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Critical Thinking Ability of Junior High School Students in Solving Mathematics Problems Viewed from Reflective-Impulsive Cognitive Style

Nur Wanda Afifah[1*], Endah Budi Rahaju[1]

[1]Pendidikan Matematika, Universitas Negeri Surabaya, Surabaya, Indonesia

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***Corresponding author:**
nurwanda.19032@mhs.unesa.ac.id

Abstract: One goal of learning mathematics in Permendikbud No. 58 of 2013 is that students have the critical thinking ability. Apart from critical thinking ability, another goal of learning mathematics is to solve mathematical problems. Critical thinking ability is needed in the problem solving process. In solving problems, students will use various strategies. Problem solving strategies are heavily influenced by cognitive styles. One challenging problem that can give students the opportunity to use all their abilities, including critical thinking ability, is a problem related to geometry in the material of flat sided spaces. This research is a qualitative descriptive study. The subjects of this study were two students of class VIII-H at Junior High School in Surabaya of the same sex, who had learned flat sided space, had equivalent mathematical abilities, had good communication skills, and had reflective and impulsive cognitive style. The method of collecting data in this study is through *Matching Familiar Figure Test* (MFFT), math ability tests, problem solving tests, and interviews. The results showed that reflective cognitive style students have very good critical thinking ability focus, reason, inference, situation, clarity in the steps of understanding the problems, devise a plan, and carrying out the plan. Meanwhile, in the step of looking back, student with a reflective cognitive style have good overview critical thinking ability. Impulsive cognitive style students have very good critical thinking ability reason, inference, situation, clarity in the steps of devise a plan and solving problems according to plan. Meanwhile, in the step of understanding the problem, student with an impulsive cognitive style has well enough focus critical thinking ability. In step of looking back student with an impulsive cognitive style have good overview critical thinking ability.

INTRODUCTION

One of the reasons for learning mathematics mandated in the 2013 curriculum is that students have the ability to think logically, analytically, systematically, critically, creatively, student-centered, and have the ability to work together effectively. Critical thinking is important to be learned because critical thinking is needed in various jobs, studying various fields of science, and to solve various problems (Ismail, 2018). Students' critical thinking ability in learning mathematics are needed to understand and solve a mathematical problem or problem that requires reasoning, analysis, and evaluation. Sulistiani (2016) revealed that critical thinking in learning mathematics can minimize the occurrence of errors when solving problems, so that in the end results the right conclusions will be obtained. Apart from critical thinking, another goal of learning mathematics is to solve mathematical

problems which include the ability to understand problems, develop models of solving mathematics, solve mathematical models, and provide desired solutions (Permendikbud No. 22 of 2016). Problems in mathematics are questions that when we want to solved, its cannot be immediately resolved or cannot be solved using commonly used procedures. Sadiq (2004) argues that a question will become a problem if the question indicates a challenge that cannot be solved by a previously known routine procedure.

According to Winarso (2017), learning mathematics aims to encourage students to become problem solvers based on critical, logical, and rational thinking processes. This statement is in line with the opinion which states that the orientation of learning mathematics is currently trying to put more emphasis on teaching higher-order thinking skills, namely critical thinking and creative thinking (Siswono, 2008). Critical thinking skills are needed in the problem-solving process. To find out students' critical thinking skills, it can be done by identifying students' critical thinking skills when solving problems. There are two types of mathematical problems, namely open-ended problems and closed-ended problems. Open-ended problems is a problem that has multiple solution, a closed-ended problem, on the other hand, is a problem formulated in such a way that there is only one correct answer with one solution (Indarwati, 2014). Research by Clarke et al (1992) shows that students' understanding of open-ended math problems is still lacking. Students experience difficulties in solving open-ended math problems.

