Metacognitive Skill Of Students With Sensing Personality Type In Solving Linear Equation System Of Two Variables

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Abstract. The purpose of this study was to describe the metacognition skill of eighth grade students of junior high school who have sensing personality types in solving problems in the material linear equation system of two variable. The used research method is descriptive qualitative. The subjects chosen for this study were six eighth grade students of SMP Negeri 3 Dawe which were divided into two groups, three students with guardian personality types and three students with artisan personality types. The results of this study indicate that the students' metacognition skill in solving linear equation system of two variable's problem in developing action plan, monitoring action of plan, and evaluating action of plan for student with guardiang personality types work more specifically, and be more careful in solving problems. For students with artisan personality types to work with a little haste, so the metacognition stages are not met the indicators.

Key Words: Mathematical Problem Solving, Metacognitive, Personality Type, Sensing

1 Introduction

Education has an important role in improving the quality of human resources. According to Law No. 20 of 2003, formal education means an educational stream, which is structured and has levels, encompassing basic education, secondary education, and higher education. For all levels of education, mathematics is one of the most important lessons. Mathematics has a close relationship in various aspects of human life. Ministerial Regulation No. 22 of 2006 concerning content standards for the Primary and Secondary Education units states that mathematics needs to be provided to all students (students) starting from elementary school to equip students with the ability to think logically, analytically, systematically, critically, and creatively, as well as ability to work together. All of these abilities are needed by someone in solving problems, where problem solving is an indispensable skill to combat the industrial revolution 4.0. This is in line with NCTM which includes problem solving as one of the standard processes in mathematics learning [1].

Problems in mathematics are usually interpreted in mathematical problems. A math problem is called a problem for a student, if: (1) the question confronted can be understood by students, but the statement must be a challenge for him to answer it, and (2) the question cannot be answered by routine procedures that students already know [2]. In the world of mathematics education, problem solving is also an important thing to instill in students. By

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solving mathematical problems, making mathematics does not lose its meaning, because a concept or principle will be meaningful if it can be applied in problem solving. In addition, if students are accustomed to solving mathematical problems, it is hoped that the pattern of problem solving will be used to solve problems in their daily lives.

Based on the results of PISA, Indomesia's mathematical competence increased by 11 points from the previous year in 2012 which was only 375 points. However, this increase does not give a significant meaning because the ranking for Indonesia is still below that is ranked 64 out of 72 countries. This shows the low ability of Indonesian children in the field of mathematics. Seeing this reality, the teacher certainly must strive for students to achieve optimal results. According to Risnanosanti, teachers can make solving as a direct object that students must learn. By giving a problems during the learning process provides opportunities for students to develop mathematical concepts and mathematical skills. In order to solve a problem there are several aspects of abilities that students must master, one of which is metacognitive abilities.

The process of learning mathematics is not only related to knowledge and procedures that involve students' cognitive operations. It also requires students' thinking awareness to control and regulate their thought processes. Risnanosanti states that problem solving is a complex process involving metacognition [3]. This is also relevant to Stenberg's statement which says that students need metacognition skills, in addition to the cognitive component, to regulate and monitor the problem solving process [4].

Metacognition is thinking about one's own thinking or awareness of its own cognition [5], [6], [7], [8], [9]. Thinking about his own thinking is related to students' awareness of their ability to solve problems because the true purpose of problem solving in mathematics is not only to equip students with a set of skills or processes but rather to enable students to think about what they are thinking [10].

Wilson and Clarke stated that there are three metacognitive activities involved when students solve mathematical problems, namely metacognitive awareness, metacognitive regulation, and metacognitive evaluation. Metacognitive awareness is related to an individual's awareness of his existence in the problem solving process, specialist knowledge about the problem at hand, and knowledge of strategies to solve problems. Metacognitive awareness also includes knowledge about what needs to be done, what has been done, and what might be done in the problem solving process. Furthermore, metacognitive evaluation refers to judgments made about thought processes, the capacity to think, and self-limitations when working in certain situations, while metacognitive regulation occurs when someone uses metacognitive skills to organize knowledge and thought. Metacognitive regulation refers to one's knowledge of strategy, including how and when to use specific strategies and the use of executive skills such as planning, correction, setting goals to optimize the use of their own cognitive resources [11].

