

ALYSIS OF STUDENTS' CRITICAL THINKING ABILITIES IN SOLVING MATHEMATICAL PROBLEMS AS SEEN FROM THE INITIAL ABILITIES OF GRADE VII STUDENTS OF SMPN 4 SUNGGUMINASA

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Abstract

The main problem in this study is how students' critical thinking skills in solving mathematical problems are reviewed from high initial abilities, medium initial abilities, and low initial abilities. This study aims to analyze students' critical thinking skills in solving mathematical problems reviewed from the initial abilities of grade VII students of SMPN 4 Sungguminasa. This type of research is descriptive qualitative research. The procedures of this study include preparation, implementation and completion. The subjects in this study were 3 students of grade VII.d of SMPN 4 Sungguminasa. The technique for determining the subjects was by giving tests to all grade VII.d students to determine the subjects, namely students with high, medium and low abilities. The determination of subjects was based on the considerations of subject teachers and test scores. This study refers to four aspects of critical thinking indicators, namely: interpreting, analyzing, evaluating, and inferring. The instruments in this study were critical thinking tests and interview guidelines. The results of this study indicate that there are differences in critical thinking of students with high abilities, students with medium abilities, and students with low abilities. From Based on the research results above, it can be concluded that subjects with high initial abilities met all four critical thinking indicators: interpretation, analysis, evaluation, and inference. Subjects with moderate initial abilities met two critical thinking indicators: interpretation and evaluation. Subjects with low initial abilities did not meet any critical thinking indicators.

Keywords: Analysis, Critical Thinking, Descriptive Qualitative Research

INTRODUCTION

Mathematics is one of the foundational sciences for other sciences (Sari 2017:1). Therefore, mathematics plays a crucial role in improving students' thinking skills. Mathematics learning is closely linked to activities, learning processes, and ways of thinking due to the nature of mathematics as a science and human activity. Why is this so? Because mathematics is a model of thinking, a logical proof of a group of people (organizations), using words that can be described more clearly, accurately, and precisely.

An important aspect in mathematics is the ability to think critically. According to Desmita (Alexandra and Novisita 2018:104) critical thinking skills are the ability to reflect/consider problems or issues in depth, keep the mind open to various approaches and conflicting perspectives/points of view, do not immediately believe information from various sources that appear both verbally and in writing, think wisely rather than absorbing input without knowledge/understanding and definite consideration.

Mathematics is a subject that must be taught to all students to equip them with the skills of logical/rational, analytical/in-depth, systematic, critical/thorough, and creative/intelligent thinking, as well as collaboration (Ministry of National Education, 2007). These competencies/expertise are necessary for students to receive, process, and utilize information in their daily lives. Every person, even students, must possess critical thinking skills. Critical thinkers can identify primary questions and problems and explain them clearly/correctly. Therefore, it is crucial for every student to possess critical thinking skills to be able to solve problems, especially mathematical problems.

Solving math problems requires considering many factors, such as remembering the hierarchy of mathematics material and the interconnectedness of mathematical concepts, which give rise to new, complex concepts. Students are unable to solve problems because their initial mathematical abilities are still lacking. Students need to connect their mathematical concepts in their thinking with the problems they face or experience. Based on this explanation, students' initial mathematical abilities must be considered because they influence their ability to solve or work on mathematical problems.

Critical thinking skills are paramount for students, as they enable them to express opinions logically and make sound choices. Furthermore, it is necessary to instill critical thinking habits/culture so that students are able to examine and address various issues in everyday life (Somakim, 2011:43). Critical thinking is a highly sought-after skill in today's world. Furthermore, critical thinking has long-term benefits, supporting students in developing their learning skills and empowering individuals to participate creatively and innovatively.

Based on the experience during the third internship at SMP Negeri 4 Sungguminasa, it was found that most students could only memorize and recall information given by the teacher. This information could not be properly analyzed and developed by the students. Meanwhile, in order to reach the level of thinking, especially critical thinking, the analysis and development of information from the teacher is important. This can be seen when the daily test questions are given exactly like the example, the only change is the numbers. Then, after reviewing the students' work, it turns out that some students are unable to solve the problems. Furthermore, student responses during learning are less than optimal because many students are not active in the learning process.

