted from May to June 2022.

The research stages that have been carried out include preparation, implementation, data reduction, and data analysis. The preparation stage is carried out by compiling the required instruments, namely the test questions of mathematical problem solving abilities in the form of pictures. At the implementation stage, it is done by giving tests to deaf students and interviews. The data reduction stage is carried out by removing irrelevant and unnecessary data. The data analysis stage is carried out by examining the data with related theories, research, and previous data. The data validity technique used is triangulation technique, namely subject interview data compared to problem solving ability test data.

RESULTS AND DISCUSSION

The pictorial problem-solving ability test questions consist of 11 questions. Figure 1 below shows answers from subjects related to the measurement material.

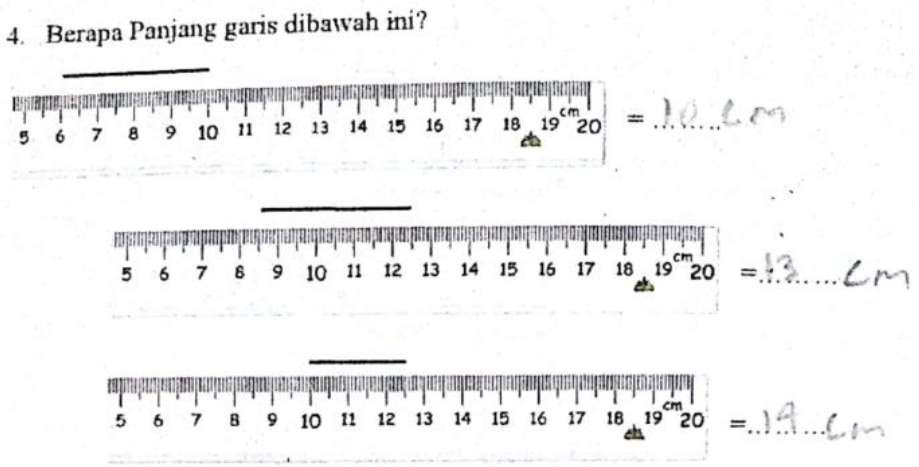

Figure 1. Subject's answer to item number 4

In item 4, the subject is asked to measure the length of the line above the ruler. The ruler that appears in the picture does not start at the number 0, this is a distraction for the subject in the aspect of accuracy. In Figure 1 it can be seen that the subject misinterpreted the existing line

drawing. In the problem of the subject is asked to interpret the concept of measurement. The subject misinterprets the image of the measuring instrument into the concept of measurement. In fact, in the first ruler image in Figure 1, the line segment starts at point 6 and ends at point 10. The subject only interprets at the end point of the line, which is point 10. So the subject measures the length of the line is 10. Likewise, the same thing in the picture the second and third rulers, the subject misinterpreted the end points of the line, namely 13 and 14.

In Figure 2 below, the results of the work of the subject in point 5 on the topic of number lines are shown.

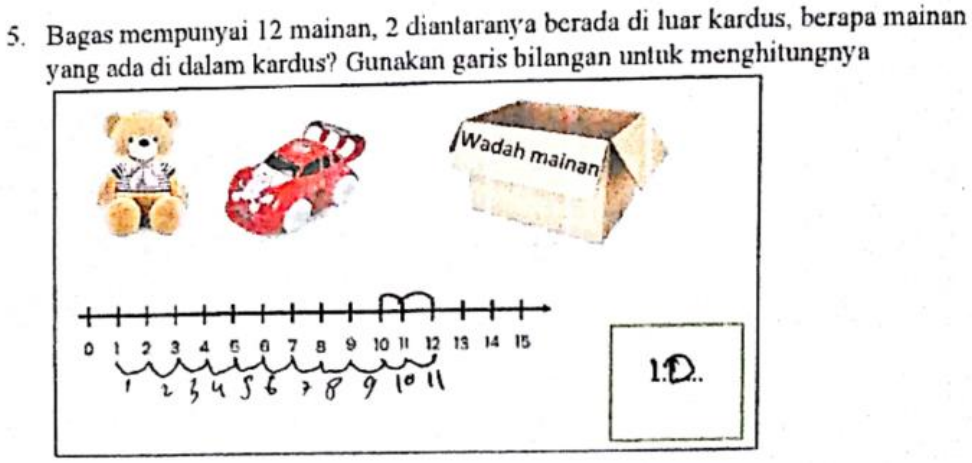

Figure 2. Subject's answer to item number 5

In Figure 2, the results of the subject's work in point 5. The problem is related to the topic of the number line, the concept of negative numbers, and integer operations. The subject can understand the problem and the purpose correctly. However, in interpreting on the number line the subject does not start at the number 0. The subject correctly describes that the toys that are outside the box are depicted on the number line in the range of numbers 10 to 12. The subject correctly marks the number line. The subject can also correctly calculate the integer operations referred to in the problem.

Figure 3 shows the results of the subject's work related to integer operations.

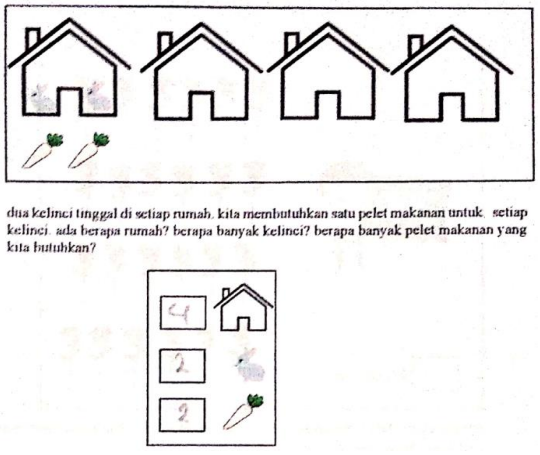

Figure 3. Subjects' answer to item number 7

In Figure 3 it can be seen that the problem is related to the existence of a rabbit cage. The subject does not understand the question and the purpose of the question well. The subject seems to only count the number of pictures of rabbits, rabbit food, and the number of rabbit cages. The subject did not understand that the problem was that they were asked to count and fill the cage with the provision that each cage had two rabbits. Another stipulation that the subject did not understand was that each rabbit in the cage needed one food. However, the subject only counted the number of cages, rabbits, and food in the problem, namely four cages, two rabbits, and two food items.

Based on the explanation above, deaf students on several items with long details turned out to have difficulty. The difficulty is due to their limited linguistic condition (Blatto-Vallee et al., 2007; Marschark et al., 2013; Zarfaty et al., 2004). Vocabulary and sentence structure of deaf students are often different from regular students (Straetz et al., 2002; Vosganoff & Paatsch, 2011), so that it is possible to become the main obstacle for deaf students in solving math problems.

In addition, deaf students sometimes only focus on the existing pictures without paying attention to the details of mathematical problems that are not in the pictures. Picture questions

provide information to deaf students, but at the same time make the deaf students focus only on pictures. This is in line with one of the characteristics of deaf students, namely liking things that stimulate visuals (Blatto-Vallee et al., 2007).

CONCLUSION

Based on the indicators of problem solving ability, deaf students have difficulty in interpreting the meaning of the questions so that there are errors in working on the questions. Errors that occur are errors in the concept used, calculating errors, and errors in the use of formulas.

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