The description of students' mathematical problem-solving skill and self-regulation

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Abstract: The research aimed to describe the students' mathematics problem-solving skill and self-regulation in *SMP Negeri 8 Purwokerto* used Miles and Huberman's model of cover reduction, serve, and conclusion. The data source of this research were eight graders of class F by using purposive sampling. The students grouped into three categories according to the mid-term result. The categories were: high, mediocre, and low scores. The data was collected using tests, questionnaire, interview, and documentation. This research concluded that the students' mathematics problem-solving skill from those three categories was different. The high score students' group had a better problem-solving skill compared to the students in the mediocre or the low categories. However, the self-regulation from these three groups did not have a significant difference. It was still at the developing level. Thus, it could be concluded that the students' self-regulation did not affect the ability to solve mathematical problems.

Keyword : mathematic problem-solving skill, self-regulation

1. Introduction

Mathematics is a field of science that has an important position in the world of education. It is a developing science used by other studies and helps to overcome the daily problems. Problems are the form of unbalanced states of the expectation with the reality. A problem requires a person to think longer about the way or the strategy of how he or she could solve the problem. Thus, learning mathematics should be able to assist the students' ability in problem-solving.

The mathematics problem-solving ability is one of the five standard processes based on the National Council of Teachers of Mathematics (NCTM), aside with communicating, reasoning and proving, connecting, and mathematical presenting [1]. Particularly in mathematics, the problem-solving skill turns into the most complex one. It also becomes the main focus in the mathematics' curriculum. As in problem-solving skill, it includes all of the knowledge aspects, (memory, comprehension, application, analysis, and evaluation) as well as the sensibility to accept challenges [2]. Further, one who faces the mathematic problem has to analyze, synthesize, and evaluate his work outcome until he is certain of it [2]. In the students' process of learning, it is possible to gain experience using the knowledge and skills which they already have. The students can applyit into infrequent problem-solving.There are four steps in solving the problem,

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they are;(1) understanding the problem, (2) devising a plan, (3) carrying out the plan, and (4) looking back [3].

In the problem-solving process, the students are not only required to resolve it but also to develop a creative thinking skill in solving problems. Unfortunately, in learning mathematics, students often have difficulty. Especially in solving problems which they rarely have. Therefore, there are several mathematics problem-solving strategies which commonly used. These strategies are such as: ableto describe problems in the form of diagrams, tables, drawings, create equations, use algorithms, the properties of numbers, the appropriate formula of completion, known knowledge and the relevant concepts to make the mathematical models or sentences [4]. Not every problem-solving strategy can be used to solve problem, meaning problems with certain characteristics require specific troubleshooting steps. Sometimes the issue presented in the learning of mathematics is a matter that is infrequent, then it takes the ability that must be possessed by students is the competence to manage themselves in learning.

A person will get a decent learning achievement if he is aware, responsible, and knows how to learn efficiently. The success of a student in the learning process is not only determined by the level of intelligence (IQ) that he has, but also the competence to manage himself during the learning process. In this case, it requires a good self-regulation in learning or often referred as self-regulation.

Self-regulation behavior in the context of studying is the ability of the students to self-regulate themselves in the learning process. Self-regulation in learning is a self-regulated action taken by students in studying whose emphasis is on: (a) on how students choose, organize, or create a favorable learning environment for themselves, (b) as well as on how students plan and control the form and number of instructions their own [5]. Individuals have the ability to cope their learning by developing self-monitoring measures, setting standards, self-evaluation, self-assessment, and responding to themselves [6].

This self-regulatory capability is required for students to be able to manage and direct themselves, able to adjust and control themselves in resolving the learning tasks. The good self-regulation also helps students in organizing, planning, and instructing themselves to achieve specificaims which in this case is the maximum achievement especially the mathematics field. The result of research also shows that there is a positive and significant relationship between the self-regulation behavior from metacognition, motivation, and behavior toward students' learning achievement [7]. Hence, another research shows that the group of college students whose given self-regulation training have a higher grade point average score compared to those whose not given self-regulation training [8]. Other studies have also shown that optimizing the formation of self-regulation in students will improve the quality in mathematical problem-solving and affect the quality improvement of mathematics learning it self [9]. Based on these studies, they show that self-regulation has a significant role in achieving general learning outcomes, including in the mathematical study. Therefore, with this

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self-regulation, the students are expected to show more behaviours or businesses that can support their success in the process of learning mathematics.