For the reasons above, the author tried to conduct a study entitled "Analysis of Students' Critical Thinking Skills in Solving Mathematical Problems Reviewed from the Initial Abilities of VII Grade Students of SMPN 4 Sungguminasa". The purpose of this study is to determine students' critical thinking skills in solving mathematical problems reviewed from high, medium, and low initial abilities in VII grade students of SMPN 4 Sungguminasa.

Facione (2011) defines that "critical thinking is self-regulation to make decisions that result in interpretation, analysis, evaluation, and inference, as well as explanation using a statement along with evidence, concepts, methodologies, criteria, or contextual considerations that form the basis for making the decision."

Fisher (2011: 10) argues that "critical thinking is a person's ability to interpret, analyze, and evaluate ideas and opinions." Pickett and Poster (Susiyati: 2014) argue that "critical thinking is a higher way of thinking, not just memorizing material but using it and manipulating the materials studied in different situations.

According to Hanun (2013:123) who argues that "initial mathematical abilities are cognitive abilities that students already have before they take the mathematics lessons that will be given and are a prerequisite for them to learn new lessons or subsequent lessons." Initial abilities are known as one of the very important requirements for the construction of a person's knowledge and learning outcomes. Students can construct new knowledge according to their initial abilities. Students can link various kinds of knowledge they already have in constructing new knowledge."

According to Smaldino, as quoted by Dewi Salma (2008: 20), "every student is different from one another due to general characteristics, initial prerequisite abilities or requirements, and also learning methods." Furthermore, it is explained that initial abilities are basic abilities/skills that students must have before learning new knowledge. Therefore, before planning learning, teachers must know the characteristics of students. Insufficient initial abilities will be a barrier to the student's learning process because they have become a basic prerequisite for mastering the material.

RESEARCH METHODS

The type of research used in this study is qualitative descriptive research. This research was carried out in stages, with 3 stages being used, namely the preparation stage, the implementation stage, and the completion stage. The location of this research is in Sungguminasa 4th Junior High School. Data collection was conducted in class VII of SMPN 4 Sungguminasa. Subjects In this study, there were three students: one with high initial ability, one with medium initial ability, and one with low initial ability. The data were obtained from test results and interviews.

Research result

The initial ability test is given to select subjects with high ability (KT), subjects with medium ability (KS), and subjects with low ability (KR).

The method for determining high-ability subjects is by looking at the highest score from the test that has been given with the score obtained by the subject being 97.5. Meanwhile, determining medium-ability subjects is seen from the middle score on the test results and also the consideration of the mathematics teacher with the score obtained by the subject being 75. Furthermore, for low-ability subjects, the score obtained is taken from 57.7.

Table 4.1 Selection of Interview Subjects

No.	Student abilities	Code
1	Tall	KT
2	Currently	KS
3	Low	KR

Based on the results of the ability test obtained, the researcher took 3 students, namely high ability students (KT), medium ability students (KS), and low ability students (KR). Next, the researcher distributed the second test to 3 subjects, each representing each level, to measure students' critical thinking skills and then interviewed them to obtain a more in-depth picture when solving algebra and flat geometry problems.

1. Subjects with High Initial Ability (KT)

a. High Initial Ability Test Results on Question Number One

Diketahui:
 Umur caci lebih tua dari umur cici 5 tahun
 Umur caci dan cici adalah 14 tahun
 Ditanyakan:
 Berapa umur caci dan cici sekarang!
 Penyelesaian:
 Misalkan x = umur caci dan y = umur cici
 $x - y = 5$ (1)
 $x + y = 14$ (2)
 $x - y = 5$
 $x + y = 14$
 $-y = -9$
 $y = 9$
 Substitusi nilai x ke Persamaan 2
 $x + 5 = 14$
 $x = 14 - 5$
 $x = 9$
 Jadi umur caci 9 tahun dan umur cici 5 tahun