In solving problems, students will use various strategies. Susan & Collinson (2005) state "general problem-solving strategies can indeed influenced by an individual's cognitive style". There is various classification of cognitive styles, one of which is a classification based on the speed and accuracy of absorbing information. Students are grouped into four namely reflective, impulsive, fast accurate, and slow inaccurate. According to Warli's research (2013) the proportion of students who have a reflective-impulsive cognitive style is greater than students who have a fast-accurate and slow-accurate cognitive style. The form of reflective-impulsive cognitive style is also the most frequently discussed by experts. Based on this, this study will focus on a form of reflective-impulsive cognitive style.

Each individual has his own way of processing and organizing information obtained in response to environmental stimuli. There are individuals who respond quickly, but there are also those who respond more slowly. The ways of responding to these stimuli are closely related to attitudes and personal qualities. This shows that each student has a different cognitive style, the way students process information and solve problems are different, so that it is also possible that these differences will affect differences in their critical thinking skills.

One challenging problem that can give students the opportunity to use all their abilities, including critical thinking skills, is a problem related to geometry, one of which is three-dimensional material (geometric shapes). Three-dimensional material, especially for flat-sided geometrical material, is material that is difficult to understand because it is abstract and students lack skills in drawing these shapes (Novita, 2018). According to Hasibuan's (2018) research results, students' difficulties when studying flat sided geometric material are

that Class VIII junior high school students have difficulty learning mathematics on the subject of flat sided shapes related to how to determine the surface area of cubes, blocks, prisms, and pyramids. Another study conducted by Yuberta (2011) found that students had difficulty understanding how to determine the surface area of a flat side shape. Rianti (2018) in his research stated that on flat sided geometric material, especially for cube and block material, students tend to memorize formulas, so that when given questions that are different from the examples of questions being taught, especially those in the form of story questions, students experience difficulties in understanding these questions, students often wrong in determining which formula to use and in the end get the wrong answer.

In this study, the critical thinking indicator used by Ennis (1996) and the material for flat-sided geometric shapes, this is what distinguishes this research from research by Masriyah (2020) which uses the critical thinking indicator Facione (1990). The review of this study is only on differences in students' cognitive styles, this is also a differentiator from previous research by Cahyono (2019) which is also reviewed from gender differences.
Based on the problems in the background above, the researcher conducted a study entitled "Critical Thinking Ability of Junior High School Students in Solving Mathematical Problems Viewed from Reflective-Impulsive Cognitive Style".

METHOD

This research was descriptive research with a qualitative approach. This research was conducted in SMPN 26 Surabaya. The data sources in this study were research subjects consisting of 2 class VIII students of the same sex, who had received learning related to flat-sided geometrical material, had equivalent mathematical abilities, had good communication skills, and had a reflective or impulsive cognitive style. The selection of research subjects was based on the results of the Matching Familiar Figure Test (MFFT), Mathematical Ability Test (TKM), and teacher recommendations.

Data collection methods used are test and interview methods. The tests used include the MFFT, TKM, and Problem-Solving Test (TPM). The instrument for the adaptation of the MFFT from Warli (2013) consisted of 15 items with 2 experimental items and 13 other items as test questions to group students into reflective or impulsive cognitive styles. The TKM questions used were questions related to mathematics material in class VII. In this study the TKM questions were adopted from National Examination items and consisted of 10 questions. TPM prepared by the author and consulted with the lecturer. Interviews will later be used to dig deeper into information about students' critical thinking skills in solving math problems related to flat sided space.

MFFT was analyzed by counting the number of students' correct answers and the time used in completing the MFFT. Reflective students use *time (t) > average time for candidate research subject to work* and the number of correct answers *(f) ≥ 7 questions*. Meanwhile, impulsive students use *time (t) ≤ average time for candidate research subject to work* and the number of correct answers *(f) < 7 question*. TKM results were analyzed based on the scores obtained by students after working on TKM using the conversion reference set by

Ratumanan and Laurens (2006). TPM results are analyzed based on indicators of critical thinking ability in the problem-solving step. As for indicators of critical thinking skills in problem solving steps as shown in Table 1 below.

