

Problems of Students' Critical Thinking on the Material of Straight Line Equations of Students of SMP Muhammadiyah Larangan

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ABSTRACT

This study aims to describe the difficulties of students' critical thinking skills. The research method used was qualitative descriptive with data collection techniques through written tests and interviews. Written tests are used to find out students' difficulties in solving problems while interviews are used to dig deep into information to find out information related to problem solving. The subject of this study is grade VIII students of SMP Muhammadiyah Larangan. The material used is a straight line equation. Data analysis was carried out by triangulation, which is comparing data from sources (written tests and interviews). The results of the study showed that: 1) high category students did not experience difficulties in solving problems, namely interpreting, analyzing, solving problems, and conducting evaluations, but students experienced difficulties in making inferences or drawing conclusions; 2) Medium category students do not experience difficulties in interpreting, analyzing, and solving problems, but students have difficulties in conducting evaluation and inference. 3) Low-category students have difficulty in solving problems because students have difficulties in interpreting, analyzing, solving problems, evaluating and drawing conclusions in solving problems. Based on the results of the study, it shows that students are not used to solving contextual problems so that students need to be accustomed to working on contextual problems so that they do not experience difficulties in critical thinking.

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1. INTRODUCTION

Mathematics is often recognized as the foundation of various sciences due to its significant influence in many fields. In line with the opinion (Anwar, 2018) the important role of mathematics causes an increase in the need for students' mathematical abilities in learning. This need not only includes the ability to calculate, but also includes the ability to think logically and critically in solving problems, as expressed by (Fathani, 2016).

Solving the problems faced requires several skills to solve systematically, logically so that in drawing conclusions based on existing data. The skills of analyzing information, evaluating arguments, and making decisions based on existing facts are often called critical thinking skills (Azka et al., 2024). A person is said to think critically if a person is able to think logically, reflectively, systematically, and productively which can be applied when making considerations in making a decision (Ratna Hidayah, Moh. Salimi, 2017).

Critical thinking skills need to be possessed by students, because with critical thinking skills students can develop thinking skills by finding ways and finding solutions to a problem, especially in mathematics learning (Crismasanti & Yunianta, 2017). Critical thinking skills.

Critical thinking skills will help students in solving story problems or contextual problems so that students are able to develop their ability to solve the given problems (Syafuruddin & Pujiastuti, 2020). According to (Ratna Purwati, Hobri, 2016) critical thinking skills are the ability of a person or individual to analyze and evaluate information obtained based on facts and data so that they can draw conclusions through the process of interpretation, analysis, evaluation, and inference.

However, based on the results of previous research, it shows that students have difficulties in critical thinking skills in the low category (Jahra Kie, Ida Kurnia Waliyanti, 2016). Other studies show that the presentation of the achievement of critical thinking ability indicators is still below 50% because students have difficulties in analyzing, evaluating, and inferring analysis which is still very low (Hidayanti et al., 2016). Another study (Lestari et al., 2019) shows that students with critical thinking skills are in the low category, because only some students can understand the problem well while others cannot understand or experience difficulties from the given problems. Research (Fitri et al., 2023) also shows that students' critical thinking skills are in the low category because they have difficulty solving problems because students are not able to interpret, analyze, evaluate, and inferate.

Straight line equations are part of geometry material that can develop critical thinking skills (Hidayanti et al., 2016). Straight line equations are one of the materials taught and become a scourge for grade VIII students. (Wahyuni et al., 2018) in their research stated that students had difficulty understanding and felt difficulties in solving the problem of straight line equations, especially questions in the form of stories. Students find it difficult to solve problems in the form of story questions, students have difficulty translating problems into the form of graphs. Many students also make mistakes because students are not used to working on problems outside of the examples given so that students do not understand what is meant in the problem, students do not know how to use the appropriate method to solve the problem (Putu et al., 2021).

