

## DIFFICULTIES OF DEAF STUDENTS IN SOLVING WORD PROBLEMS

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**Abstract.** The purpose of this study was to find out what difficulties were experienced by deaf students in solving word problems of integer arithmetic operations. This research used qualitative approach with a descriptive type of research. Data collection techniques used are tests and interviews that has been collected from 6 students of 7th grade in SMPLB YPTB Malang. The results of this study are; (1) Subjects with difficulty using the concept are caused because students have difficulty in remembering some conditions and expressed in mathematics terms that represent it; (2) Subjects with difficulty using the principle are caused because of they are not careful in carrying out calculations and difficult to state a principle, also cannot apply the principle; (3) The subject has difficulty solving verbal problems are caused of the subject only has a little understood vocabulary. This will have an impact on the subject's inability to use the data in the word problems, interpret the language or terms contained in it and the difficulty in drawing conclusions.

**Keywords:** Analysis; Difficulty; Deaf; Word Problems

### A. INTRODUCTION

One indicator of learning difficulties is the inability or difficulty of students in understanding mathematical concepts. Mulyadi (in Rusmawan, 2013) states that learning difficulties are a condition in the learning process which is indicated by the existence of certain obstacles in achieving learning goals. In line with this opinion, Reid (in Jamaris, 2014) revealed that a student is declared to have learning difficulties if the student cannot complete his assignments at school. This is in accordance with the opinion of Wahyudi (2010) that the weakness of mathematics experienced by students at school is due to the low ability of students to understand mathematical concepts.

Difficulties in learning are also experienced by deaf students or students with hearing impairments. Although many studies report that deaf students make progress in learning mathematics, they often cannot catch up with age (Swanwick, Oddy, and Roper 2005). This is in line with the statement of Husniati, et al. (2020) that if students in general still often experience difficulties in learning, especially in problem solving, then deaf students will also experience more difficulties due to their limitations. Leton, Wahyudin, and Darhim (2019) also stated that deaf students generally have normal or average intelligence, but because this intelligence is strongly influenced by language skills and development, the intelligence of deaf students is lower than that of normal students in general. This is because deaf students are less able to absorb information (language barrier), lack of vocabulary, difficulty in understanding language that contains abstract words.

Research on the difficulties of deaf students conducted by Kelly, Lang, and Pagliaro (2003) shows that deaf students have unreflective behaviour, minimal persistence in solving problems, and difficulties in transferring learning from one context to another. Deaf students show fairly good work results but are only limited to tasks involving one piece of information, but performance decreases when they have to integrate two or more pieces of information. Furthermore, Kelly, et al. (2003)

states that the result of this is that teachers tend to focus on practice and practice (drill) rather than problem solving, so that teachers seem to avoid cognitively challenging aspects of problem solving. As a result, deaf students are not involved in various mathematical solutions.

One of the obstacles for deaf students in the learning process is in completing the math assignments given by the teacher. Difficulties of deaf students in solving math problems often occur in the type of word problems (Ansell and Pagliaro 2006). This is because word problems involve general thinking skills such as analysis, attention to subject matter, the ability to understand information comprehensively, and use analogies to understand a problem (Marschark, Lang, and Albertini 2001). Meanwhile, learning difficulties in children who are deaf or hard of hearing are due to several factors, namely the impact of their hearing loss so that deaf students have few learning opportunities, as well as communication and language difficulties (Furth 1966; Rapin 1986). In line with this, Kelly and Mousley (2001) stated that when deaf students face a mathematical problem in the form of word problems, they will experience difficulties based on the problem of language limitations. Furthermore, Kelly and Mousley (2001) stated that deaf students tend to have intuitive thinking in interpreting the story problems given.

Deaf students have weaknesses in performing compositional addition operations, reasoning related to multiplication, ratios, and fractions (Nunes 2002). Furthermore, Nunes found that deaf students needed longer time to solve questions that contained basic numeracy and arithmetic skills. Cooney, Davis, and Henderson (1975) state that difficulties in solving math word problems can be grouped into three types, including; 1) difficulty using the concept; 2) difficulty using principles; and 3) difficulty solving verbal problems. Based on the background that has been mentioned, it is necessary to conduct research to analysis the difficulties experienced by class VII deaf students in solving integer operations word problems.