Table 1. Indicators of Critical Thinking Ability in The Problem Solving Step

Problem Solving Steps	Critical Thinking Ability Indicators	Indicators	Code
Understanding Problems	*Focus*	Understand exactly the problem	F1
		Mention information that is known and asked from the problem given	F2
Devise a Plan	*Situation*	Use all the information needed	S1
		Using mathematical concepts related to the problem	S2
Carry Out the Plan	*Reason*	Presenting reasons based on relevant facts/evidence at every step in making a decision or conclusion	R1
	Inference	Make the right conclusions	I1
		Present relevant reasons to support the decisions or conclusions that have been made	I2
	Clarity	Explain the symbol or meaning that has been written	C1
Look Back	*Overview*	Re-examine the steps or strategies that have been used to solve the problem	O1

Furthermore, interviews were conducted with research subjects to confirm answers and complete the required data. Analysis of the results of interviews through three stages, namely starting with data reduction, data presentation, and drawing conclusions.

RESULT AND DISCUSSION

The research was conducted on a group of class VII students at SMP Negeri 26 Surabaya. There were two students who met the criteria as research subjects, having different cognitive styles, equal mathematical abilities, and the same sex. Table 2 below shows the research subjects.

Table 2. Research Subjects

No.	Student's initials	Gender	Cognitive Style	Code	TKM Score
1.	CN	Female	Reflective	SR	86
2.	NK	Female	Impulsive	SI	86

Labeling and Research Data Code

Data were obtained from written answer to problem-solving tests and recording of interviews with research subject. The interview recording will be convered into transcipts. The interview transcripts are presented using the following code:

$$\text{Sequence-}\ \underset{1}{\underline{(P/S)}}\ \underset{2}{\underline{(R/I)}}\ \underset{3}{\underline{(1/2)}}\ \underset{4}{\underline{(1, 2, 3,\ldots, n)}} \quad (1)$$

Description:

1: Refers to the researcher or research subject (P: researcher or S: research subject)
2: Refers to the research subject's cognitive style (R: reflective or I: impulsive)
3: Refers to the problem-solving test question number
4: Refers to the researcher's question sequence or the research subject's answers

Example:
PI.2.1: The researcher's question or response to the impulsive cognitive style subject for problem-solving test question number 2 in the first interview sequence.
SR.1.2: The reflective cognitive style research subject's answer to problem-solving test question number 1 in the second interview sequence.

The coding of indicators for critical thinking ability in the problem solving step is presented in Table 1. Data from the problem-solving test, consisting of written answers from research subjects, were also labeled for answers that met the indicators. The data is presented using the following labeling.

	(R/I)	(F1, F2, R1, …, O1)	(1/2)	
Sequence-	1	2	3	(2)

Description:
1: Refers to the research subject (R: reflective or I: impulsive)
2: Refers to the indicator of critical thinking skills in solving problems
3: Refers to the problem-solving test question number
Example:
I.F1.2: The research subject's answer to question number 2, which demonstrates an impulsive cognitive style, meets the indicator of accurately understanding the problem.

Critical Thinking Ability of Reflective Cognitive Style Students in Solving Mathematical Problems

SR's interview and test results are shown in the following.

