MATHE*dunesa*
Jurnal Ilmiah Pendidikan Matematika *Volume 8 No. 2 Tahun 2019*
ISSN :2301-9085

DESCRIBING SECONDARY STUDENTS' GEOMETRIC PROBLEM SOLVING BY SEX

Junaidi
Mathematics Education, Faculty of Mathematics and Natural Science, Universitas Negeri Surabaya
email : junaidijunaidi@mhs.unesa.ac.id

Ekawati, R
Mathematics Education, Faculty of Mathematics and Natural Science, Universitas Negeri Surabaya
email : rooselynaekawati@unesa.ac.id

Abstract

Students' efforts in solving mathematical problems often involve the describing of data within the problem. One of the problems that often arises in mathematics is the problem of geometry. In this research, problem solving geometry of male and female students are described. The geometry problem solving written test was delivered, specifically the application of trigonometry in Geometry. This research was conducted by taking 17 eleventh grade students as participants and 2 students as research subjects. The results of the study show that Problem solving between male and female students has difference in the stages of planning, executing, and looking back. While at the stage of understanding is same. The differences can be caused by several factor such as a memory that occurs or post solution strategy to solve a given problem. Implication of study expected to be able to provide a deeper description of geometry problem solving so that in making geometry questions consider this research.
Keywords: problem solving, geometry, sex

INTRODUCTION

In everyday life, a person will be faced with problems and are required to find solutions. A problem is something that is not separated from someone (Masruroh, 2018). Often high school students experience difficulties in solving problems given.
In Mathematics, not all problems are a problem. Mathematical Problems are said to be a problem if students do not have alternative ideas for their solutions and wish to solve them (Arum, 2016). In the opinion of Aljaberi (2015) the problem can be interpreted as the difficulty of students in completing something that exists, or according to Suharman (2005) the gap between the present situation and the desired goal. So, mathematical problems are mathematical problems that cause students to experience difficulties (do not have alternative ideas for solutions), but students want to solve them.
One of the frequently encountered Mathematical Problems is geometry. Geometry is one branch of Mathematics that is taught at all levels of education. Besides that Geometry can also be easily applied in real life, because almost all objects that are seen are geometric objects, so that it does not close the possibility of students having faced mathematical problems in the field of Geometry (Arum, 2016).
Problem Solving is an art in Mathematics, because it requires merging or reducing concepts in Mathematics. Merging or reducing these concepts is one of the stages of problem solving, so that the processing of student data in solving mathematical problems is quite important to discuss.
Students who obtain Geometry problems and wish to solve them, will make efforts to solve them (Arum, 2016). The effort of students to respond or overcome obstacles when an answer

Problem solving theory

A. (*Preparation*) Understanding

The initial stage of problem solving is understanding the problem. In this study, understanding is means to understand more about the mathematical concepts needed. Recall the terms and notations used in the problem. Some of the questions that might appear in the first stage are as follows,

1. What topics are raised by the problem?
2. What was asked?
3. What is the meaning of the pattern known in the question?
4. Is data needed beyond what is known to be a problem? Or is that enough? Is there implied data or not?
5. What is known and not? Etc.

B. (*Thinking Time*) Make a plan

In this stage, the thinking strategy determines the outcome of the execution later, so

Polya reviews the strategy that allows solving mathematical problems as follows (depending on the tricks that might arise). Drawing graphics, specifying with variables, planning coherent events, thinking of short ways, guessing and checking, looking back at patterns that have not been fully understood, making lists etc.

C. (*Execution*) actions

After the planning stage is complete, next is to execute. If there is more time, think of other possible solutions. If the first method does not work well, it does not mean a method that is wrong, but may not be effective. Eliminate unnecessary or failed methods in the process. If the previous method takes a long time, then think quickly about new ideas and try them. This can calm the mind (Polya, 1957). One key is to keep trying until something is successful.

D. (*Verification*) looking back

In this stage, other solutions allow it to appear. The following questions may appear. Is it successful to answer the question on a given problem? Is the result relevant? Is there another answer possible? Is there a simpler way? Etc. If you find that the way you executed it doesn't work, there may be a small error that occurred. Again, it does not mean "total" wrong. Look back at the stages that occur between one another before trying a new solution (the mind must be flexible).

Whereas According to Sarathy (2018) Problem Solving called Analytical Problem Solving consists of 2 stages, (1) Defining and Represent Problems, (2) Planning. Here's the explanation.

1. Define and represent the problem. Interpret and form a representation of the problem given at this stage and this happens to WM. If the problem given is familiar and structured, then the control mechanism for data from the problem is carried out. To represent data from a problem requires coding techniques. In addition, calling data in EM occurs at this stage. If it is clear and coded data in mind, then planning and finding solutions can begin.
2. Plan. Planning is the process of generalizing strategies to more advance than the data obtained from the problem to meet the objectives requested by the problem. In this phase, calling for data in the form of a solution strategy from a problem in previous experience (Pss) which is then coordinated with the execution to be carried out. The results of the hypotheses obtained are used to build the planning stages. Previous experience, ability to describe abstract things, predictions of the future, and navigation on a scale large enough to affect the planning stage. After the plan has been determined, the implementation of the plan begins.
3. Broadly speaking, Analytical Problem Solving Theory explains the initial stage of the problem solver by defining and starting to find a solution, but when the solution cannot be directly found or the problem solver is deadlocked, the problem solver must rearrange data or change the representation of the problem and look for a solution back based on the new representation (Sarathy, 2018). This theory is called Insight Problem Solving (IPS). To rearrange the representation of the problem, it can be done by (1) paying attention to new features (data) that may arise from the problem, (2) re-coding to correct the wrong or incomplete representation of the problem, and (3) changing the constraints/gaps.

