Journal of Education and Learning Mathematics Research (JELMaR)

Analysis of Student Mistooks in Solving the Geometry Transformation Matter for Class IX SMPN 1 Geger Reviewed From the Stage of Polya Theory

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Abstract: Mathematics is considered a difficult subject because the concepts studied are not well understood, so that in solving math problems students often make mistakes. This study aims to analyze mistooks and factors causing mistooks made by class IX students of SMPN 1 Geger in terms of the stages of Polya's theory. This type of research is qualitative research. Data collection techniques used in the form of written tests and interviews. The research subjects used were 4 students of class IXB who were identified as making mistakes in solving problems in terms of the stages of Polya's theory. Data analysis techniques in this study used data reduction, data presentation, data verification and conclusions. The results of this study indicate that the mistooks made by the four subjects were (1) at the stage of understanding the problem students did not write down information about the questions. (2) at the stage of preparing the plan the students did not write the completion plan and the students could not determine the formula to be used. (3) at the stage of implementing the plan the students did not write down the completion steps or incorrectly applied the formula according to what was asked in the question. (4) at the re-checking stage, students do not re-check their answers or re-check but not systematically. The factors causing these mistooks are (a) students cannot understand the questions, (b) poor time management of students, (c) students' habits in solving problems.

Keyword: Mistook Analysis, Polya Theory, Geometry Transformation.

INTRODUCTION

Mathematics is a lesson that one of the subjects studied from basic education to higher education. It aims to teach how to think analytically, critically, logically, creatively and systematically as well as the ability to work together (Permendiknas Number 22, 2006). However, in reality in social life mathematics is considered a difficult subject to learn, because the concepts are not understood properly. So that interest in this subject is very low compared to other subjects. Due to these things, many students have difficulty so that students often make mistakes in solving math problems which causes student achievement to decrease. This can be seen in the results of the 2018 Program for International Student Assessment (PISA) study. Indonesian student scores have decreased from 2015. Indonesia's math score at PISA in 2018 was 379 (OECD average 489), while in 2015 was 386 (OECD average 490). In addition, the results of the 2015 Trend in International Mathematical and Science Study (TIMSS) show that students' mathematical abilities are still below average. In which Indonesia is ranked 44th out of 49 countries with a score of 397 out of an international average score of 500 (Putri & Musdi, 2021). These results indicate that the mathematical ability of Indonesian students is still far from the average, so an mistook analysis is needed to solve the problem of low student achievement.

The process of learning mathematics does not use rote methods like other subjects but emphasizes understanding and developing critical thinking in order to avoid mistakes in solving problems. However, what happens in the field is the opposite where students

memorize formulas more than understand concepts. For most students, mathematics is considered difficult and mistooks often occur in the process. This is in line with the results of an investigation based on Nuryah et al (2020) who stated that the types of mistooks that are often made by students are mistooks in interpreting the intent of the questions, mistooks in planning, mistooks in carrying out plans, and mistooks in re-checking the final results obtained. According to Siagian & Edy (2021) in their research, they found that students made conceptual and procedural mistooks. Wijaya & Masriyah (2013) in their research found the location of students' mistakes when solving questions, including mistooks when interpreting questions, mistooks in making mathematical models, mistooks in completing mathematical models and mistooks when giving final answers to questions. No exception when working on math problems on geometry transformation material, students also often make mistakes.

Geometry Transformation material is one of the materials in the odd semester class IX mathematics subject. To measure students' abilities, it is not uncommon for teachers to use story questions. This is in accordance with Rahardjo & Waluyatis' opinion (2011) that say the form of questions used to gauge students' abilities when learning mathematics can be in the form of story questions or non-story questions. Hartini (2008) states that story questions are a form of questions that present problems related to everyday life in the form of stories. In solving mathematical problems, especially story problems, students often make mistakes in solving problems, this also applies when working on Geometry Transformation problems. This can be seen from the mistakes made by students in understanding the problem, making / compiling the problem into a mathematical model, mistooks in the selection of settlement procedures, as well as in completing calculations. Therefore, a special strategy is needed to be able to solve mathematical problems, one strategy that can be used is to use the stages of Polya Theory. According to Polya (1978) there are four steps in solving mathematical problems as follows.