Figure 4.1. Work results of KT number 1

Based on the answer to question number one in Figure 4.1, it can be seen that at the analysis stage, the subject understood the given problem. On the answer sheet, the subject rewrote the meaning of the problem by writing what was known and what was asked in the problem. At the analysis stage, the subject was able to create an accurate mathematical model, but did not provide an explanation. Then, at the evaluation stage, the student was able to use the appropriate strategy to solve the problem, complete and correct calculations. And at the inference stage, the student was able to draw accurate conclusions.

b. High Initial Ability Test Results on Question Number Two

Diketahui:
 Sisi atas = 30 m dan 24 m
 Jumlah kedua luas sisi atap = 54 m
 Ditanyakan:
 Bagian manakah dari atap rumah putri yang
 belum diketahui dan tentukan berapa ukurannya
 Penyelesaian:
 Jumlah kedua luas sisi atap = 54 m
 Luas satu sisi atap = $\frac{54}{2} = 27 \text{ m}^2$
 Luas satu sisi atap = $\frac{1}{2} \times \text{jumlah sisi atas} \times \text{tinggi}$
 $27 = \frac{1}{2} \times (30 + 24) \times t$
 $27 = \frac{1}{2} \times 54 \times t$
 $27 = 27t$
 $t = 1$
 Jadi, bagian yang belum diketahui adalah tinggi
 yaitu 1 m.

Figure 4.2. Work results of KT number 2

Based on the answer to question number two in Figure 4.5, it appears the subject understood the given question. On the answer sheet, the subject rewrote the meaning of the question by writing what was known and what was asked in the question. In the analysis stage, the student was able to provide an explanation of the relationship and the concept. used during problem solving. Then, in the evaluation stage, students can use appropriate strategies to solve problems, complete and perform calculations correctly. And in the inference stage, students can draw correct conclusions.

2. Subjects with Moderate Initial Ability (KS)

a. Initial Ability Test Results Are Moderate on Question Number One

Diketahui : umur cara lebih tua dari umur cici
 setelah umur keduanya 14 tahun
 Ditanyakan : berapa umur ~~terakhir~~ cara dan cici sekarang
 penyelesaian : x = umur cara
 y = umur cici
 $x - y = 14 \dots (1)$
 $x + y = 2 \times (x + y + 14) \dots (2)$
 $x - y = 14$
 $x = 14 + y$
 $y + 5 = 2 \times (x + 5)$
 $y + 5 = 2 \times (14 + y + 5)$
 $y + 5 = 28 + 2y + 10$
 $y + 5 = 38 + 2y$
 $y - 2y = 38 - 5$
 $-y = 33$
 $y = 33$
 Jadi, umur cara 47 tahun dan cici 33 tahun

Figure 4.9 Results of work of KS number 1

Based on the results of tests and interviews conducted with KS onIn the interpretation stage, the subject can write down what is known and what is asked in the problem. In the analysis stage, the student can create a mathematical model, but some are inaccurate and do not provide a precise explanation. In the evaluation stage, the student is able to use the correct strategy to solve the problem, but the subject makes a calculation error. In the inference stage, the subject can draw a conclusion from the answer obtained, but it is inaccurate.

b. Initial Ability Test Results Are Moderate on Question Number Two

2. Diketahui : sisi sejajar = 30 m dan 24 m
 ditanyakan : jumlah luas sisi atap = 864 m
 Ditanyakan : Bagian manakah dan atap rumah Putri yang belum
 diketahui dan bentukan berapa ukurannya
 penyelesaian :
 Luas trapesium = $\frac{1}{2} \times \text{jumlah sisi sejajar} \times t$
 $= \frac{1}{2} \times (30 \text{ m} + 24 \text{ m}) \times t$
 $= \frac{1}{2} \times 54 \text{ m} \times t$
 $= 27 \text{ m} \times t$
 $t = \frac{864 \text{ m}^2}{27 \text{ m}}$
 $t = 32 \text{ m}$
 Jadi, bagian yang belum diketahui adalah tinggi trapesium yaitu 32 m