Based on some of the facts that have been explained, more in-depth research is needed to describe students' critical thinking skills. To find out students' critical thinking skills, it can be seen from students' mastery of subject matter, one of which is by giving test questions (Evi Selviana, 2022). The student's ability to solve the problem can be one of the clues to find out the student's critical thinking ability. Through the analysis of critical thinking skills, students are expected to find out the difficulties of mathematical critical thinking skills. Therefore, this study aims to describe the difficulties of students' critical thinking skills, especially in the material of straight line equations.

2. METODE

The type of research used is qualitative descriptive with the aim of describing students' critical thinking skills on line equation material. Sampling was carried out on students of grade VIII A SMP Muhammadiyah Larangan. The sampling technique of the sample was selected by the purposive sampling technique. The purposive sampling technique is a sampling technique by considering certain criteria (Sugiono, 2015). The instruments used for data collection consisted of written tests and interviews. The written test is used to measure critical thinking skills and is developed based on indicators of critical thinking ability. The interviews in this study were used to dig deeper information related to the difficulties experienced by students.

Data Analysis Techniques The critical thinking ability test data obtained was then analyzed and categorized into three categories, namely high, medium, and low. Each category was then taken by one respondent to get an overview of critical thinking skills. The material tested is a straight-line equation. The data analysis technique uses the Miles and Huberman model (Sugiono, 2015), namely data reduction, presenting data, and drawing conclusions. The data presentation uses images and is described qualitatively to make it easier to get an overview of the capabilities, while the conclusion is based on the results of the data presentation obtained.

3. RESULT AND DISCUSSION

Based on the results of the depiction of the difficulties of critical thinking skills, it shows that the three categories have different critical thinking skills. The following are the results of students' work in solving problems.

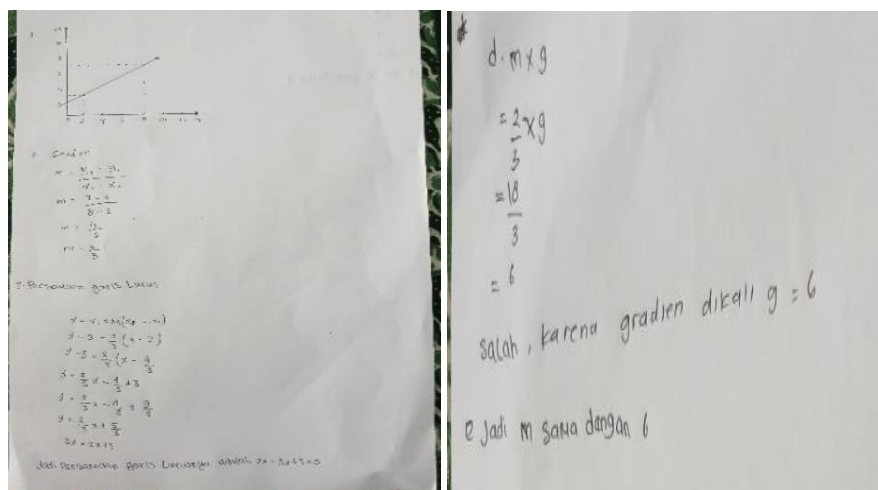


Figure 1. High category students (YN)

The results of the settlement from YN show that the respondents did not experience difficulties in solving problems. YN starts by describing the cartesian plane according to the point that has been provided, then adds a straight line at the intersection of the point as the direction of the highway according to the given problem. Next, YN performs calculations to find the gradient of the two points by writing the right formula and the correct calculation. Next, YN looks for the straight line equation, starting by writing the formula correctly and then doing the calculation correctly. The evaluation process is carried out by multiplying the gradient by the number 9 to get the truth of the problem that has been solved. The inference made by YN only writes down the magnitude of the gradient on the given problem.