1. Understanding the problem (understanding problem), at this stage students are required to understand the given problem, namely determining what data is known, what is being asked to solve the given problem.
2. Making a plan of completion (devising a plan), at this stage students are required to be able to determine the example of variables, create mathematical models, determine the theorems to be used, determine strategies or methods to be used, and write down the steps for solving them.
3. Completing the plan of completion (carrying out the plan), at this stage students must carry out the plans that have been set in the second stage. The ability of students to understand the material and the skills of students to do mathematical calculations can help in solving problems.
4. Looking back, at this stage students must reflect, namely checking and re-examining the solutions obtained and being able to write conclusions from the results obtained.

One of the benefits of problem solving in Polya's theory is that it makes students more careful in recognizing the stages that are appropriate to the problem solving process. The stages of completion of Polya's theory can be used as a reference to assist students in solving problems by arranging a neat settlement framework and can be used as a reference in analyzing student mistooks in solving problems.

According to the Big Indonesian Dictionary (KBBI), analysis is an investigation of an incident in order to find out the actual situation. Meanwhile, based on Sastrio et al (2020) mistook is a deviation from the actual thing which is systematic, consistent, and incidental in certain areas.

The purpose of this study was to analyze the mistooks of junior high school students and their causal factors in solving geometry transformation problems in terms of the stages

of Polya's theory. Widodo & Sujadi (2017) suggest that students' mistakes when solving problems are useful as a guide to determine the extent to which students master the material. With this research, it is hoped that it can help the quality and quality of the nation's young generation.
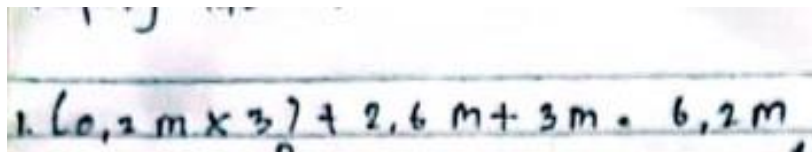
METHOD

The research method applied in this study is a qualitative descriptive method. In the opinion of Ahyar et al (2020) which states that the descriptive research method is a research method that is directed at providing symptoms, facts or events systematically and accurately. Through this method, the researcher tries to reveal what the students' mistakes are in solving the geometry transformation problems for class XI SMPN 1 GEGER in terms of the polya theory stage. The subjects in this research is students of class IXB SMPN 1 GEGER, totaling 32 students. Subjects were taken through a contextual problem solving test related to Geometry Transformation material which was given to XIB class students offline. The instrument in research is a problem-solving test in the form of a description test of the geometry transformation material to see student mistooks in solving questions and interview instruments to determine the types and factors causing student mistooks. Data analysis techniques in this study used data reduction, data presentation, data verification and conclusions.

RESULT AND DISCUSSION

Subjects were taken through a problem solving test related to Geometric Transformation material that was given to students in class XIB offline. Polya's theory. The subjects selected based on the research objectives were students (1) Rifqy Iqbal Wibisana (RIW), (2) Anggita Dewi Aprilia (ADA), (3) Anindita Nafitul Khasanah (ANK), and (4) Chelsi Aulya Putri (CAP). Furthermore, the researchers conducted interviews with the four subjects. Based on the results of the student mistook analysis test and interview results, the following results were obtained.

