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Preliminary Research on Prospective Teacher's Ability in Understanding the Physics Problems by Sketching

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Abstract. Understanding problem is an essential stage of problem solving skills. A preliminary research about problem solving skill (especially on understanding the question) in physics instruction was significantly important. Prospective physics teachers have to comprehend the problems by sketching the situation prior to solve it. It would make prospective teachers skilled at problem solving. The purpose of this study was to analyze prospective teachers' ability in understanding physics problem by sketching. It was an initial study for the further developing research about applying metacognitive strategies to increase the teacher candidates' problem solving skill in physics classrooms. The sample of this study was physics education class of 2018 who had taken the fundamental physics course, amounting to 35. Data was analyzed by using qualitative-descriptive method. To sum up, the findings of this study are; prospective physics teachers had difficulty comprehending the problems and sketching the problems' situation. Hence, it is suggested to apply a learning strategy which trains the prospective teachers' skills in problem solving. For instance, integrated metacognitive and sketch strategy of knowledge in physics instruction.

INTRODUCTION

The most important skill that the physicists should have is a Problem solving. The research about problem solving skill are significantly essential in physics instruction due to physics students had to comprehend concepts and recognized it coherently. By those comprehensions, it would make prospective teachers skilled at problem solving. The first stage of problem solving skills is understanding the problem.

According to the preliminary observation result, it can be seen that one of the students' problem when they were solving the fundamental physics problem, is that they have not capability to connect the physics concept cohesively. It causes students to be unable to solve the problems which were given by the lecturer. The students looked confused and had not any ideas of what supposed to answer. It happened for a reason. They did not understand the questions. On the other hand, most of the students did not answer the questions systematically and lack of attention towards the solving steps. Students only concerned with the final answer, hence there are lots of processes that were abandoned, especially the rechecking the answers [1].

Moreover, the research about "Sketch strategy of knowledge in physics learning" that has been stated by Amin, Bunga D, et al [2] describes the result of metacognition knowledge ability test (MKAT) that was given to the new physics education students in Makassar State University. The purpose of this test was to obtain an idea on how well the students understand, implement and integrate the factual knowledge, conceptual and procedural knowledge in solving physics problems. The example of the test given can be seen below:

Two cars move in the same direction at a constant velocity, Car-B in front of car-A. The velocity of car-A is 20 m/s and car-B is 10 m/s. At $t = 0$ s, the distance between the two cars is 1000 m. Find the time when car-A takeover car-B.

FIGURE 1. The example

The test results showed that there are none of the 26 students that wrote the correct answer. This case indicates that the students have not been able to integrate their ability in cognition process. It can be seen easily from the solving procedure of some students. This procedure is similar to the strategy developed by Chi and Van Lenh[3].

Based on the study, it can be known that one of the weaknesses of target variable strategy (TVS) is translating the problem statement. Research by Abdullah [4] showed that TVS can be done through three stages, namely:

- (1) *Translating the problem of visual*
- (2) *Drawing the sketch*
- (3) *Finding the knowing variable so that the solution can be determined.*

Thus, in order to identify the initial ability of physics teacher candidates to understand the problem with sketches, this research needs to be done.

Research Purpose

According to the research background above, the purpose of this study was to analyze prospective teachers' ability in understanding physics problem by sketching.

METHODS

This research was a qualitative-explorative research. The sample in this study was physics education class of 2018 who have taken the fundamental physics course, amounting to 35.

Overall, the procedures of this research can be described as follows: (1) Designing research instruments; (2) Determining the subjects research based on (a) Initial Test and, (b) GPA, and (c) Recommendation from lecturers in Fundamental Physics courses; (3) Data collection includes (a) providing initial test sheets to Physics Education students who have programmed Fundamental Physics courses, to be used as a reference in determining research subjects by selecting subjects with high, medium, and low value intervals (c) give draft problem solving to the research subject. The subject worked on the problem given while being interviewed, (d) analyzed the difficulties in understanding problems done by students, and (e) triangulation; (4) Analysis of data, including (a) analysis of initial test results. (b) Analyzing the test results difficulty in understanding physics problems given by each number and (c) analyzing interview results; (5) Arranging the implementation of exploration (discussion of the results of the analysis) the difficulty in understanding physics problems of Physics Education's students at the Universitas Sulawesi Barat; (6) Prepare reports on research results. The expected results are to obtain an explanation of the difficulties faced by students of the Universitas Sulawesi Barat, Physics Education Study Program in understanding problems by sketching in Fundamental Physics Courses and how to prevent and overcome these difficulties.

The research flow chart can be illustrated in the following chart:

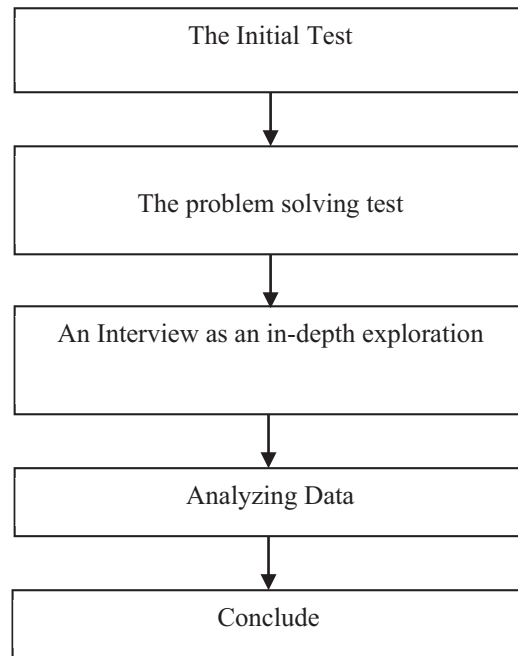


FIGURE 2. The flow charts

RESULTS AND DISCUSSION

As previously explained, this is a qualitative explorative research. The data were collected by giving a number of questions which taken from the material of the Fundamental Physics Course. The results of the initial tests were used as a basis for taking the research subjects. The grouping of research subjects was based on the results of the initial test of students who were in the high, medium, and low value intervals. Of the 35 students, 3 (three) research subjects were selected, each representing students with an initial test scores in the high, medium and low categories. To explore the difficulties of students in understanding problems, interviews were conducted with the three research subjects.