## B. MATERIAL & METHODS

This study uses qualitative research methods and descriptive research types. The subjects of this study were 9 deaf students of class VII SLB-B YPTB Malang who had received material on integer operations. The data collection technique used was a story problem test on integer operations and interviews. In this case, the interview was conducted with the help of the class teacher using sign language. Based on the results of the tests and interviews, an analysis was then carried out to determine the types of difficulties experienced by students.

## C. RESULT & DISCUSSION

Based on the results of the work of class VII deaf students in solving integer subtraction word problems, it was found that, information was obtained that some students experienced varying difficulties. These difficulties are categorized based on three types including:

### 1. Type of difficulty understanding the concept

Difficulties in understanding the concept experienced by deaf students in class VII (hereinafter referred to as S1), this can be seen in the results of student work listed in Figure 1 below.

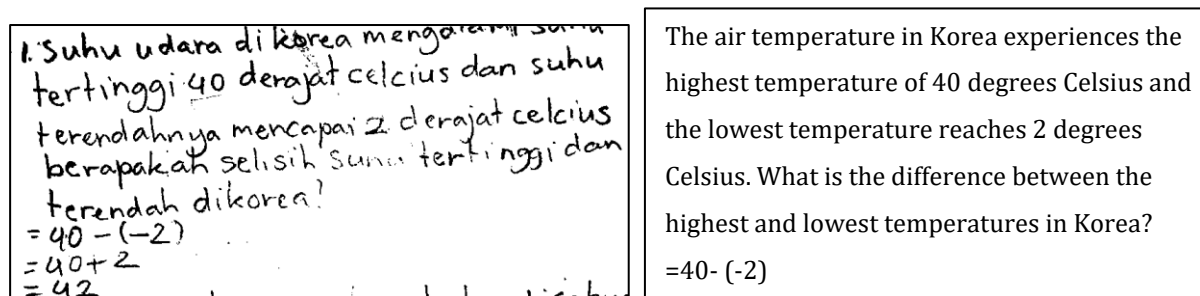


Figure 1. Results of S1 Test Answers

From Figure 1, information is obtained that S1 has taken the test with the correct answers, accompanied by correct arithmetic operations and mathematical sentences. However, S1 did not

write down what was known and was asked about it. This is supported by the results of the interview as follows:

- R : *When going to work on question number 1, were there any obstacles or difficulties in understanding the information from the question?*  
S1 : *Yes*  
R : *What is the difficulties you fell?*  
S1 : *I was confused at first, 40 is the highest degree and the lowest degree is indeed 2 or -2 because I thought the symbol (-) meant the degree was low. But after I try it can.*

Based on the results of the analysis of written tests and interviews, the difficulties experienced by S1 were at the stage of understanding the questions. This is because the subject still experiences problems when understanding the concept of negative numbers. In this case, S1 still hesitates in mentioning the lowest temperature with 2 or -2 degrees. The difficulty is because S1 thinks that the negative symbol is the lowest temperature, meaning that S1 has difficulty expressing the negative symbol to the term that represents it. So that the type of difficulty experienced by the S1 subject includes the type of difficulty using the concept that appears in the indicator of the inability to remember an object to be expressed in terms that represent it.

Furthermore, in planning the settlement strategy, S1 did not experience many difficulties. S1 can plan the steps for solving the problems given, even though at first S1 has difficulty understanding negative concepts. However, S1 has the motivation to improve his skills in solving questions as evidenced by the results of interviews that have been conducted with S1, when S1 experiences confusion he uses using streaks on paper to recalculate the questions given in order to overcome his confusion and do it correctly. This is evident from the following interview results.