1. Subject RIW

Figure 1. RIW Test Results Number 1

Figure 1 shows that RIW made a mistake by not writing down information that known in the question, implementing the plan but the written plan did not answer what was asked about the question and didn't write the conclusion.
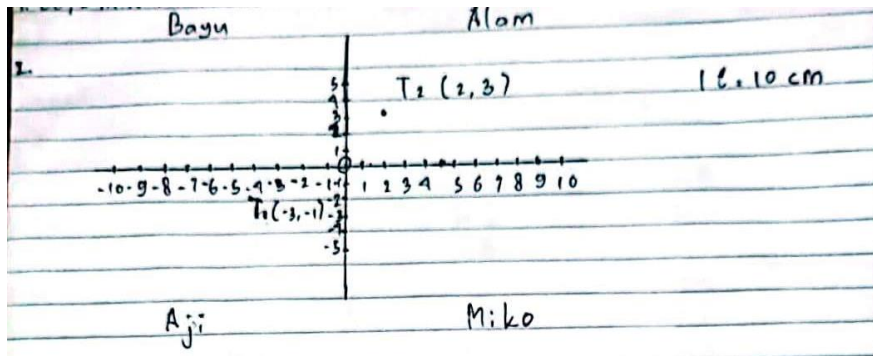
Figure 2. RIW Test Results Number 2

Figure 2 shows that RIW made a mistake by not writing down what is known and what was asked in the problem, not writing a settlement plan, not writing down the steps and not writing the conclusion of the final result.
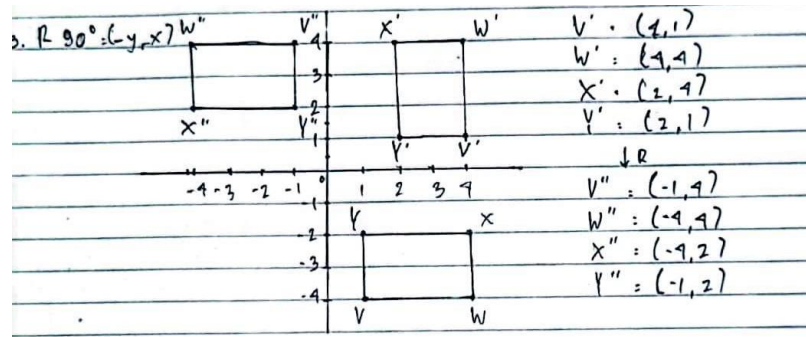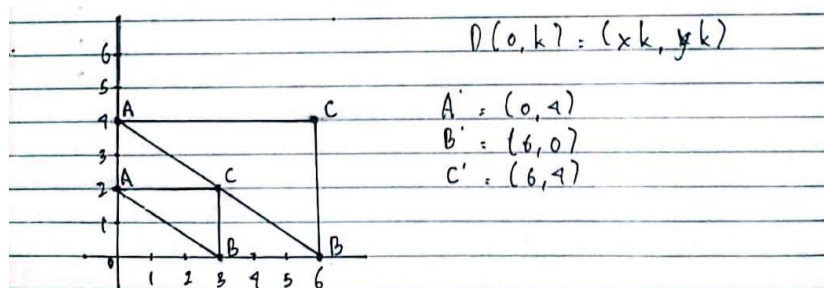

Figure 3. RIW Test Results Number 3

Figure 3 shows that RIW made a mistake by not writing down information that known in the question, skipping one of the steps, and not writing the conclusion of the final result. In addition, the final results written are not in accordance with what is being asked about.

Figure 4. RIW Test Results Number 4

In Figure 4, it shows that RIW made a mistake by not writing down information that known in the question, not writing down the steps, writing wrong description on the Figure, not writing the conclusion of the final result and the final result written does not match what was asked. on the question.
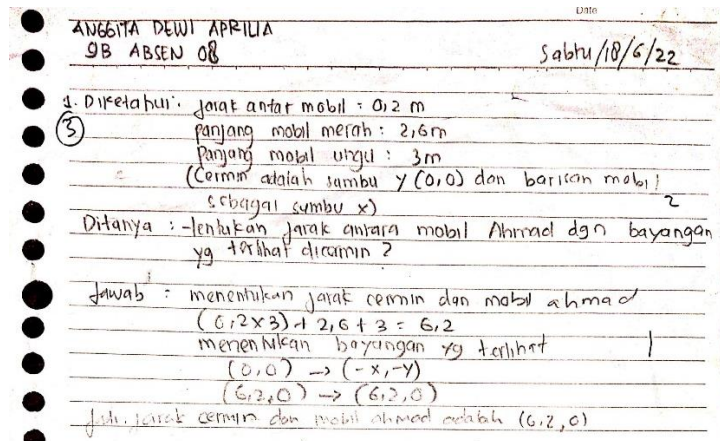
2. Subject ADA