R : What material do you think the TPM question was related to?
SR : Build a flat side room. ***(F1)***
R : Try to explain again about TPM using your own language! What's the point of this question?
SR : The question was asked to find the type and the most efficient paint size combination for the minimum cost. ***(F1)***
R : Mention any information found in the problem!
SR : The size of the wall you want to paint is 8 meters long, 4 meters wide and 6 meters high, 2 windows are $120\ cm \times 170\ cm$*, 1 door is* $120\ cm \times 210\ cm$*. There are two paint brands and paint sizes with different prices.* ***(F2)***
R : What is asked from the question?
SR : What was being asked was the most efficient type and size combination of paint for the minimum cost. ***(F2)***
R : Apart from the material for flat sides, what material does this question relate to?
SR : Flat Build. ***(S2)***
R : Why is it related to flat build material?
SR : Because it relates to the sides of the meeting room that will be painted, it's in the form of a block so the sides are rectangular. ***(S2)***
R : Try to state the steps that will be taken to get the solution of the problem?
SR : First, find the area of the wall you want to paint, the walls are different and there is a front and a side. The wall that you want to paint is the front and back and the sides too. Find twice the area of the window and the area of the door and then find the area of the wall to be painted by adding the area of the front, back and side then subtracting the area of the two windows equal to the area of the door. ***(S1)***
R : OK, now that you know the area of the wall you want to paint, what's the next step?
SR : So the results that have been subtracted will be shared by the standard for using the paint. ***(S1)***
R : So next?
SR : Looking for the price for the paint, first for paint brand 1, the previous result was multiplied by 3 because it needed 3 coats, while for brand paint 2 times 2 because it needed 2 coats. After that, the results are adjusted according to the needs of the paint, then the minimum price is sought. ***(S1)***
R : Explain each step of solving the problem that you did!
SR : First find the area of the side walls and the front and back sides, because the beam makes the sides square, so find the area with length times width, area of front and back is equal to 2 times $8\ m \times 6\ m\ equals\ 96\ m^2$ *. For the side side, it means that 2 times 4 m×6 m equals 48* m^2*.* ***(R1)***

R : OK, after that?

SR : After that, in that room there were two windows and a door, so it was reduced by the area of the window and door. ***(R1)***

The area of two windows is equal to 2 times 120 cm ×170 cm equals 40,800 cm^2 *I change it to meters squared to 4.08* m^2*. The area of the door equals 120 cm ×210 cm equals 25,200* cm^2*, so I change it to 2.52* m^2*. Then the area of all the walls plus minus the area of the windows and doors is 137.4* m^2*. Then the results are divided by the paint requirement to find the amount of paint needed to find 11.45 kg.* ***(C1)***

R : Then for the paint selection?

SR : Before that, we looked for the needs of each paint for brand 1 multiplied by 3 and brand 2 times 2. The results obtained for brand 1 paint required 35 kg of paint and for brand 2 required 23 kg of paint. Because the available paint sizes are 1 kg and 5 kg so that it is efficient for brand 1 paint, it means that it requires 7 cans of paint measuring 5 kg and for brand 2 paint it requires 4 cans of paint measuring 5 kg and 3 cans of paint measuring 1 kg, then multiplied by the respective prices each paint. ***(I2)***

The comparison is obtained that by buying brand 2 paint, the price will be cheaper. ***(I1)***

R : After the work process is complete, do you re-check your completion steps from start to finish?

