

# Metacognition Students In Problem Solving

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**Abstract**—Metacognition is the mind's ability to monitor and control itself, in other words, the ability to know about our knowledge. In mathematics education, the importance of the investigation metacognition students during the mathematics activities that are focused on solving mathematics problems. This study describes the student metacognition in problem-solving Linear Equations System with 3 subjects the first semester students are capable of high, medium and low. By using the "think aloud", the results showed that subjects with high ability seemed to perform activities of metacognition at each stage in problem-solving Polya. Students with medium or lower did not do a good metacognition process in the last three stages of the problem-solving based on Polya step.

**Keywords:** *metacognition, problem solving, polya*

## I. INTRODUCTION

The process of thinking in problem solving is an important thing that needs attention, especially teachers to help students to develop the ability to solve problems in the real-world context and in the context of mathematics. In order for this ability can be owned and developed, it needs the support of teachers, including giving students the opportunity to resolve the issue in its own way, as well as helping students to recognize and regulate their own thinking process when solving a mathematics problem. Process realize and organize the students' own thinking, known as metacognition, which includes thinking about how students make the approach to the problem, choose the strategies used to find solutions, and to ask ourselves about the problem (Gartman and Freiberg, 1993).

Metacognition is generally associated with two-dimensional thinking. The first is the awareness of a person about his thinking (self-awareness of cognition). The second is the ability to use awareness to adjust his thinking process (self-regulation of cognition) (Bruning et al., 1995). The second dimension of metacognition that has the properties of interdependence with each other. Woolfolk (1998) explains that metacognition refers to a way to raise awareness about thinking and learning is done. This awareness will materialize when one can start thinking with a plan (planning), monitoring (monitoring) and evaluation (evaluating) and the results of the cognitive activity. For the same thing, Lee and Baylor (2006) states that metacognition is awareness of the activity of cognition; in this case, metacognition relates to how a person aware of his thinking process. According to Flavell (1979), metacognition is defined as "cognition about cognition" or "thinking about thinking." He also explained that students who manage cognitive activities properly, allowing can handle tasks and solve problems well too.

Problem-solving according to Bailey (1989: 116) is a complex activity and a high level of mental processes. Solving the problem is defined as a combination of new ideas that emphasizes reasoning as the basis for combining ideas to problem-solving.

Arends (2007: 41) states that the learning model based problem is the model of learning by learning approach students on issues of authentic and meaningful to students who serve as the foundation for investment and the investigation of students, so that students can construct his own knowledge, foster a higher skill and inquiry, the student's independence, and improve self-confidence. This model is characterized by the use of real-life problems as something and improve critical thinking skills and problem solving, as well as gaining knowledge of important concepts. This learning model prioritizes the learning process where the teacher's task should focus on helping students achieve self-directed skills.

Some research indicates that metacognition plays an important role in solving problems. Research results Chamot et al. (1992) showed that students were able to absorb the lessons of mathematics at the highest level and obtain information about an exercise in strategy. metacognitive (ie planning, monitoring, and evaluation of learning itself) have better skills in problem-solving. Panaoura and Philippou (2004)

shows a result of research that students who are skilled in knowing and regulate cognition and realizes its ability demonstrated ability to think more strategically in solving problems than those who are not aware of how the system works cognition. McLoughlin research results and Hollingworth (2003) showed that effective problem solving can be obtained by providing opportunities for students to apply metacognitive strategies when solving problems. Obviously, that between metacognition and problem solving has a fairly strong relationship.

Metacognition in this study is an overview of what it is about the students' metacognition which involves awareness and regulation of thinking in terms of planning (planning) thought processes, monitoring (monitoring) thinking process and evaluate (evaluation) process and the results of his thinking when solving mathematics problems by phasing Polya (1973).

The purpose of this study is to describe the student metacognition in problem solving of linear equations systems.

## II. METHODOLOGY

This study is exploratory research that describes in depth profile of metacognition students of Department of Mathematics Tadris IAIN Tulungagung in solving mathematics problems. The data in this study are described qualitatively and the results in the form of written words, spoken or description of the subject of further research and analysis. Subjects were students of the first semester of academic year 2015/2016 IAIN Tulungagung do junior high school mathematics

Selection of research subjects with the following criteria: (1) is based on achievement test scores were done, the students are divided into three groups of ability, which is a subject capable of high, medium and low. The subject said highly capable, if obtaining a score of 85-100; subject capable of the medium, if obtaining a score of 65-84; and the subject of their low performance, if it obtained a score of 0-64. and (2) require consideration of whether the subject lecturer elected scored in accordance with the daily class capabilities and can express opinions verbally or in writing.

The data analysis consisted of three stages, namely data reduction, data presentation and interpretation or conclusion. Includes data reduction process to summarize, pick things that are basic, focusing on things that are important, look for themes and patterns. Presentation of data which presents the data is reduced so that the data is organized, arranged in a pattern of relations. Interpretation and conclusion of interpreting the data that has been presented later concluded.