Figure 5. ADA Test Results Number 1

Figure 5 shows that ADA made a mistake by writing a plan but the plan did not answer what was asked and was wrong in writing the conclusion of the final result.
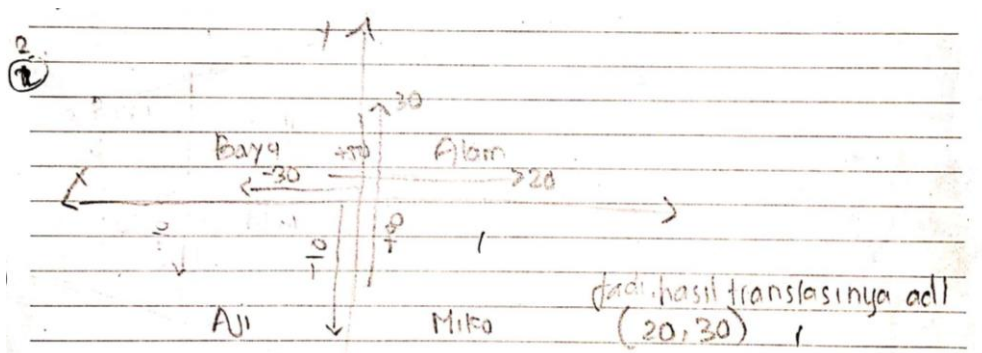

Figure 6. ADA Test Results Number 2

Figure 6 shows that ADA made a mistake by not writing down what is known and what was asked in the problem, not writing a settlement plan, not writing down the completion steps and not writing the conclusion of the final result.
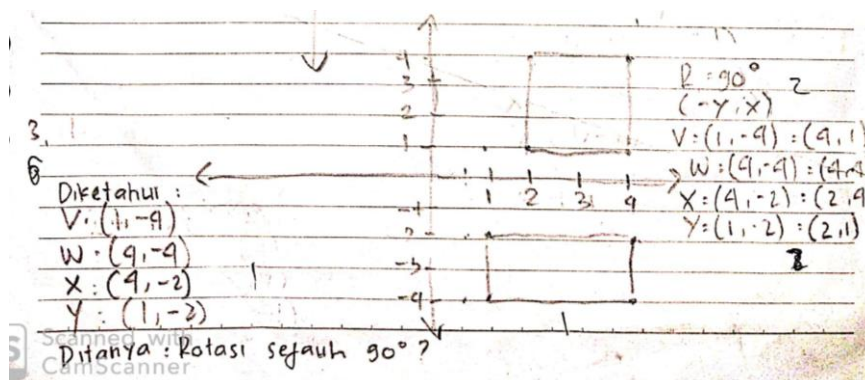

Figure 7. ADA Test Results Number 3

Figure 7 shows that RIW made an incomplete mistook in writing what was asked in the question, did not write down the information on the Figure and didn't write the conclusion.
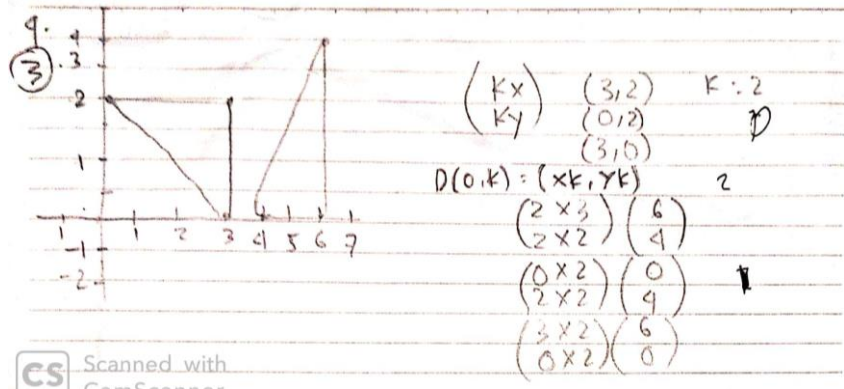
Figure 8. ADA Test Results Number 4

