Indonesian Journal of Education & Mathematical Science
Vol. 6, No. 1, Januari 2025, pp. 13~17
ISSN: 2715-985X, DOI: 10.30596/ijems.v6i1.21723

Analysis of Mathematics Problem Solving Ability Viewed from Self-Regulated Learning

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ABSTRACT

The goal of this study was to assess SMA Wachid Hasyim 5 Surabaya students' abilities to solve arithmetic problems in the low, medium, and high self-regulated learning categories. Three students from class X IPA 3 participated in this qualitative study. Data for this study were gathered by questionnaires, tests, and interviews and analyzed through data reduction, data presentation, and drawing conclusions. The authenticity of the data in this investigation was determined via time triangulation. Based on the findings and discussion, the researcher concluded that the four steps of problem solving for students with high and moderate independence when learning can be fulfilled properly; however, independent students are experiencing difficulties at the stage of carrying out the settlement plan because students are not careful about the results of their calculations. Meanwhile, students with low learning independence meet one of the indications, namely understanding the problem, but are unable to appropriately put down what is learned in the questions, resulting in incorrect calculations.

Keywords: Mathematical Problem Solving Ability, Self-Regulated Learning

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1. INTRODUCTION

One of the subjects that must be applied at all levels of education in Indonesia is mathematics. According to Hasratuddin (F Assyifa et al., 2020) mathematics is the study of regularity and structured concepts ranging from the most basic to the most complex. Therefore, the existence of a structured concept of mathematics will make it easier for students to understand various problems. With a variety of different structured concepts that students have, they can develop logical, critical, and creative thinking skills as well as skills for studying independently or in groups.

Permendikbud No.59 of 2014 states that learning mathematics has a goal, especially at the high school level, namely students can master how to explain mathematical concepts by explaining relationships between concepts when solving problems, using formulas as estimates when solving problems, applying arguments when solving math problems, conveying ideas and doing proof using tables, symbols and diagrams (R. K. Putri & Roichan, 2021). Therefore, to achieve a learning goal, students need to master their mathematical problem solving skills.

Students with the ability to solve a problem, can solve the problem with several efforts as related to the knowledge or understanding previously possessed. Therefore, students can determine the appropriate technique or strategy to solve the problem. According to George Polya (S. M. S. Putri & Putri, 2022) the problem solving step indicators consist of 4 stages, namely the stage of understanding the problem, the stage of making a plan, the stage of carrying out the plan, and the stage of re-examining. Student independence in learning is one aspect that influences students' problem-solving abilities. Independent learning is the ability of students to carry out independent learning through appropriate learning methods to maximize learning outcomes. However, in reality, many students also believe that a subject that is difficult to master and understand is mathematics (Purwasih & Rani Kurnia Putri, 2020). Because of this, student independence in learning is reduced.

Based on the results of the researchers' observations and discussions with the mathematics teacher during the Introductory Field Schooling activities at Wachid Hasyim 5 Surabaya High School, it was found

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that the 2 classes were different with the same material. Different treatment was given to the two classes. This is based on the difference in problem-solving abilities of each student because the level of independence of students in learning is different. Students who have low independence tend to always want to be explained before working on problems, as well as solving problems that are done in groups. In contrast to students who have high learning independence, these students are able to solve problems on their own without the help of friends or teachers. Schunk and Zimmerman (1998) revealed that independent learning is a learning process that occurs when one's thoughts, feelings, strategies, and actions are used to achieve learning goals. Agree with this Ellis, J.M., & Helaire, L.J. (Agustina et al., 2019) also states that learning independence is an ability that encourages students to set learning goals, monitor, regulate, lead and control cognition, motivation, and behavior to achieve learning goals. Therefore, in (Ekadiarsi & Khusna, 2022) study, students with high independence in learning have superior problem-solving abilities compared to students with moderate and low independence in learning.

Based on the description above, the researcher is interested in conducting research entitled "Analysis of Mathematical Problem Solving Ability Viewed From Self-Regulated Learning" with the aim of assessing the mathematical problem solving abilities of SMA Wachid Hasyim 5 Surabaya based on their high, medium, and low learning independence.

2. RESEARCH METHOD

This descriptive qualitative research involved all X IPA 3 SMA Wachid Hasyim 5 Surabaya students who were used as research data sources and three students were selected as research data sources based on low, medium, and high levels of self-regulated learning. To collect research data, a questionnaire test was carried out, a problem solving ability test, and an interview test. The questionnaire given was about learning independence. The test is presented in the form of a problem solving test with descriptive questions. Then data from the results of the questionnaire were taken to group students based on their independent learning and tests were used to assess students' problem solving skills. Data were analyzed in stages including data reduction, data presentation, and drawing conclusions. To assess the accuracy of the data in this study, time triangulation was used.

3. RESULTS AND DISCUSSION

Based on the analysis of the Self-Regulated Learning questionnaire test according to Zimmerman (1989) it was found that out of a total of 36 students in class X IPA 3 there were 6 students having low learning independence, 14 students having moderate learning independence, and 16 students having high learning independence. In this study three subjects were selected for each one student based on the level of self-regulated learning.