Due to the importance of the mathematical problem-solving ability as well as the students' self-regulation act, it is necessary to examine the description of the problem-solving ability of mathematics and students' self-regulation behavior. In this case, the demands of the achievement in *SMP Negeri 8* Purwokerto require students to be able to manage their learning behavior in the hope that they can obtain maximum learning results. Especially, in solving problems that are infrequent mathematics. Based on the interview results with the mathematics teachers, these achievement demands are often miss-matched with the well-arranged learning strategies by students. Therefore, in this research, the researcher will describe the ability in mathematics problem-solving and self-regulation behavior of students in *SMP Negeri 8 Purwokerto*.

2. Method

This research is a qualitative descriptive research with two variables that are the problem-solving ability of mathematics and students' self-regulation. This study intends to conduct an investigation on these two variables by providing a description of the research object/subject state at the present moment based on facts which appear as they are. This research is used to describe the problem-solving ability of mathematical and students' self-regulation behavior. In this study, it uses descriptive qualitative because the data collected in the form of words and images in the research environment. The data were obtained using the methods of test mathematical problem-solving, self-regulation questionnaires, and interviews. The mathematical problem-solving test method is used to see the students'mathematical problem-solving ability. The questionnaire method used to obtain the students' self-regulation information. The interview method used to obtain a deeper information about the students' ability of mathematical problem-solving as well as their self-regulation. The technique of analysis done by using data triangulation.

The population of this study is all students of SMP Negeri 8 Purwokerto in the academic year 2014/2015. The subjects were the students of class VIII-F. Before the research, subjects were divided into three categories based on previous learning outcomes, i.e., high, medium, and low groups. This was conducted to see the students' problem-solving ability and self-regulation behavior from each category.

3. Result and Discussion

The research started from the test of mathematical problem-solving ability, interviews, and self-regulation questionnaire by class VIII students at SMP Negeri 8 Purwokerto. Furthermore, the researchers analyzed the test results and were reinforced by the interview activities of learning outcomes from each category.The researchers also analyzed the result of self-regulation questionnaires and deepened with interview activities. From each category can be obtained data as follows.

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3.1 Students' Mathematical Problem-Solving Ability in High Learning Result Category

Problem number 5:

Rio has 3 pieces of bearing (laher) in the form of a tube with a diameter of 7 cm long. Rio will bind the bearing (laher) in two ways, namely:

Cara 1 Cara 2

What is the minimum length of rope that Rio uses to bind 3 pieces of bearing (laher) in 1 way? Is the length of the rope required to bind 3 pieces of bearing (liner) in 1 and 2 ways have the same length?

Figure 1. Problem number 5

Student answers:

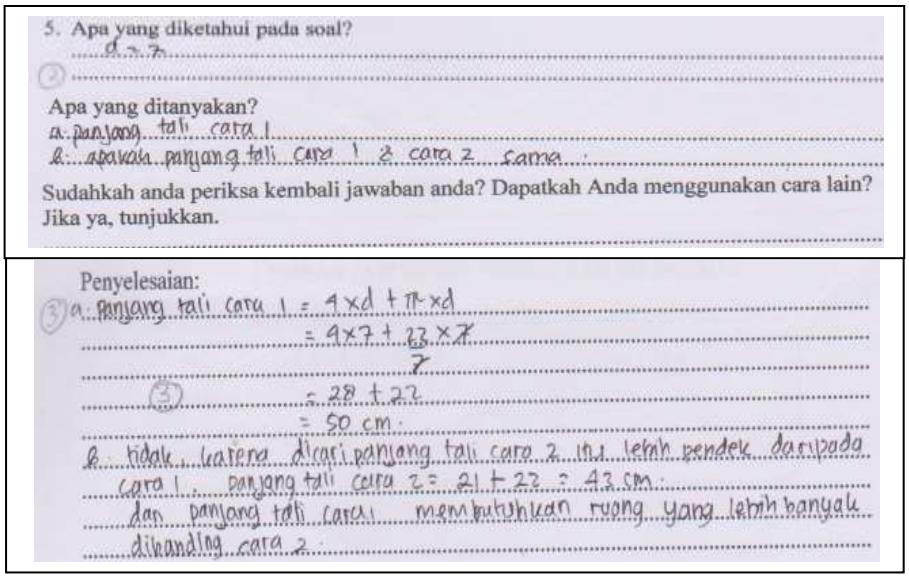

Figure 2. Student Answer for Problem Number 5

Based on the analysis of the students' responses and interview with the subjects, the researchers found that students were able to solve the mathematical problems well. This indicated by the test results and interviews. The students could understand the problem well, that shown by writing down what they were already known to it, could plan the settlement, and could solve the problems well. But, the students were still having difficulty in reviewing the results that had been obtained. Interview results also obtained that students were able to explain all the problem-solving stages well.

3.2 Students' Self-Regulation Behavior in High Learning Result Category

The results of the self-regulation questionnaire in this category indicate that the students tend to not always have clear learning objectives. But, they have a learning

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plan, often self-motivation, and use good attention control. When they have a difficulty in learning, they often seek help and evaluate the learning outcomes. But the students rarely use flexible learning strategies.

3.3 Students' Mathematical Problem-Solving Ability in Medium Learning Result Category

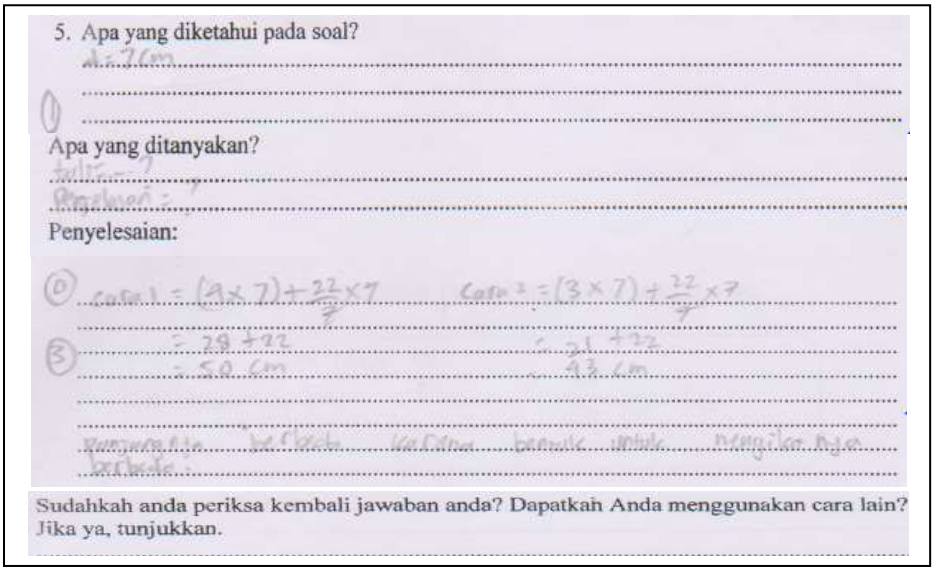

Figure 3. Student answer for problem number 5

Based on the analysis of the students' responses and interview with the subjects, the researchers found that they could do an adequate mathematical problem-solving. This indicated from the test results and interviews. Based on the analysis of the students' responses and interview with the subjects, the researchers found that they could do an adequate mathematical problem-solving. This indicated by the test results and interviews. Students could understand the problem although it was still simple, could plan the settlement although used only the symbol, could solve the problem simply, but could not carry out the fourth stage of problem-solving, that is to review the results that have been obtained. The interview result shows that the students were still hesitated in explaining the completion stage.

3.4 Students' Self-Regulation Behavior in Medium Learning Result Categoriy

Based on the results of the self-regulation questionnaire analysis, students in this category do not always have the clear learning objectives, but they have a learning plan, self-motivation in completing the given task, monitor the progress of learning, and when they face the difficulties they seek appropriate assistance. But, the students still rarely use good attention control to stay focused in their learning as well as the flexible learning strategies.