Figure 8 shows that RIW made an incomplete mistook in writing what was asked in the question, did not write down the information on the Figure and didn't write down the conclusion.
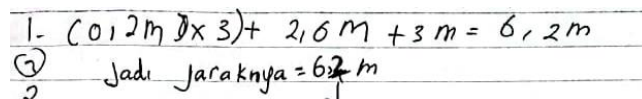
3. Subject ANK

Figure 9. ANK Test Results Number 1

Figure 9 shows that ANK made a mistake by not writing down information that known in the question, the plan that was written didn't answer what was asked about the question and incorrectly wrote the conclusion.
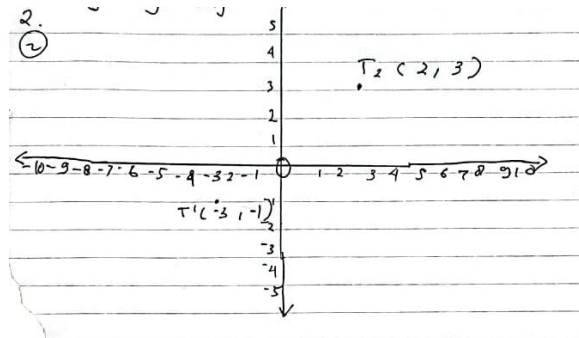

Figure 10. ANK Test Results Number 2

Figure 10 shows that ANK made a mistake by not writing down what is known and what was asked in the problem, not writing the solution plan, not writing down the steps and not writing the conclusion of the final result.
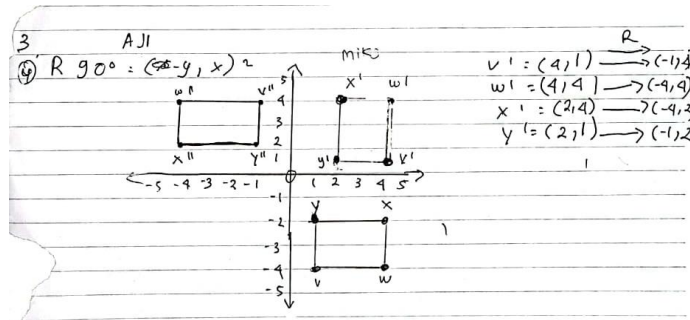
Figure 11. ANK Test Results Number 3

Figure 11 shows that ANK made a mistake by not writing down what is known and what was asked in the question, skipping one step and not writing down the conclusion of the final result.
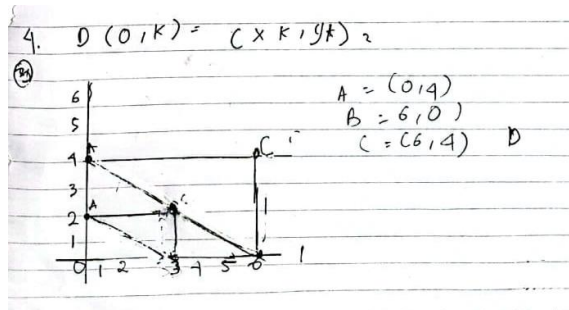

Figure 12. ANK Test Results Number 4

Figure 12 shows that ANK made a mistake by not writing down information that known in the question, not writing down the steps, not writing the conclusion of the final result and writing the information incorrectly.