As the previous example is the selection of the path to school when the road usually traversed is jammed, it is assumed that the road can be taken more than one, call the road A and B, for example the solver chooses path A, but when going down or going down there are new obstacles (for example there are road repairs), then the problem solver chooses line B (it is assumed there are no other possible paths). The process of changing from line A to line B is called changing the problem in the problem. The inability to solve problems (dead ends) is often associated with the lack of initial knowledge needed with those provided (Suharman, 2005).

On the other hand, social studies are believed to involve the emergence of unexpected solutions or clear strategies, sometimes accompanied by aha! Experience. Based on the description above, it can be concluded that problem solving is a series of stages in solving problems that begin with understanding the problem, making a plan, executing a plan that has been made, and ending with looking back at what has been done.

Problem Solving: tools to looking

From the description above, the indicator of Problem solving (PM) is prepared in table 1.

Table 1 Indicator IP in PS

Problem understanding	
1.	Writing the data and the aim of given problem
2.	Writing the data relevant to the aim
3.	Making sketch from the data
Planning	
1.	Organizing relevant strategies
2.	Choosing the best strategy
Executing	
1.	Writing the exact solution
2.	Using the algorithm
Looking back	
1.	Find the possible new solution
2.	Writing the new strategy
3.	Recheck the writing solutions

METHODS

Problem solving tests will be conduct in one class of high school. The participants were asked to write thoughts about the answers to the questions given. The subject was chosen based on the best problem solving test scores. At least 2 selected subjects based on sex, namely SA-L and MM-P.

Problem solving test consists of 3 geometry questions for high school which are validated by lecturers of psychology and problem solving. The instruments were validated by 2 validators before use. After being validated, the instruments were revised according to the validator's suggestions.

In order to clarify the data obtained or not obtained from the results of problem solving tests, interviews were conducted. The type of interview used is semi-structured. To prove this, interviews were recorded.

RESULTS

The data used to describe this is TPM results data and interview data from research subjects by analyzing both data. Data on TPM results and interviews will be made into one complete and complementary data to reveal and describe the processing of student problem solving geometry problems.

A. Problem solving of male student

Problem solving of male student in solving Geometry problems begins with complete or sketch from the data. Completing the sketch can be an example to add new data. Then, male students tend to directly determine the strategies used to execute without organizing strategies that might be used to solve the problem, but the stage of organizing appears after the execution is jammed or it is deemed incorrect (failed). This is almost similar to *trial and error*, but researchers consider this to be different. The location of the difference at the planning stage. Trial and error tends to organize possible strategies, while not happening in the case of SA-L. After the process of looking back at the results of the execution, SA-L thought of strategies that could be used in solving the problem.

In the results of the executions carried out, male students tend to use mathematical symbols or because they are lazy to write longer.

From the results of the research conducted, male students rechecked the executions that had been carried out, even though checking was done on different numbers. Differences in numbers in checking back can be caused by several factors, including because the memories they have at that time differ from one individual to another, depending on the problem at hand, or the difference because of the wishes of the students themselves. However, overall checking was carried out by male students. In checking, there were those who thought of changing the strategy that had been written before or just adding work that was felt to be lacking.

In changing the strategies that have been used, male students pay more attention to new data that might be missed or that might appear. As for students who choose to add workmanship, the process is done by updating the data obtained from the previous problem.

B. Problem solving of female student.

Problem solving of female students in solving geometry problems begins complete or sketch out data received. Completing a sketch can be in the form of an example that is done to add data that is lacking or to facilitate execution. But in making sketches, female students tend to be more wrong and doubtful, so that the sketches are produced a lot, but most female students cannot solve representational problems.

Then, female students tend to organize strategies that might be used to solve problems rather than directly determining the strategies used to execute. But the stage of organizing the strategy is exceeded if the female students feel they do not know the strategy that can be used (deadlock), so that their execution is done immediately.

From the results of the research conducted, female students rechecked the executions that had been carried out, even though checking was done on different numbers. Differences in numbers in checking back can be caused by several factors, including because the memories they have at that time differ from one individual

to another, depending on the problem at hand, or the difference because of the wishes of the students themselves. Some of the remaining female students did not check again because the time given was not enough to do so. Of the students who did the checking, there were those who thought of changing the strategy that had been written before or just adding work that was felt to be lacking.

In changing the strategies that have been used, female students pay more attention to new data that might be missed or that might appear. As for students who choose to add workmanship, the process is done by updating the data obtained from the previous problem.

CONCLUSION

The interesting thing is the process of planning the strategy and then executing it. Male students tend to execute first after 1 thought strategy, while women consider possible strategies first before then executing the strategy, unless it doesn't occur to any strategy.

The second difference is in terms of representation. The representation of male students is better than female students, especially in this study is geometry representation. Because from the results of research, male students only need 2-3 times to re-read the data contained in the problem, while female students need 4-5 times to read again to be able to make geometric representations.

The third difference is at the stage of looking back at solving the problem given. Male students tend to look for or replace other possible strategies compared to female students. As a result the strategies obtained from male TPM results are more varied than female students.

In general, problem solving between male and female students is different. Some of the factor that influence it are problems that are given and memories at that time. Table 2 below are some of the findings of differences in this study.

Table 2 difference between Male and Female

Indicator	Male	Female
Geometric representation	Read data 2-3 times to make a Geometric representation	Read data 4-5 times to make a Geometric representation
Organizing strategies	Immediately in execute after 1 thought strategy	Organize in advance the possible strategies that occur
Looking back	Tends to change the previous strategy	Look back at the calculations done

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