- P : *okay, you're confused, right, what do you do then?*  
S1 : *I try to make a scratchwork first*  
P : *May I have a look?*  
S1 : *(showed the scratchwork)*  
P : *why do you try to scribble first? Why don't you just write the answer right away?*  
S1 : *Just to make sure my answer*

This shows that the difficulty in understanding the concept experienced by S1 can be overcome by trying to work on the problem and examining the correctness of the strategy to be implemented, which will then be used in solving the problem. In line with this, Ishak and Irmayanti (in Anditiasari, 2020) state that by improving the skills of solving problems on a regular basis, the subject will get used to processing questions, determining plans and looking for possibilities that occur in questions, and overcoming difficulties experienced in solving problems.

In the next aspect, the subject also has no difficulty in carrying out the planned completion strategy. This was also supported by the results of interviews which showed that there were no problems experienced by the subject on the indicators that existed in the type of difficulty using principles.

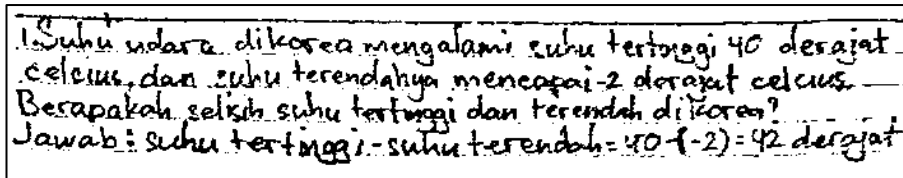
Finally, in the aspect of re-checking the results of the answers, the subject has no difficulty re-checking the results of the answers that have been obtained. This was also due to the thoroughness of the subject in reading and answering the story questions given. This is in accordance with the statement of Nunes (2002) that not all deaf students are weak in the accuracy of working on math problems, about 15% of deaf students are at a level above the average on their math tests.

Based on the analysis of tests and interviews on S1 it can be stated that S1 has difficulty remembering one or more conditions required by an object to be expressed in terms that represent it. These difficulties occur due to S1 being influenced by his personal opinion, so that the difficulties experienced by S1 are included in the type of difficulty using concepts.

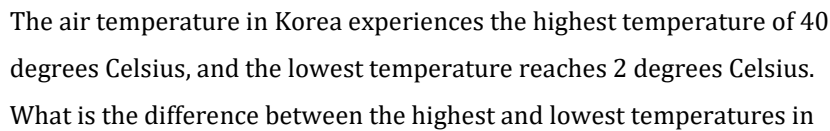
## 2. The type of difficulty uses the principle

Figure 2 below is the result of the work of a Masters subject who experienced a type of

difficulty using principles.



1. Suhu udara di Korea mengalami suhu tertinggi 40 derajat celsius, dan suhu terendahnya mencapai 2 derajat celsius. Berapakah selisih suhu tertinggi dan terendah di Korea?  
Jawab: suhu tertinggi - suhu terendah =  $40 - (-2) = 42$  derajat



The air temperature in Korea experiences the highest temperature of 40 degrees Celsius, and the lowest temperature reaches 2 degrees Celsius. What is the difference between the highest and lowest temperatures in

Figure 2. The results of the work of subject S2

Based on the analysis of test results and interviews that have been given to the S2, information is obtained that the S2 does not experience difficulties at the stage of understanding the questions. S2 can already use the facts from the given story problems. In addition, S2 also has no difficulties with the indicators contained in the difficulty of using the concept.

In addition, based on Figure 2, information was also obtained that S2 had answered the test with the right answers. However, S2 experienced difficulties in performing arithmetic operations, this can be seen from the following interview results.

R : Are you having difficulty determining the arithmetic operations?

S2 : At first I was confused about the difference

R : Oh, you mean you don't know what the difference is, have you not taught it before at school?

S2 : It's just that I forgot, but I kept remembering again and again

R : At first, how did you write it down before remembering what the difference is?

S2 : (Embarrassed-student smiles), I wrote it  $40 - 2$ . But now, right?

Based on the results of the interview, S2 experienced difficulties in using the difference principle. S2 stated that they still had difficulty understanding the term difference. It was proven that at first S2 did not write down the mathematical model correctly, namely  $40 - 2$ . This difficulty was caused by S2 still experiencing problems in carrying out the operation of subtracting negative numbers.