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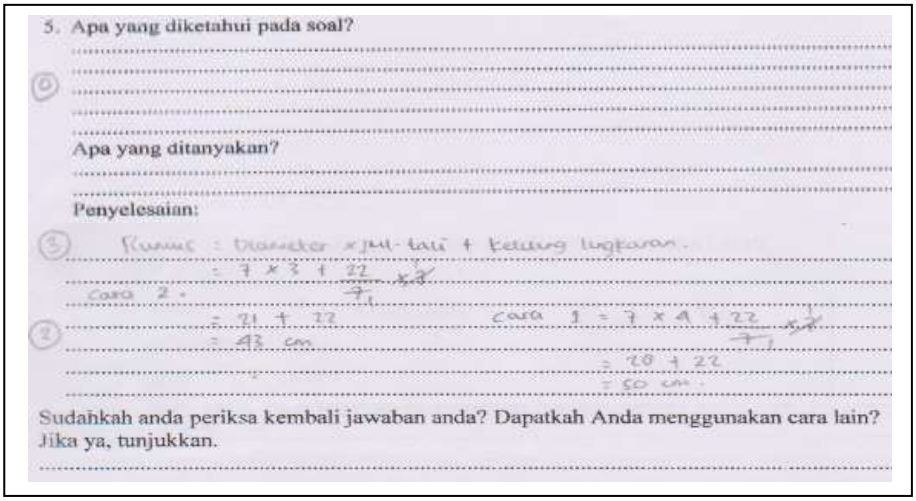
3.5 Students' Mathematical Problem-Solving Ability in Low Learning Result Category


5. Apa yang diketahui pada soal?

Apa yang ditanyakan?

Penyelesaian:

Rumus : diameter x jml tali + keliling lingkaran.

: 7 x 3 + 22

cara 2 :

: 21 + 22

: 43 cm

cara 1 = 7 x 4 + 22

: 28 + 22

: 50 cm.

Sudahkah anda periksa kembali jawaban anda? Dapatkah Anda menggunakan cara lain? Jika ya, tunjukkan.

Figure 4. Student answer for problem number 5

Based on the analysis of the students' responses and interview with the subjects, the researchers found that thestudents had not been able to solve mathematical problems well. This shown from the test results and interviews. Students could not understand the problem and could not plan the completion well. It was shown in the answer that the studentscould not write down what wasthey known to the problem. At the problem-solving stage, students were quite capable to do so, but could not carry out the fourth stage of problem-solving, which was to review the results that had been obtained. The results of the interviews shown that the students had difficulties in explaining the completion stage.

3.6 Students' Self-Regulation Behavior in Low Learning Result Category

Based on the results of the self-regulation questionnaire analysis, students in this category category tend to have clear learning objectives, and have a mature learning plan. In addition, when they have difficulties, they do self-motivation so they will not easily give up and use good attention control and monitor themselves in the progress of learning. However, students still rarely use flexible learning strategies, and when experiencing learning difficulties seldom seek the right assistance and rarely do self-evaluation of learning outcomes.

4. Conclusion

Based on the analysis results, the researchers can conclude as follows:

1) Students with high learning achievement category have a good mathematical problem-solving ability. They also have shown self-regulation behavior by doing six processes of self-regulation.
2) Students with medium learning achievement category have the problem-solving skill that is not good enough. But, their self-regulation action has started to develop.

3) Students with low learning achievement category have a poor mathematical problem-solving ability. They are still unable to do the problem-solving stages. However, they are also has started to develop their self-regulation process, namely by conducting five self-regulation process.

Based on the description above, there are some findings of this study which can be stated as follows. (1) The students' self-regulation behavior does not affect the ability of problem-solving mathematically. This is based on the results of questionnaires and interviews. It states that students from the high, medium or low learning groups have similar self-regulation behavior. It ranges in the moderate category. (2) The students' mathematical problem-solving ability has a direct connection to their learning outcomes. This is based on the results of questionnaires and interviews. As could be seen from it, the students who have the ability to solve mathematical problems have a high learning result. On the other hand, the students who have the moderate ability to solve mathematical problems have a medium to the low learning outcome. However, the students' mathematical ability and their self-regulation could be enhanced by directing and developing their purpose in the learning process [10].

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