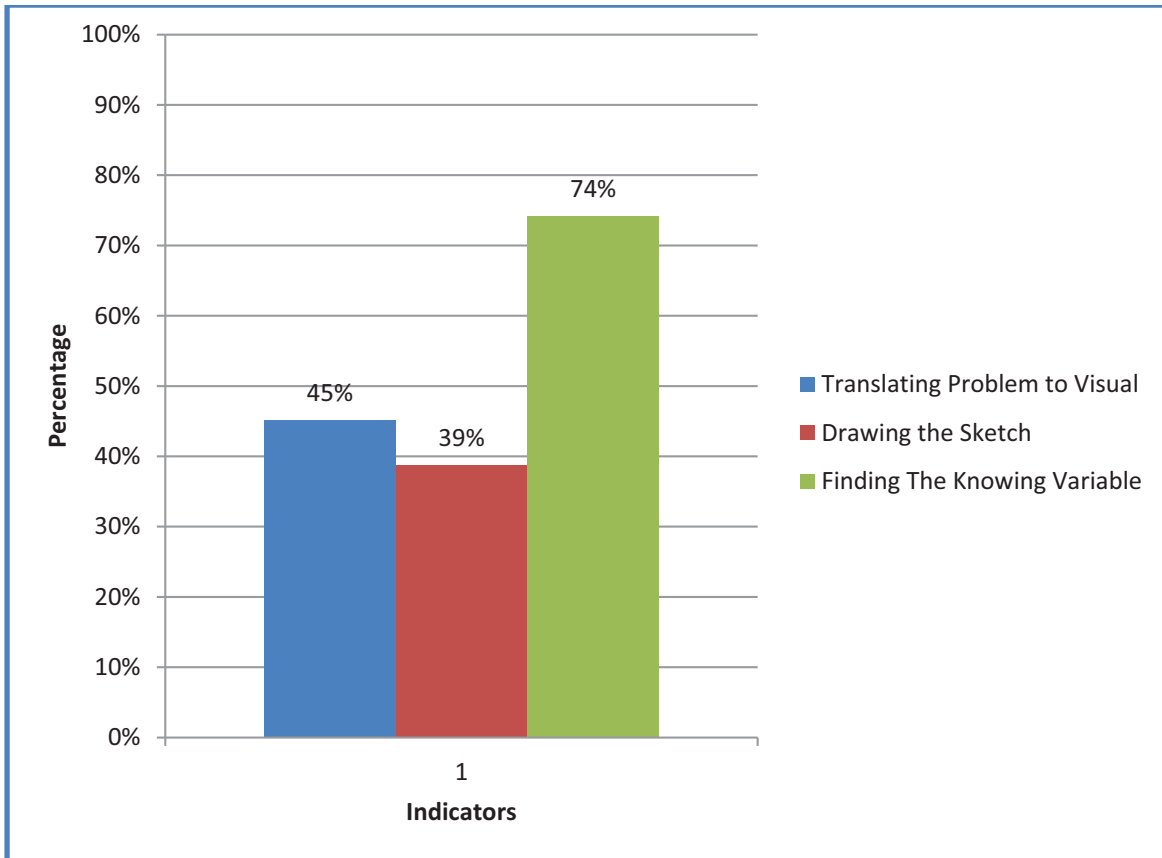


FIGURE 3. Chart Students' Ability in Understanding The Problem

Based on Figure 2. It is known that out of 32 research subjects 45% of students were able to imagine cases that occurred to understand the problem or almost some of the subjects had difficulty understanding the Basic Physics questions given. Furthermore, in the second and third stages of understanding the problem, namely the stage of drawing a sketch of the problem state, there were only 39% of students who did it. This means that most students still have difficulty in sketching out the situation from a matter of the story. At the last stage, which is the stage of finding variable known, there have been many students who are able to identify variables which are around 74%. The results of this test are in line with the results of the interview results and the finding of Sartika's [1] research entitled, Analyzing Students' Problem Solving Difficulties on Modern Physics.

Finally, from the three indicators above, it can be seen that students are the most difficult to understand basic physics questions because they are unable to imagine the condition of the problem and are unable to draw a sketch of the situation.

CONCLUSION

According to the outcome and discussed above, then it can be concluded that:

Most of the prospective physics teachers for the Physics Education Study Program of Universitas Sulawesi Barat have difficulty in understanding the fundamental physics problems with percentages; 55% of students had difficulty in translating the problem to visual stage, 61% of students had difficulties in the drawing the sketch stage, and 26% of students had difficulty in finding the known variables. One solution that can be applied to overcome this problem is

the implementation a strategy of learning which train the prospective teachers' problem solving skill. For instance, integrated metacognitive and sketch strategy of knowledge in physics instruction.

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