Table 1. Data of Three Selected Subjects

Number	Initials Name	Score	Category	Subject Code
1.	MAK	84	High	ST
2.	NPS	69	Moderate	SS
3.	WDN	54	Low	SR

The three selected subjects were given the Mathematical Problem Solving Ability Test twice at different times. After conducting the Mathematical Problem Solving Ability Test, interviews were conducted with three selected subjects to strengthen the results of the problem solving ability test, especially on Rows and Series material.

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A. Results

The following are the results of high, medium, and low subject tests on problem-solving ability questions based on Polya Theory.

Table 2. Results of Subject Data Analysis ST

Number	Polya's Problem Solving Stages	Question 1	Question 2
1.	Understanding the Problem	Good	Good
2.	Making a Plan	Good	Good
3.	Carrying out the Plan	Good	Good
4.	Re-Examining	Good	Good

In the first and second tests of problem solving ability (TKPM 1 & TKPM 2), subjects in this category were able to solve them well and were structured according to their mathematical problem solving ability. The ST subject can plan the solution well and can apply it to the problems given in the TKPM Test 1 and TKPM 2. Based on the results of the interview test, the ST subject always feels confident about what he is doing and previously the ST subject has studied the material in rows and rows.

Table 3. Results of Subject Data Analysis SS

Number	Polya's Problem Solving Stages	Question 1	Question 2
1.	Understanding the Problem	Good	Good
2.	Making a Plan	Good	Good
3.	Carrying out the Plan	Less	Less
4.	Re-Examining	Less	Less

In the first and second tests of problem solving abilities (TKPM 1 & TKPM 2), subjects in this category were able to solve the two TKPM test questions well even though there were errors in calculating the final results. SS subjects were able to plan their solutions well and were able to apply them to the problems given in the TKPM1 and TKPM 2 test questions even though there were a few errors such as inaccuracy when calculating number operations, and at the end of the solution they did not write a conclusion. Based on the results of the interview test, SS subjects who were self-reliant in learning were able to explain it again in their own language and already understood the methods or formulas used in the questions, even though when the process was still a little difficult.

Table 4. Results of Subject Data Analysis SR

Number	Polya's Problem Solving Stages	Question 1	Question 2
1.	Understanding the Problem	Good	Good
2.	Making a Plan	Less	Less
3.	Carrying out the Plan	Less	Less
4.	Re-Examining	Less	Less

In the first and second tests of problem solving abilities (TKPM 1 & TKPM 2), subjects in this category were able to solve the two TKPM test questions well even though there were errors in calculating the final results. The SR subject could plan the solution well and be able to apply it to the problems contained in the questions so that the 2 questions on the TKPM 1 and TKPM 2 tests could be solved properly even though there were a few errors such as errors in entering values in formulas, inaccuracies when calculating number operations, and at the end of the settlement they did not write a conclusion. Based on the results of the interview test, subjects with low learning independence were able to explain it again in their own language, but experienced confusion about determining what formula to use, this was because the SR subject did not memorize and rarely reviewed the material provided by the teacher. So that the problem can not be resolved properly.

B. Discussion

The findings obtained by the research data are that from a total of 36 students in class X IPA 3 there are 6 students who have low learning independence, 14 students have moderate learning independence, and 16 students have high learning independence. Students who have high learning independence also have high ability to solve problems because they always feel confident in what they do. In addition, students with high learning independence have shortcomings in terms of interacting with friends. This causes students to tend to be able to solve problems without the help of others. This statement is reinforced by Zimmerman (in Sutikno, 2016) students who have high independence have difficulties when interacting with other students. As for students who have moderate learning independence, the ability to solve problems is moderate. However, students in the moderate category actually feel confident in what they do. However, sometimes they need help from friends when they find it difficult to solve problems. This is reinforced by research (Ansori & Herdiman, 2019) students who have good enough independence have a tendency to learn independently but when they encounter difficulties these students tend to be silent and ask a few questions to students who understand better.

Students who have low learning independence also have low problem solving skills. Because students in the low category always feel less confident in what they do this is because they do not memorize the formula and rarely review the material that has been given by the teacher. In addition, students with low learning independence tend to dislike or have no interest in learning math. Thus, they always feel the need for help from friends when they find it difficult to solve problems. This is reinforced by research (Etika et al., 2013) that students who have low independence do not have a good response to learning, do not have curiosity and interest in learning, and students with low learning independence always feel less confident in their abilities.

4. CONCLUSION

Based on the findings and discussion, the researcher concluded that the four steps of problem solving for students with high and moderate independence when learning can be fulfilled properly; however, independent students are experiencing difficulties at the stage of carrying out the settlement plan because students are not careful about the results of their calculations. Meanwhile, children with low learning independence meet one of the indications, namely understanding the problem, but are unable to appropriately put down what is learned in the questions, resulting in incorrect calculations.

ACKNOWLEDGEMENTS

Thank you to those who have helped with this research. Hopefully this research can be useful for society and can be used as a reference for further research development.

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