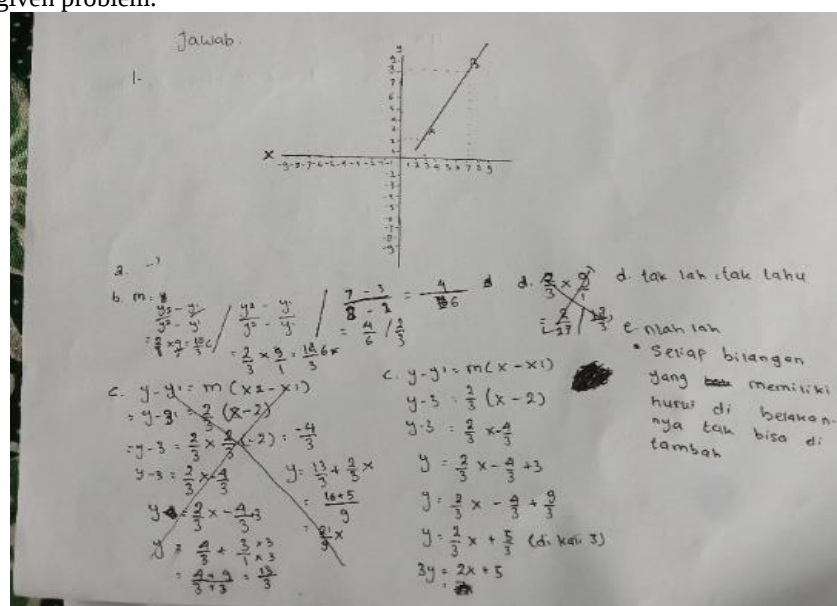


Figure 2. Medium category students (WF)

The results of the completion carried out by WF showed that the respondents could interpret point A and point B in the coordinate system, then the respondents carried out the analysis by writing down the gradient formula and calculating precisely. Furthermore, respondents can solve problems by writing down the formula for the straight line equation and calculations correctly. However, respondents indicated that they could not conduct an evaluation by re-examining the completed results and making appropriate inferences.

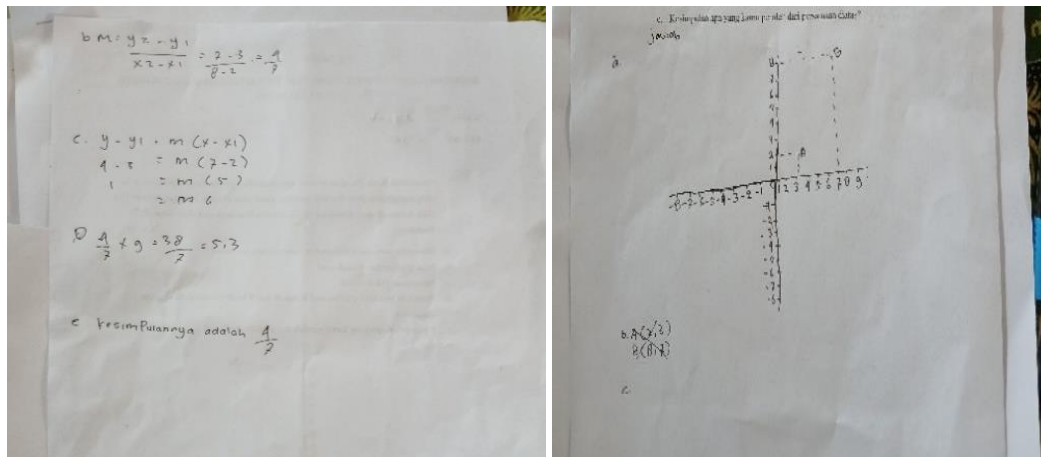


Figure 3. Low-category students (AI)

The results of the completion carried out by AI show that respondents can interpret the problem in the Cartesian field, but it has not yet shown where the highway referred to in the question is going. The completion process carried out by DR directly places point A and point B in the cartesian plane. Furthermore, respondents said that they could conduct an analysis by calculating with a gradient formula. The respondent was able to substitute the values of x and y in the formula, but in the final result the respondent made a mistake in the calculation. In point c, the respondent was only able to write the formula for the straight-line equation, but did not show the exact completion result. Furthermore, in point d, the respondent does not show the results of the evaluation by re-checking whether the answers obtained are correct or not with the help of questions, so that the respondents cannot conduct an evaluation. At point e, the respondent did not show an inference on the problem properly.

