Contextual mathematical problem solving of deaf students based on the montague stages

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Abstract. This study aims to analyze the completion of contextual mathematics problems of deaf children based on Montague stages. This research was descriptive qualitative research. The data collection technique was in the form of tests, questionnaires, and interviews. The subject of this study was deaf class XI students in one of the Special Schools (SLB-B) in Kuningan, Indonesia. The results of this study were the students’ ability to solve contextual math problems from 2 students namely one student has the ability to solve contextual math questions in sufficient categories and one in the low category.

1. Introduction

The 1945 Constitution Article 31 paragraph 1 which reads "every citizen has the right to receive teaching”. Based on the statement, it is clear that every citizen has the right to get the same opportunity to obtain education, including children with special needs. Students with special needs especially those who have hearing deficiencies have the intellectual potential of approaching normal students in general [1,2]. The inability of children in solving mathematical problems is in arithmetic material due to students’ inability to read, so there is a close connection between mathematics and reading ability [3,4].

Deafness is someone who has a lack or ability to hear either partially or completely due to the malfunction of part or all of the hearing instrument [5,6]. A problem is a situation, quantitative or otherwise, that confronts an individual or group of individuals, that requires resolution, and for which the individual sees no apparent path to obtaining the solutions [7]. Another definition of solving mathematical contextual problems is a problem that is related to the real world (everyday life) and divided into four types of problems, namely the personalities of students, schools or academics, society or public, and scientific [8,9]

The capabilities that must be owned by the generation in the 21st century, including those that include creativity, critical thinking, innovation, problem solving, decision making, communication, collaboration, literacy, communication and technology, and social responsibility. Besides that based on NCTM which explains that problem solving and critical thinking must be owned by everyone to help in the process of mathematical thinking [10,11]. Mathematical problem solving is a complex cognitive activity accompanied by processes and strategies. The processes and strategies that described by Montague are read, paraphrase, visualize, hypothesize, estimate, compute, and check [12]

Learning by using Realistic Mathematics Education Approach (RME), it becomes better and more enjoyable for students. Learning motivation becomes increased and the concentration of students to follow the learning becomes more focused [13]. Deaf students generally lag behind a few years in arithmetic, but little is known about the mechanism behind this [14].
2. Methods
The type of research used in this study is qualitative research. Qualitative research is research that aims to understand the phenomenon of what is experienced by research subjects, holistically and in a descriptive way in the form of words and languages in a specific natural context and by utilizing various scientific methods [15]. Qualitative research is much more difficult to do than quantitative research because the data is collected and is the main measurement tool for collecting data is the investigator himself [16]. Which means that qualitative research is more difficult when compared to quantitative research because the collected data is subjective and the instrument as a data collection tool is the researcher himself. Qualitative methods are divided into five types, namely phenomenological research, grounded theory, ethnography, case studies, and narrative research [17]. This study is very suitable with the purpose of study who wants to express the ability to solve mathematical contextual questions of deaf students based on the Montague strategy.

The subject of this study was students with special needs who were hearing impaired (deaf) who had studied arithmetic material. The choice of this subject is in accordance with the research background. The place of research is an Extraordinary School (SLB) in the city of Kuningan. The researcher uses documentation to get student data. Then to get the research data, students were asked to solve mathematical questions on mathematical contextual, then the researcher interviewed the research subject. Data obtained during interviews were recorded using a voice recorder. Suggest that activities in qualitative data analysis are carried out interactively and take place continuously until complete, so the data is credible. Activities in data analysis, namely data reduction, data presentation, and conclusion drawing / verification.

3. Results and Discussion

3.1. Results
This research was conducted on two subjects of deaf students in one of the special schools in Kuningan regency, the two students are DP and ID.

3.1.1 Question number 1

![Figure 1](image1.png)

(a) DP’s answer  (b) ID’s answer

*Figure 1. Figure Completion of mathematical contextual question number 1*

(a) DP’s answer  (b) ID’s answer

In number 1 DP can understand the first sentence correctly, so at the completion DP can finish correctly but cannot answer the main question. Whereas ID cannot understand the intent of the problem, so ID only do algebraic operations that ID knows.

3.1.2 Question number 2

![Figure 2](image2.png)

(a) DP’s answer  (b) ID’s answer

*Figure 2. Figure Completion of mathematical contextual question number 2.*

(a) DP’s answer  (b) ID’s answer
In number 2 DP can understand the question well so that it can work on the problem well. Whereas ID is still confused in understanding the purpose of the question besides that in his algebraic operations he is still experiencing difficulties.

3.1.3 Question number 3

![Figure 3](image3.png)

Figure 3. Figure Completion of DP mathematical contextual question number 3.
   (a) DP’s answer   (b) ID’s answer

DP and ID do not understand the problem because there are terms "dozen" which they do not know when converted to the actual number.

3.1.4 Question number 4

![Figure 4](image4.png)

Figure 4. Figure Completion of DP mathematical contextual question number 4.
   (a) DP’s answer   (b) ID’s answer

DP and ID feel difficulties in understanding the problem. So they can't work on the problem.

3.1.5 Question number 5

![Figure 5](image5.png)

Figure 5. Figure Completion of DP mathematical contextual question number 5.
   (a) DP’s answer   (b) ID’s answer

DP has been able to understand the purpose of the problem and has been able to do algebraic operations properly but cannot conclude the answer that DP gets. Whereas ID cannot understand the question well so he cannot answer the question.

3.2. Discussion

From the results of the study it was found that basically the ability of deaf students was not much different from general students. This can be seen from them being able to operate properly. The difference is when given contextual story problems, deaf students have difficulty understanding the context of the sentence. Based on Montague's abilities. Can be seen from the presented table.
Table 1. Completion of mathematical contextual questions based on the Montague's strategy

| Question number | Student | Montague’s strategy |
|-----------------|---------|---------------------|
| 1               | DP      | In the montague strategy it has entered the computing phase, but when it enters the last phase called checking, it is unable to re-check the purpose of the question so that the answers obtained are not in accordance with what the question maker wants |
|                 | ID      | Can not understand the question well which means it is still in the first stage, namely read |
| 2               | DP      | Have answered the questions correctly and well, so according to Montague's strategy it has passed seven phases from read to checking |
|                 | ID      | Can not understand the question well which means it is still in the first stage, namely read |
| 3               | DP      | Can not understand the question well which means it is still in the first stage, namely read |
|                 | ID      | Can not understand the question well which means it is still in the first stage, namely read |
| 4               | DP      | Can not understand the question well which means it is still in the first stage, namely read |
|                 | ID      | Can not understand the question well which means it is still in the first stage, namely read |
| 5               | DP      | In the montague strategy it has entered the computing phase, but when it enters the last phase called checking, it is unable to re-check the purpose of the question so that the answers obtained are not in accordance with what the question maker wants |
|                 | ID      | Can not understand the question well which means it is still in the first stage, namely read |

Based on the table above it can be concluded that DP has the ability to solve story problems well but in some cases DP cannot understand the questions. Whereas ID cannot understand the question well, it means the ability to solve questions based on Montague's strategy is low.

4. Conclusion
To conclude, based on the discussion above, student's ability in mathematical contextual problems on the Montague's strategy are one person with sufficient ability and one person with low ability.

5. References
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Acknowledgments
We thanks to the students and schools that agreed to participate in this study and especially to Mrs. Eka Khairunnisa for helping in writing this paper