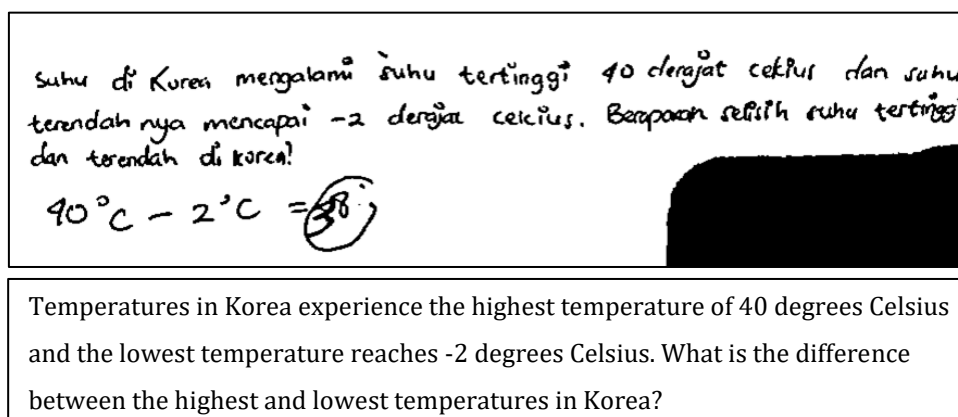
Furthermore, in the aspect of determining the completion strategy and working on it, the subject tends to experience difficulties. The difficulty was because the subject still experienced confusion in carrying out the arithmetic operation of subtracting negative numbers. Constraints on the indicators experienced by the subject include the type of difficulty using the principle. This is in line with research conducted by Oktari, Handayani, and Sofyan (2019) which explains that the difficulties felt by deaf students can also be caused because students often forget and have difficulty with operations involving negative signs which cause the calculation results to be wrong. Furthermore, Oktari, et al. (2019) stated that students might try again to avoid mistakes. In this case, S2 stated that when he was confused about doing the assignment, S2 recalled the topic or material in the problem.

At the stage of checking the results of the answers, S2 stated that he had no difficulties. In general, it can be said that S2 has difficulty in carrying out discovery activities about something because he is not careful in carrying out calculations or arithmetic operations. As well as difficulties in stating a principle but unable to express its meaning, and unable to apply the principle. So that the two subjects are included in the type of difficulty using principles.

However, apart from that there are quite interesting findings from S2, namely a lack of focus in answering and calculating the results of the story questions given. This can be seen when S2 is working on the questions given by the researcher, S2 tends to talk to each other using sign language. This is in accordance with Hasmira's research (2016) which states that some deaf students find it difficult to focus on working on the practice questions given.

### 3. Type Difficulty solving verbal problems

Figure 3 below is the result of the work of the S3 subject who has a type of difficulty solving verbal problems.



The figure shows two parts. The top part is a photograph of handwritten text in Indonesian. The text reads: "suhu di Korea mengalami suhu tertinggi 40 derajat celsius dan suhu terendahnya mencapai -2 derajat celsius. Berapakah selisih suhu tertinggi dan terendah di Korea?" Below the text is a handwritten calculation:  $40^{\circ}\text{C} - 2^{\circ}\text{C} = 38$ . The bottom part is a typed English translation of the problem: "Temperatures in Korea experience the highest temperature of 40 degrees Celsius and the lowest temperature reaches -2 degrees Celsius. What is the difference between the highest and lowest temperatures in Korea?"

Figure 3. Work Results of S3 Subjects

Based on Figure 3, information was obtained that S3 answered the test questions with incorrect answers. S3 also doesn't write the exact math sentences. And S3 also did not write down what was known and asked in the question. This happened because S3 had difficulties in understanding the questions that can be seen from the results of the following interviews.