Discussion

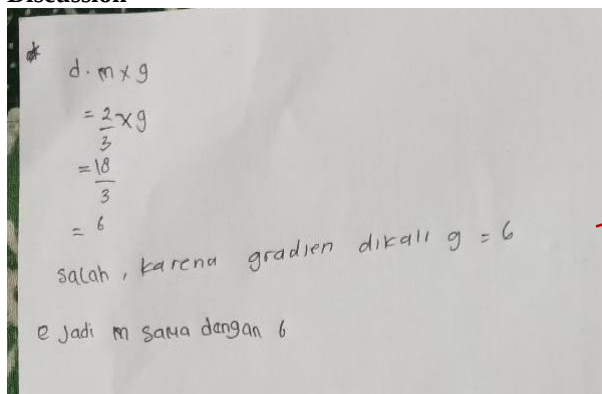


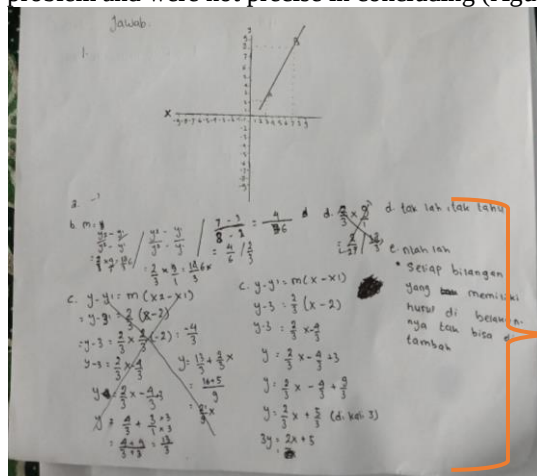
Figure 4. High category students (YN)

The results of the settlement from YN show that the respondents did not experience difficulties in solving problems. YN starts by describing the cartesian plane according to the point that has been provided, then adds a straight line at the intersection of the point as the direction of the highway according to the given problem. Next, YN performs calculations to find the gradient of the two points by writing the right formula and the correct calculation. Next, YN looks for the straight line equation, starting by writing the formula correctly and then doing the calculation correctly. The evaluation process is carried out by multiplying the gradient by the number 9 to get the truth of the problem that has been solved. However, the respondents at the inference stage had difficulties so they only answered the problem by writing back the gradient value that had been obtained previously.

Based on the results of the interview, it was said that YN did not have difficulty in solving the problem of straight-line equations from point a to point d, but at point e students admitted that they had difficulty in drawing conclusions because mathematical problems usually do not write conclusions so that respondents only wrote the results of the solution at point d, which is 6.

In the high category, students have met four indicators, namely interpretation, analysis, and problem solving. This is in line with research (Fitri et al., 2023). This is because there are many students who do not write

conclusions, there are only a few students who write conclusions correctly. Students only work on the questions until the evaluation stage. Inference indicators reach very low criteria due to the low ability of students in indicators to analyze and evaluate which affects the low ability of students to make conclusions appropriately (Agustin & Effendi, 2022). The same thing was also found from the results of the study (Luritawaty et al., 2022) that students were able to answer correctly but students did not rewrite the answers as conclusions, students only went straight to the core of the problem and were not precise in concluding (Agustin & Effendi, 2022).