Figure 4.13 Results of KS work number 2

Based on the results of the tests and interviews conducted with the KS subjects on question number 2, at the interpretation stage, the students were able to write what was known and what was asked in the question correctly. At the analysis stage, the subjects with moderate abilities on question number two were unable to identify the relationship between the statements, questions, and concepts given in the question, as seen on the answer sheet, the subjects did not write the analysis stage well. Then at the evaluation stage, the students were able to use the right strategy in solving the problem, but the subjects made errors in the calculations. And at the inference stage, the subjects were able to draw conclusions from the answers obtained but were less precise.

3. Subjects with Low Initial Ability (KR)

a. Initial Ability Test Results Are Low on Question Number One

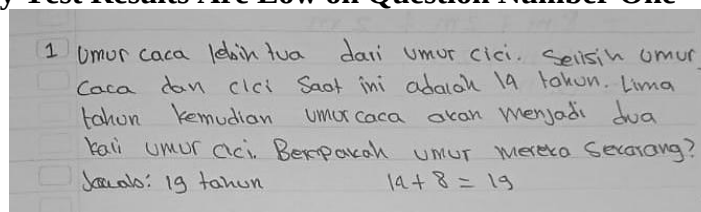


Figure 4.16 results of KR work number 1

Based on the results of tests and interviews conducted with subject KR on question number 1 in Figure 4.16, the interpretation stage showed that the subject could not write down what was known and what was asked in the question correctly. In question number one in Figure 4.16, the analysis stage showed that the subject could not create a mathematical model correctly. Then, in the evaluation stage, the student was unable to use the right strategy when working on the question. And in the inference stage, the subject could not draw conclusions from the answers obtained.

b. Initial Ability Test Results Are Low on Question Number Two

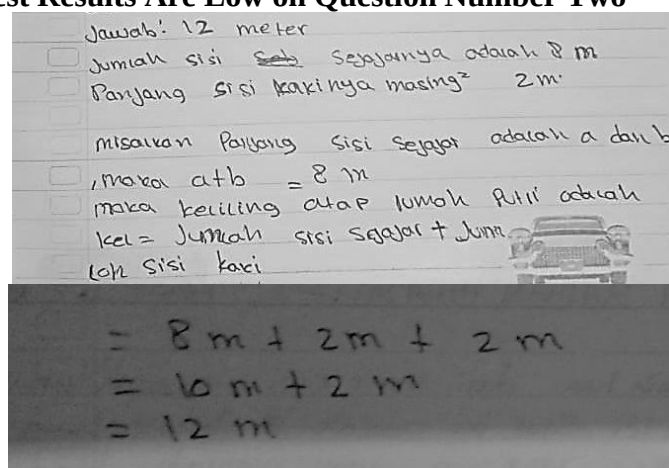


Figure 4.17 Results of KR work number 2

Based on the test results and interviews conducted with subject KR on question number 1, at the interpretation stage, it was apparent that the subject was unable to accurately write down what was known and what was asked in the question. At the analysis stage, the subject was unable to create an accurate mathematical model. Furthermore, at the 17th evaluation stage, the subject did not use the correct/appropriate strategy while working on the problem. And at the inference stage, the subject was unable to draw conclusions from the answers obtained.

DISCUSSION

In this section, we will answer the problem formulation in chapter 1, namely how are students' critical thinking skills in solving mathematical problems viewed from the perspective of high, medium, and low initial abilities of class VII students at SMPN 4 Sungguminasa?

1. Description of High Critical Thinking Skills

Based on the results of the work of subjects with high initial abilities, it can be seen that students can solve the problems given well and correctly. This is seen when the subjects can write known and asked questions in the problem correctly, students can also identify the relationship between the concepts used when working on the problem, then for the evaluation stage the subjects use the correct/appropriate strategy while working on the problem, and can draw good and correct conclusions.

As for the excerpt of the interview dialogue, it can be seen that the subjects with high initial abilities, at the interpretation stage, seen from the answers during the test and during the interview, the subjects were able to understand what was known and what was asked in the questions, and also the subjects were able to explain the steps for solving the questions given, and the subjects were able to make the right conclusions.