- R : *When you did question number 1, were there any problems in understanding the information from the story questions that you gave?*  
S3 : *Yes, it's really difficult*  
R : *What do you understand from this question?*  
S3 : *What I understand is there are temperatures of 40 and 2*

Based on the results of the interview above, it appears that S3 was not correct in writing down what was known and asked about the question. In this case, S3 states that the known temperatures are 40 and 2, while the correct answers are 40 and -2. In this case it can be stated that the subject is having difficulty using the data in the questions that have been given. This condition is in line with the results of research by Purnama (in Nurhanifah and Utami, 2021) which states that some deaf students do not understand mathematics problems that are modified into verbal problems or what are usually called story problems. This difficulty can be seen when S3 cannot use existing data or information provided by the story questions completely and precisely.

This also resulted in S3 having difficulty in planning a solution strategy for the problem obtained, namely in changing the problem into a mathematical model. In this case, S3 experienced difficulty in using the principles of integer counting operations, especially the difference principle. This can be seen from the results of the following interview.

- R : *OK, then when you determine the correct arithmetic operation to calculate the difference, do you have any difficulties?*  
S3 : *Yes, I don't know what the difference is.*  
R : *So, what is the meaning of your answer  $40 - 2$ ?*  
S3 : *yes,  $40 - 2$  straight away*  
R : *Does that mean the difference?*  
S3 : *I don't know*  
R : *Are you just trying it out or do you have other thoughts about the difference?*  
S3 : *just try it*

Based on the results of the interview above, information was obtained that S3 experienced

difficulty in determining the appropriate settlement strategy, namely by writing the difference between 40 and -2 with  $40-2$ . The difficulties shown in the interview results above were caused by S3 still experiencing confusion in understanding the meaning of the difference. However, S3 is able to perform subtraction arithmetic operations on integers, this can be seen from S3's answer  $40-2=38$ , even though this answer does not match the question in the problem. This is in line with research conducted by Nurhanifah and Utami (2021) that this difficulty is because some deaf students experience problems in using the correct principles in working on questions. This difficulty was also caused by S3 experiencing problems in carrying out the difference calculation operation. The problem experienced was because S3 did not understand the meaning of the difference itself.

At the re-examination stage, S3 also experienced difficulties, this can be seen from the results of the following interview.

- R : *When you do your work, do you check your answers again?*  
S3 : *No, what is that?*  
R : *Do you check your answers again after you finish working or not?*  
S3 : *No*  
R : *But do you know how to check the correctness of this answer?*  
S3 : *I don't know, it's difficult.*

Based on the results of the interview, S3 experienced difficulty in checking the results. In this case, S3 experienced difficulty in determining how to re-check the correctness of the answer. This is in line with the opinion of Hasmira (2016) that students do not recheck their answers because they tend to be unfamiliar or do not know the procedures that must be used. Based on this analysis, S3 is included in the type of difficulty solving verbal problems, this can be seen from S3's difficulty in understanding the information in the problem, which then results in difficulty in using principles to solve the problem correctly.

Apart from that, an interesting finding from S3 was that when working on questions, S3 tended to rush every time he worked on the story questions given, this could be seen when S3 rushed to collect answers without checking the correctness of the answers again. This is also supported by the homeroom teacher's statement that the subject tends not to work on questions with focus and often cheats on his classmates. This is in line with research by Hasmira (2016) which states that poor student learning behavior as evidenced by the habit of cheating and the subject's lack of willingness to work seriously on the questions and exercises given by the teacher can cause the teaching and learning process that the subject goes through to become less than optimal, which can result in low mathematics learning outcomes and mathematics learning achievement.

#### **D. CONCLUSION**

Based on the results of the analysis and discussion, it was concluded that there were three types of difficulties experienced by students, including (1) difficulty using concepts due to difficulty in remembering a condition and expressing it in representative mathematical terms; (2) difficulties in using principles due to not being careful in carrying out calculation operations and difficulties in stating a principle and being unable to apply the principle; (3) difficulty in solving verbal problems due to only having a small vocabulary that is understood so that the subject is unable to use the data in the story problem, interpret the language or terms contained in it and have difficulty in drawing conclusions.

Apart from that, there was an interesting finding, namely that deaf students tended to be less focused on solving the questions and seemed to be in a hurry to complete the questions given. This affects students' performance in solving problems and more generally in learning activities, so that students experience various difficulties in learning.

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