Student difficulties

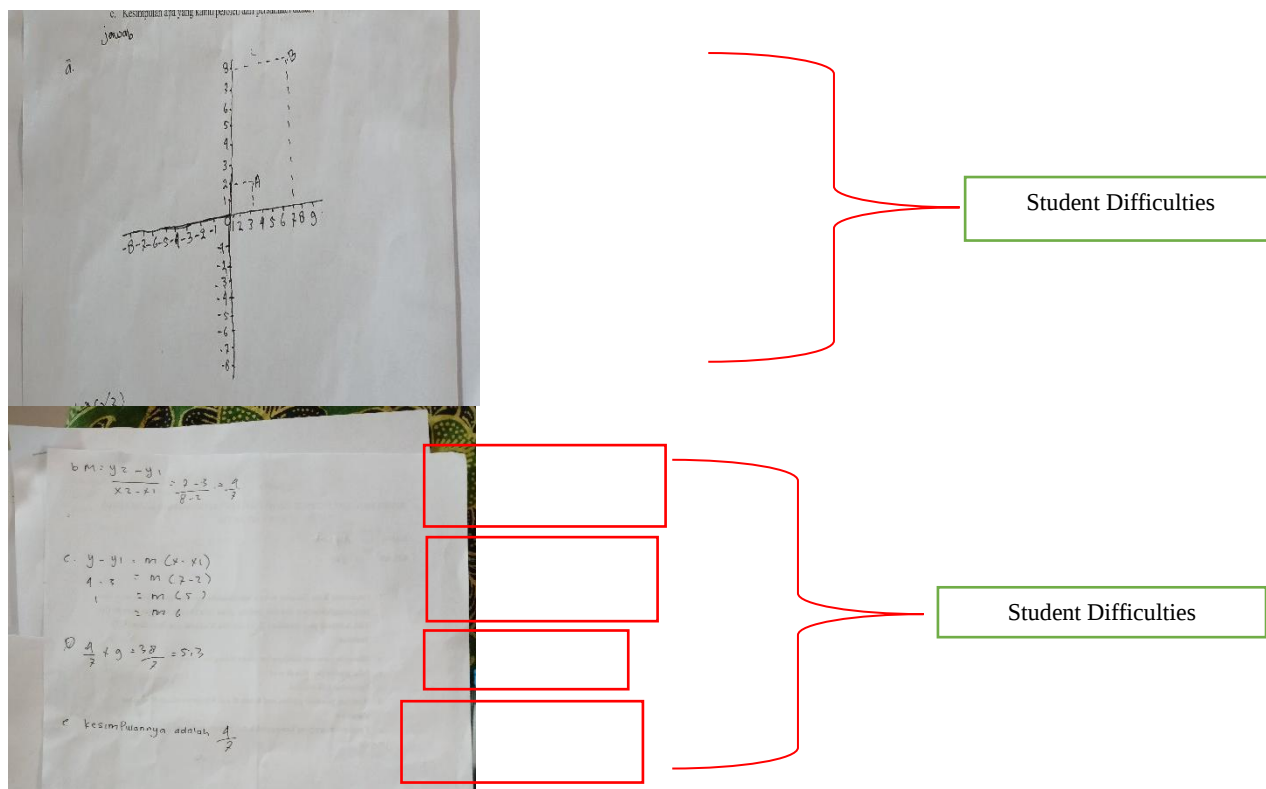
Figure 5. (WF) medium category

The results of the settlement carried out by WF show that the respondents can interpret point A and point B in the coordinate system so that the direction of the highway according to the intersection of the point is obtained according to the problem given. Furthermore, respondents are able to analyze by writing the gradient formula correctly and making calculations with the right steps. Furthermore, respondents are able to solve problems by writing down the formula for straight line equations and calculations correctly.

At point d the respondent showed difficulty in evaluating the answers that had been obtained to check the truth of the given problem so that the respondent answered "I don't know" and then at point e the respondent also had difficulty in making inferences or drawing conclusions about the given problem so that he answered with the word "I don't know". Based on these results, it shows that the respondents cannot solve the problem properly because the respondents are only able to interpret, analyze, and solve problems but cannot evaluate and infer them.