SR : Yes. ***(O1)***

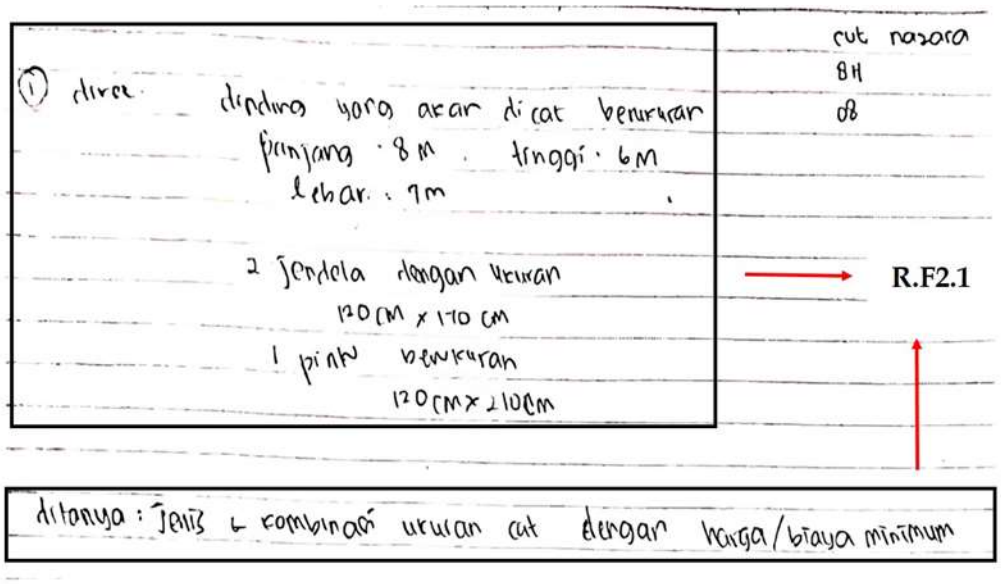


Figure 1. Subject R Answer to the Step Understanding Problems in Question Number 1

From the interview transcript and written answer, the results of SR data analysis are as follows. Immediately after read the problems SR make sure to understand what the problem means. SR read the questions 4 times. SR can determine concepts related to the problem, namely related to the surface area of the beam and explain the essence of the problem presented by quoting the language in the problem. SR did not write down the complete information that was known in the question but was able to mention the information that was known in full at the time of the interview, namely regarding the size of the walls, doors and windows, the sides of the walls to be painted, and two types of paint with different brands and prices. SR can write down and state what is asked in the question regarding the most efficient type and size combination of paint that requires the minimum cost. SR can mention concepts related to the problem, namely regarding flat shapes and can explain the relationship between the concept of a flat shape that is known and the information contained in the problem, namely related to the sides of the meeting room to be painted in the form of a rectangular flat shape.