Furthermore, the skill of metacognition is a knowledge procedure. This is a deliberate awareness by someone to control their logic. This metacognition skill includes activities such as developing action plans, monitoring action plans and evaluating action plans [12], [13], [14]. If students are aware of what is needed to work effectively, then it is possible for him to take steps to meet an adequate learning situation.

Metacognition involves two important things, namely knowledge of cognition and regulation of cognition. The regulation of cognition is influenced by anxiety. Anxiety interferes with cognitive processes at the expense of ongoing memory activity [15]. Mathematical anxiety is a psychological status, which arises in people when dealing with mathematics both in teaching and learning situations or in solving mathematical problems and

assessing mathematical behavior. Mathematical anxiety experienced by students can be obtained from learning styles, past experiences, personality types, bad books, teacher attitudes, classroom environment, time constraints, and the pressure that parents and teachers put on students [16].

Some psychologists argue that differences between humans occur due to the influence of different personalities. In 1998, in his book Please Understand Me II [17] David Keirsey, a professor in psychology from California State University, classified personalities into 4 types, namely Rational, Idealist, Artisan and Guardian. This type is divided based on how someone retrieves information, namely sensing and intuitive. Someone who takes his information by sensing, is the one who has the personality type of the Guardian and Artisan [18]. Students' thinking about solving certain problems to know is not only seen from their behavior, but specifically from the results of their work. Problems in mathematics take the form of story problems and non-story problems. Problem solving is an important part in learning mathematics.

Based on the explanation above, the question of this study is how the metacognitive skill's profile of junior high school students in solving mathematical problems in terms of personality types, especially artisan and guardian.

2 Research Method

This research is included in the type of descriptive qualitative research. This research is said to be a qualitative descriptive study because the purpose of this study is to understand the phenomenon of what is experienced by the research subject holistically and by means of description in the form of words and language, in a special natural context and by utilizing various natural methods. The phenomenon in question is when students carry out mathematical problem solving activities with the material system of two variable linear equations (SPLDV). Analyzes were carried out on students' work on solving mathematical problems in the SPLDV material.

The study was conducted at SMP Negeri 3 Dawe Kudus district class VIII A. Taking subjects using purposive sampling techniques with consideration of the results of personality type classification, the results of interviews, and suggestions from class teachers. The results of personality type classification are obtained by distributing personality type test instruments such as those in the book Please Understand Me II and have been translated into Indonesian that is adapted to the eighth grade students of junior high school. After obtaining the results of personality type classification, three students were selected with guardian personalities and three students with Artisan personality types were selected. After that, the chosen subjects were given mathematical problems with SPLDV material. Then the results of the work are checked by interviews with students to be analyzed. Table 1 below is the identity of the research subjects.

Table 1. Research subject

No	Personality Type	Subject Code
1	Guardian	G1
2	Guardian	G2
3	Guardian	G3
4	Artisan	A1
5	Artisan	A2
6	Artisan	A3

3 Result and Discussion

In this section, the results of research on the metacognition abilities of students in solving mathematical problems in SPLDV material are arranged in aspects of metacognition abilities, namely developing an action plan, monitoring an action plan and evaluating an action plan. Table 2 is an indicator of the metacognitive skill to be considered in this study. To see the metacognitive skill, students are asked to do mathematical problem solving then the student worksheets are used as a tool to see students' metacognition abilities. And interviews were conducted to find out what was in the student's mind and what about awareness when solving problems

Table 2. Indicators of Metacognition Skill in Problem Solving

Metacognitive aspects	Indicators of Metacognition Skill in Problem Solving
Developing a plan of action	1.1. Students identify information on a topic and restate it in a more operational form
	1.2. Students explore prior knowledge when they interpret the information provided and refer to relevant concepts before developing a solution plan
	1.3. Students make predictions about the information in the problem to be solved based on what they have read
Monitoring the plan	2.1. Students investigate a topic by verifying, clarifying and developing, or changing their initial statement with accurate information
	2.2. Students generate new information and express problems with pictures, symbols or labels as they are organized into a plan
	2.3. Students classify ideas that are related and identify the strategies used
	2.4. Students interpret the results and formulate an answer
Evaluating the plan	3.1. Students evaluate success and discard inappropriate strategies
	3.2. Students identify strategies that can be used later and look for promising alternative approaches

The subjects of this study were six students with three of them having the Guardian personality type, and the other three were Artisan. The following is a recapitulation of written test data results and interviews to the subject.