Based on the test results and interviews, the KT subjects obtained a total score of 32. Of these, the KT subjects obtained a score of 93.75, thus concluding that the KT subjects had "high" critical thinking skills.

2. Description of Moderate Critical Thinking Skills

Based on the answers of subjects with moderate initial abilities, it can be seen that the subjects can understand the problems shown in the questions by writing known and asked questions correctly, at the evaluation stage the subjects use the right strategy in solving the questions but make mistakes in making calculations, thus making incorrect conclusions.

As for the interview dialogue presentation, it can be seen that the subject with moderate initial ability, at the inference stage the subject can understand the question as seen from the subject's answer, namely the subject is able to answer the question correctly, at the evaluation stage the subject is able to explain the steps in solving the question but is less precise in the calculation process, then at the inference stage the subject can make a conclusion but is not correct.

Based on the answers during the test and interview, the subject with moderate initial ability, subject KS, obtained a total score of 20. From the score obtained by subject KS, he obtained a score of 62.5, so it can be concluded that subject KS has "moderate" critical thinking ability.

3. Description of Low Critical Thinking Skills

Based on the results of the work of subjects with low critical thinking, it can be seen that when working on questions, the subject cannot complete the questions correctly as seen from the subject's answers, the subject cannot write what is known and what is asked of the question correctly, then the subject also uses an inappropriate strategy in solving the question, at the inference stage the subject cannot make conclusions correctly.

Regarding the dialogue excerpt from the interview above, it can be seen that the subjects with low initial abilities were unable to explain the steps to solve the problem correctly and the subjects were unable to draw conclusions from the problems given.

Based on the test and interview responses of subjects with low initial abilities, subject KR obtained an overall score of 4. Of these, subject KR obtained a score of 12.5, thus concluding that subject KR has "low" critical thinking skills.

CONCLUSION

Based on the results of the analysis that has been presented, the author can conclude regarding the students' critical thinking methods when solving critical thinking problems on algebra and flat shapes material which are reviewed from the initial abilities of class VII D SMPN 4 Sungguminasa, namely:

1. Subjects with High Initial Ability

The analysis results from Chapter IV show that students with high initial abilities also have high critical thinking skills. In the interpretation stage, students who served as subjects wrote down the meaning of the questions and explained each interviewer's question, namely what was known, stated, and what was the problem in the question, as well as the problem in the question. Students provided answers in simple language that corresponded to what the interviewer stated. In the analysis stage, the subjects were able to correctly create mathematical models from the statements in the question and accompanied by appropriate explanations that could be used as solutions to the problems in the question. In the evaluation stage, students who served as subjects used appropriate methods to solve problems and were able to explain the steps in solving the problem. In the inference stage, the subjects provided results from solutions that were appropriate and appropriate to the problems in the question.

2. Subjects with moderate initial abilities

Students who were used as subjects who had moderate initial abilities had moderate critical thinking skills because they were able to solve problems using only a few indicators, namely interpretation and evaluation. In the interpretation stage, the subject re-explained the meaning of the problem in the problem, namely explaining from what they knew, stated, and what the problem was in the problem. In the analysis stage, the subject did not analyze as well as subjects with high initial abilities, so the subject did not utilize the statements in the problem well and did not create a good or less precise mathematical model. In the evaluation stage, the subject had a good method or strategy to be able to solve the problem in the problem, but there were errors made by the subject in his calculations. In the inference stage, the subject provided results or conclusions from the solution he had worked on, so the results were less precise for the problem.

3. Subjects with low initial abilities

Subjects with low initial ability levels had low critical thinking skills. During the interpretation stage, subjects appeared hesitant to explain the meaning of the problem. During the analysis stage, subjects were unable to describe the mathematical model of the problem and simply provided answers. During the evaluation stage, students were unable to determine a strategy for solving the problem given by the researcher. And during the inference stage, students were unable to draw conclusions from their work.

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