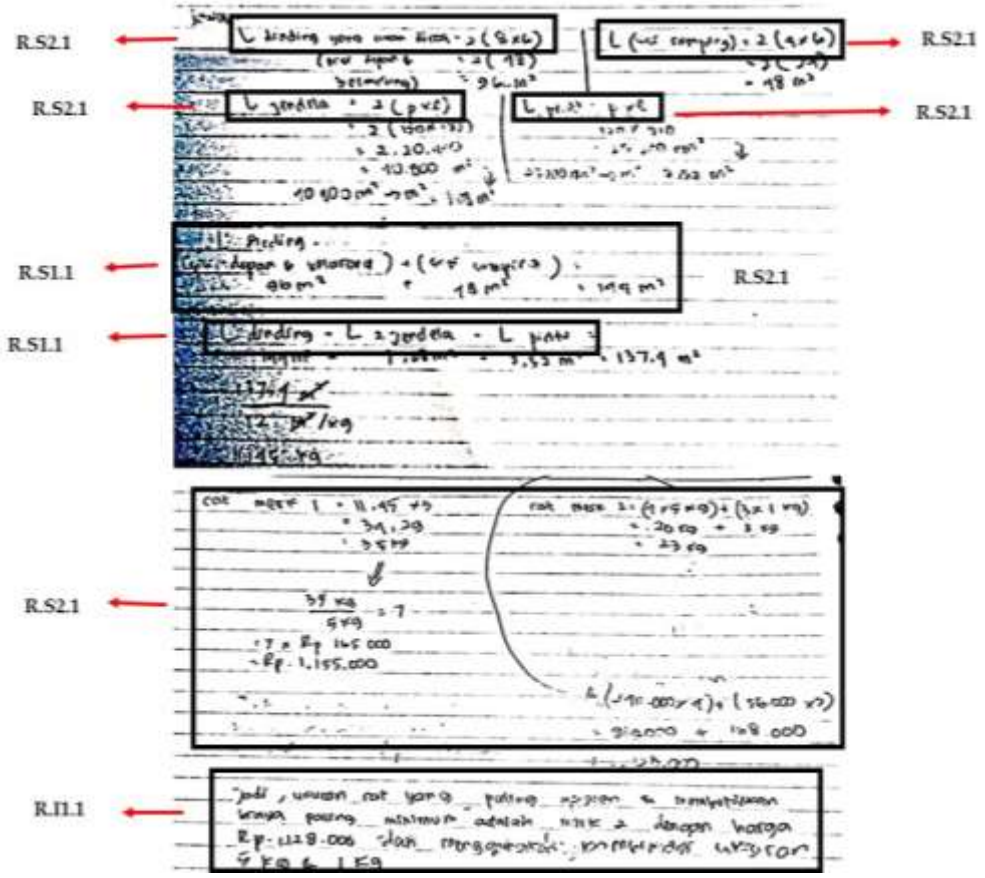


Figure 2. Subject R Answer to Carry Out the Plan in Question Number 1

SR can decide the information to be used in planning the settlement by ignoring unnecessary information such as the top and bottom sides of the meeting room that are not painted, can determine the steps to be used in obtaining the settlement, namely the first is by finding the area of the side of the wall to be painted then look for paint needs and determine which brand is the most efficient. SR can carry out each settlement step that has been planned precisely by giving reasons based on facts or relevant evidence at each step of solving the problem without making a calculation error so that the conclusion of the correct answer is obtained. Subject R can convey relevant reasons to support the conclusions that have been made. SR can describe the use of the symbol or the purpose that has been written, namely related to the formula for the area of a rectangle and can explain the conversion rules from centimeters to meters. SR re-checking all the answers that had been written from start to finish but was not thorough in finding errors. Shown by the lack of information on the questions written.

Critical Thinking Ability of Impulsive Cognitive Style Students in Solving Mathematical Problems

SI's interview and test results are shown in the following.

R : What material do you think the TPM question was related to?
SI : Build a flat side room. ***(F1)***
R : Try to explain again about TPM using your own language! What's the point of this question?
SI : So, it's like we were told to count the types and the combinations. ***(F1)***
R : Mention any information found in the problem!

SI : *First, there is a meeting room with a size of 8 m, 4 m, and the height is 6 m, then there is a window with a size of 210 cm × 170 cm, there is also a door with a size of 120 cm × 210 cm.* ***(F2)***
R : *What is asked from the question?*
SI : *Asked to look for the most efficient type and combination of paint needed.* ***(F2)***
R : *Apart from the material for flat sides, what material does this question relate to?*
SI : *Flat Build.* ***(S2)***
R : *Why is it related to flat build material?*
SI : *The point is related because the sides of the meeting room are rectangle, right using the flat build concept.* ***(S2)***
R : *Try to state the steps that will be taken to get the solution of the problem?*
SI : *To first find the area of the building first, then find the area of the window and the area of the door. The area of the building minus the area of windows and doors is the area to be painted. Now, the results that have been reduced will be divided equally by 12. Because the first brand paint is coated 3 times, the paint needs are multiplied by 3 then the brand paint is 2 times 2. Then look for the cheapest combination of paint sizes and prices.* ***(S2)***
R : *Explain each step of solving the problem that you did!*
SI : *First find the area of the wall you want to paint, first 8 m×6 m multiplied by 2 equals 96 m^2.* ***(R1)*** *Then 4 m×6 m multiplied by 2 the result is 48 m^2.* ***(C1)*** *These two plus the result is 144 m^2. Then 144 m^2 minus 4.08 m. Then subtract again the same as the door area of 2.52 m^2. After that, the results were divided by 12 to find 11.45 kg. The paint was multiplied the same, the first paint was done 3 times in the coating process so it was 11.45 kg × 3 = 34.35 = 35 kg. That means we can buy paint 5 kg × 7. Then multiplied by the price of paint which is 5 kg in size, the result is IDR 1,155,000.00. Then for the second one it was 11.45 kg × 2 = 22.9 = 23 kg. We can buy paint 5 kg × 4 and 1 kg × 3 then multiply the price of the paint the result is IDR 1,128,000.00.* ***(I1)***
R : *After the work process is complete, do you re-check your completion steps from start to finish?*
SI : *Yes.* ***(O1)***