Table 3. Recapitulation of Written Test Results and Interviews

Personality Type	Subject Code	Explanation
Guardian	G1	Some indicators were comply (on developing the plan and evaluating the plan)
	G2	Some indicators were comply (on developing the plan and monitoring the plan)
	G3	All indicators were comply
Artisan	A1	All indicators were not comply
	A2	Some indicators were comply (on developing a plan and evaluating the plan)
	A3	Only developing the plan’s indicator were comply

To clarify the results of the data analysis above, the following discussion is given. In general, students' metacognitive skill in problem solving by each student vary, both within one group of personality types and with different personality types. This is closely related to students' thought processes. In line with Dewiyani's statement, students with different personality types will also have different thought processes [19]. Therefore it will be discussed differences in students' metacognitive skill with guardian and artisan personality types. In general, Guardian and Artisan personality types can be seen from their characteristics, table 4 [20] explains the general characteristics of each personality type.

Table 4. General Characteristics of Each Personality Type

Guardian	Artisan
Very responsible, hardworking, obedient, on schedule, rigid, difficult to change, strong organizing	Prioritizing life for today, the past is no longer relevant and the future is not important and very quickly makes decisions without thinking, able to see the situation quickly
As a Student: a. Like the class with routine learning based on existing procedures, the schedule does not change b. Suitable for teachers who provide explanations in a gambling, precise and concrete manner c. The material must be presented based on the facts that happened in the past and estimates for the future d. Does not like the picture, but prefers the story e. Each task must be known in detail, especially on the benefits derived from the task	As a student: a. Prefer applied science b. Always seen active everywhere c. The preferred activities are demonstrations, presentations, and other learning experiences that involve action d. Happy to tell the results of learning to others e. Liked entertain f. In doing the task, it must be known the benefits gained, and the elevation of the material at the time g. Liked the competition, and the opportunity to compete h. Able to change things around

Based on table 3, it appears that students' metacognition abilities in problem solving appear to vary. The table shows students with the same personality types or not the same, have different abilities. Based on the results of interviews with students G1, G2, and G3. The three of them did the same thing for the step of developing a plan, namely by writing rigidly what was known from the problem. Students understand the purpose of the problem, but students feel confused in choosing and determining what is needed to make a solution. Only the subject of G3 that meets all metacognition indicators for this stage of developing a plan. G1 and G2 students do the deficiencies that is when changing the symbol is not done thoroughly, it also results in mistakes in carrying out the strategy plan that they put together.

In accordance with table 4, guardian students are students who like questions in the form of stories, they are also rigid in reading questions, so when they encounter non-routine questions, they are somewhat confused. Guardian students are aware of their shortcomings, this is shown by students always ascertaining whether what they understand is true, what they know is true, but when carrying out a plan arranged (monitoring), students do not do well, of the three subjects only one subject who do the monitoring well. Students do not align what is known so that from some information that is known does not make capital for students to solve problems.

G3 subjects as students with guardian personality types show that guardian types are those who like the work done in detail. G3 subjects develop the plan, monitor and evaluate in detail. Although the guardian likes routine procedures, G3 subjects can solve various procedures for non-routine problems.

Furthermore, for students with artistic personality types, based on interviews and worksheets subject A1, at the stage of developing the plan, subject A1 mentions what is known exactly as the problem, he also knows what is asked from the problem. However, subject A1 lacks monitoring, which considers a symbol as a number that must be included in the calculation. Students appear to be in a hurry in solving problems. In accordance with table 4, students with artisan personality types are students who are quick in making decisions.

Subject A2 is an artisan personality type with fairly good metacognition abilities. Subject A2 uses its meta-logic in developing the plan and monitoring problem solving, but subject A2 does not carry out the evaluating stage. Based on the results of the interview, subject A2 realized that all he knew was the strategy he had worked on. He did not do evaluating because for him to obtain the results of problem solving was enough.

Based on table 4, students with artisan personality types are students who are quick in making decisions. This seems clear when students with this type work on problems, he does not think long, whatever he knows and he needs to solve the problem immediately written and designed how the strategies he worked on. This has an impact on not evaluating, the results obtained are not evaluated whether it is appropriate to use the strategy, or whether the strategy is effective for other problems.

4 Conclusion

The ability of metacognition in solving mathematical problems of students with guardian and artisan personality types varies greatly, this can be seen from the student worksheets and interview results. It can be concluded that students with guardian personality types work more specifically, and be more careful in solving problems. For students with artisan personality types to work with a little haste, so the metacognition stages are not met the indicators.

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