4. Subject CAP

Figure 13. CAP Test Results Number 1

Figure 13 shows that CAP made a mistake by not writing down information that known in the question, implementing the plan but the written plan did not answer what was asked about the question and did not write the conclusion.
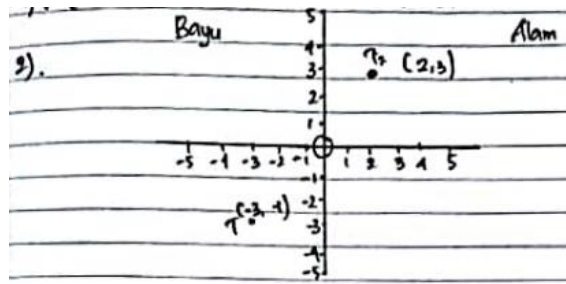
Figure 14. CAP Test Results Number 2

Figure 14 shows that the CAP made a mistake by not writing down what was known and what was asked in the problem, not writing the solution plan, not writing down the steps and not writing the conclusion of the final result.
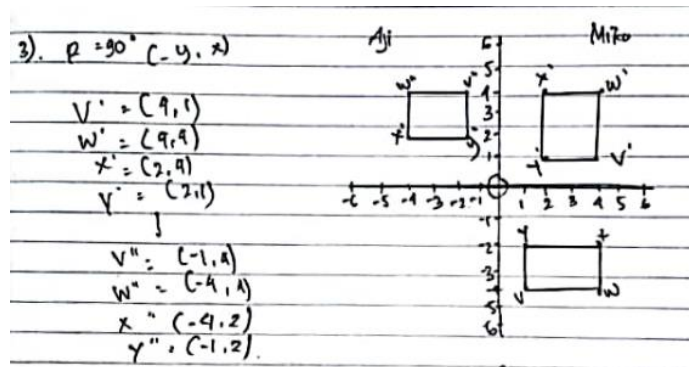

Figure 15. CAP Test Results Number 3

Figure 15 shows that RIW made a mistake by not writing down what is known and what was asked in the question, skipping one step and not writing down the conclusion of the final result.
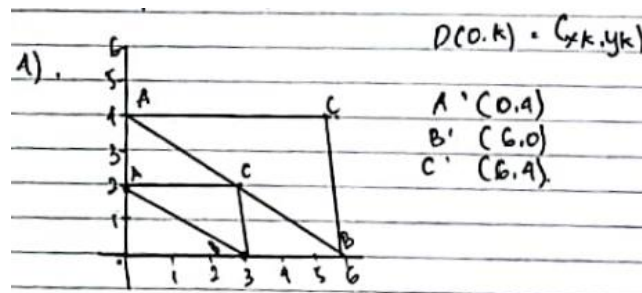

Figure 16. CAP Test Results Number 4

Figure 16 shows that CAP made a mistake by not writing down information that known in the question, not writing down the steps, wrongly writing description on the image and not writing the conclusion.

CONCLUSION

Be placed on as a base the results in this research and discussions that have been carried out, in general it can be concluded that the analysis of students' mistooks in solving math problems on geometry transformation material for class IX SMPN 1 GEGER in terms of the stages of Polya's theory is as follows. (1) in the step of understanding the problem (Understanding The Problem) students make mistakes where students do not write down what is known and what is asked in the problem and only write what is known but do not

write down what is asked, (2) in the step of making a plan (Make a plan). A Plan) students make mistakes where students do not write down the solution plan and are wrong in using or determining the formula or formula used is not in accordance with the problem, and (3) in step (Carry Out The Plan) students make mistakes where students do not write down the steps steps to solve it or make an mistook due to an mistook in the previous stage. While (4) at the stage of re-checking (Look Back) students make mistakes by not checking back and not writing conclusions or explanations of the results of their answers. The factors that cause students to make mistakes include poor time management of students so that students are afraid that the time to answer questions is not enough, students cannot understand the meaning of the questions properly, students' habits in working on questions where students are not accustomed to writing steps and only focus on the final answer, students are in a hurry to work on the questions, students are not careful in reading the questions.

ACKNOWLEDGMENTS

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