Based on the results of the interview, the respondent said that it was true that the respondent was not able to conduct an evaluation because the respondent did not understand what was meant by the evaluation, so the respondent answered that he did not know, then the respondent also admitted that he had difficulty in drawing conclusions from the given problem so that he only wrote down the answer that was in his thoughts.

For the medium category, they tend to have only three indicators of critical thinking, namely interpretation and analysis and problem solving. Respondents cannot solve problems properly because they are only able to interpret, analyze, and solve problems, but cannot make evaluations and inferences. This indicates that respondents have good basic skills, but lack in higher critical thinking skills, which are necessary to solve problems comprehensively. This is in line with research (Mardarani & Apriyono, 2023) which shows that students in the medium category can interpret, analyze, and solve problems with given problems. The mistake that students often make is that they are able to write formulas correctly, but are not able to do calculations correctly so that no results are obtained from the problem-solving process (Fitri et al., 2023).



Low-category students (A1)

The results of the completion carried out by AI showed that the respondents could interpret the problem in the cartesian plane, The completion process carried out by DR immediately placed point A and point B in the cartesian plane. It's just that the respondents had difficulties in determining the direction of the highway according to the problems given, so that the results of the intersection of point A and point B were not drawn in a straight line. Furthermore, respondents showed that they could conduct an analysis by performing calculations with the gradient formula. The respondent was able to write the formula correctly and the respondent was also able to substitute the values x and y in the formula, it was just that the respondent had difficulty in the calculation process so that in the final result the respondent made a mistake in the calculation.

At point c, the respondent was only able to write the formula for the straight line equation, but did not show the correct completion results because the respondent had difficulty in making calculations with the right steps. Furthermore, in point d, the respondent did not show the results of the evaluation by double-checking whether the answers obtained were correct or not with the help of questions, so the respondents could not conduct the evaluation. At point e, the respondent did not show an inference on the problem properly. This shows that respondents do not master all indicators of critical thinking ability.

Berdasarkan hasil wawancara, responden mengatakan bahwa memang benar tidak memahami permasalahan yang diberikan karena responden belum terbiasa dengan soal bentuk cerita sehingga Respondents have difficulty in understanding and solving the problems given. Respondents also admitted that they forgot how to calculate gradients and line equations so that students only wrote formulas.

In the category of low critical thinking ability, they tend not to meet the indicators of critical thinking ability. This is in line with previous research, where students with low categories tend not to meet all indicators of critical thinking ability (Putri et al., 2021). In addition, the lack of optimal understanding of concepts will result in a lack of interpretation, calculations, and evaluation and inference in solving problems (Zahran et al., 2024). The results of the study (Ulfa et al., 2023) showed that students in the low category did not meet the indicators of critical thinking ability because the respondents were able to interpret questions in the Cartesian field, which showed that they had a basic understanding of the coordinate system. Respondents can only write down the formula of a straight line equation without solving it correctly. This indicates that they have not been able to apply it effectively in the context of the given questions. The same thing was also found from research (Dewi et al., 2019) that students lack understanding when determining the initial formula and determining the solution systematically. Students' weak ability to analyze and evaluate, which has an impact on their inability to draw conclusions accurately (Leuly et al., 2024).

4. CONCLUSION

The results of the description of students' critical thinking difficulties showed: 1) high category students did not have difficulties in solving problems, namely interpreting, analyzing, solving problems, and conducting evaluations, but students had difficulties in making inferences or drawing conclusions; 2) Medium category students do not experience difficulties in interpreting, analyzing, and solving problems, but students have difficulties in conducting evaluation and inference. 3) Low-category students have difficulty in solving problems because students have difficulties in interpreting, analyzing, solving problems, evaluating and drawing conclusions in solving problems.

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