Problem-solving test instruments are as follows

Problem 1: Three chickens large, medium and small weighed. If large and small, weighed 2.6 kg. If large and are being weighed 3 kg. And if that was small and weighed 2 kg. The third heavy chicken it was exclusively ...

Problem 2: Ali, Ani, Budi go to the store to buy pencils and books alike. Ali bought two pencils and two books, Ani buy three pencils and four books, while Budi buys a pencil and two books. If Ali and Ani consecutive pay Rp 2,500, - and Rp 4,500, - then Budi have to pay?.

## III. RESULT

The data analysis was done for each phasing Polya (1973), the stage of understanding the problem, the stage of making plans Problem solving, the problem-solving phase of implementing the plan, and the stage to re-examine the results of problem-solving.

At this stage of understanding the problem, the students capable of high, medium or low in the first part, the core part and the latter part of the subject of metacognition activity. Subject matter carefully read and thoroughly showed that all three subjects to give attention to the information received so that information can be understood and remembered. After reading about the test, the three subjects to process the information shown on the response of the subject, which mentions things known and it asked of the matter and state the reasons underlying the answer. The process of calling back the information indicated by stating that the problem is a system of linear equations. Then the subject is also aware of the process and the results of monitoring the implementation of the current thinking in understanding the problem. This is indicated by the subject to think about prior knowledge is required, as well as proof of steps to be implemented even had planned to use the method to be used and has to think about the consequences of the choice of method to be used. In addition, subjects are aware of the process and the results of his thinking, in evaluating the measures, while understanding the problem. This is indicated by the subject to think about

the choice of notation used and also think about the sufficient conditions that will be used for completion has been considered sufficient even the expected time to solve the problem is quite rational.

At this stage of thinking about plans problem solving, students are highly capable conscious in planning to say that after reading about the first thought is to imagine the use of elimination and substitution because you know: is the problem of linear equations 2 variables, but the student capable of analysis was low is still experiencing difficulties in determining the most appropriate way to resolve the matter. Subject highly capable aware of the process and results of thinking in developing the plan when thinking about a plan of action. It was shown at this stage subject to mention that in a short time has been able to plan a settlement, even related notions have been acquired and confident with what was planned. Then the subjects are aware of the process and the results of his thinking, in monitoring the implementation of the current thinking of a plan of action, as shown by the subject to remember that there are similarities with the problem earlier settlement ever doing that is a problem system of linear equations.

At this stage of implementing the action plan by selecting the completion strategy, highly capable students in the first part, the core part and the latter part of the subject of metacognition activity are good, but the student is not capable of being dang low. Subject highly capable aware of the process and results of thinking in developing the planning when implementing the action plan. This is indicated by the subject can easily solve the problem by using concepts, formulas or mathematics operations that have been previously understood, even a little suspicious with the smooth settlement can be a sign there is an error. Then the subjects are aware of the process and in monitoring the implementation of the results of his thinking at the time of carrying out a plan of action, this matter can be shown by the subject in detail explaining each step made. Likewise, the subject is also aware of the process and the results of his thinking in evaluating the action when implementing the action plan, which is indicated by the subject says confident 90% steps taken correctly, even feel no need to replace the measures taken, even the subject is also aware that there are steps unnecessary.

At the stage of evaluating and re-examine how best solution, highly capable students in the first part, the core part and the latter part of the subject of metacognition activity is good, but the student capable of analysis of medium and low no. Subject highly capable aware of the process and results of thinking in developing the plan at the time of evaluation. This is evident from his actions do check each step and looking back the answer. Then the subject is also aware of the process and the results of his thinking, in monitoring the implementation of the current evaluation. Subject unknowingly conducting well, even feel the answer is satisfactory and felt confident of being able to apply this method to other problems and although it has not had time to think of different ways, but be aware that the settlement is done is right. Likewise, the subject aware of the process and the results of his thinking in evaluating the action when performing evaluations. The subject was not necessary to the beginning because it is convinced the answer is correct.

#### IV. CONCLUSION

This study resulted in that at the stage of understanding the problem, the students capable of high, medium or low in the first part, the core part and the latter part of the subject of metacognition activity. Students with high ability seemed to perform activities at each stage of metacognition in problem-solving Polya. Students are capable of being, or lower did not do a good metacognition process in the last three stages of the settlement of the problem based on Polya step. Students with the moderate and low level of capability only look do metacognition at the stage of understanding the problem.

Finally, suggestions can be submitted in this research is student should always train in solving mathematics problems. In each stage of completion, the step should be trained metacognition process. The results could be used as one ingredient information to make more extensive research on metacognition students in solving mathematics problems with different characteristics and materials.

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