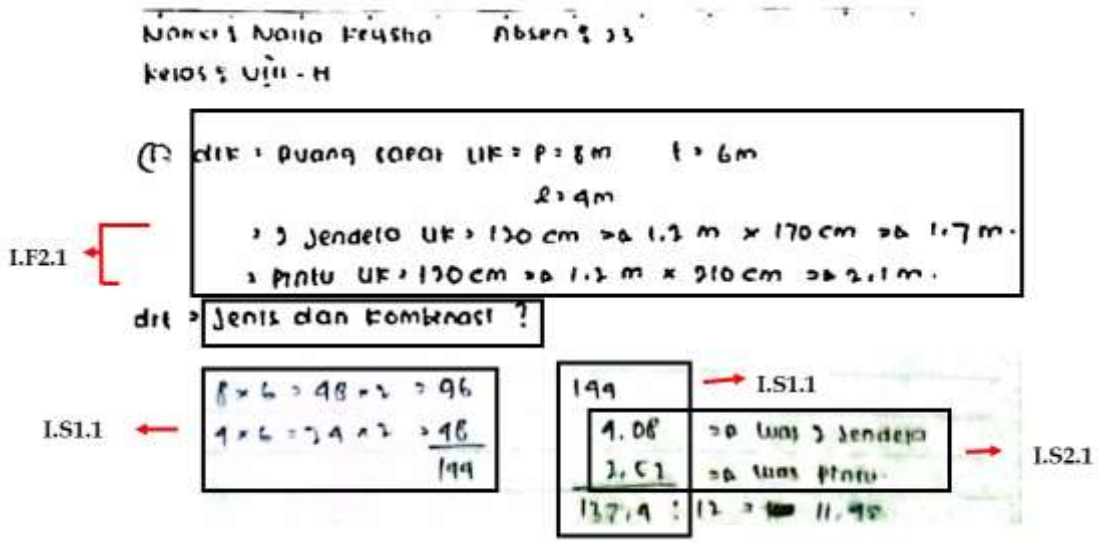
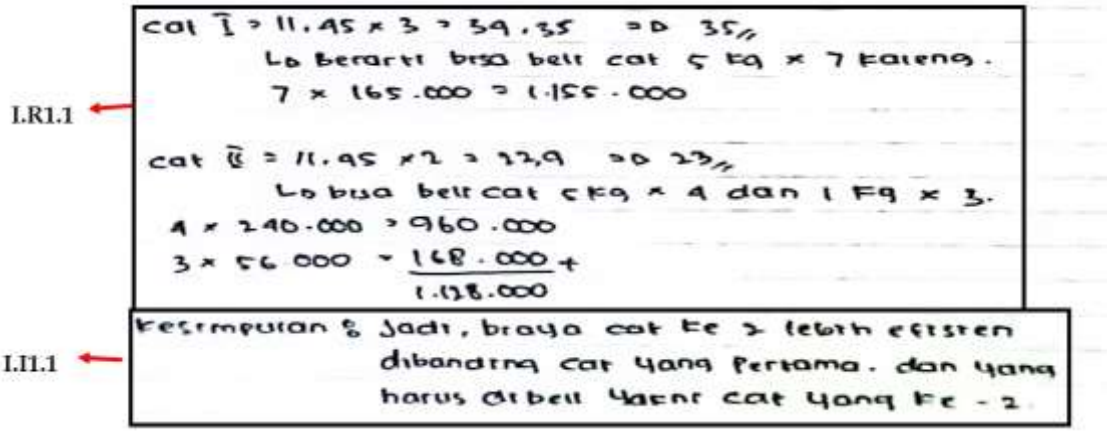


Figure 3. Subject I Answer to the Step Understanding Problems in Question Number 1



Picture 4. Subject I Answer to Carry Out the Plan in Question Number 1

From the interview transcript and written answer, the results of SI data analysis are as follows. SI understands the problem solving test questions by reading the questions 2 times. SI was able to determine concepts related to the problem, namely related to the surface area of the beam but was incomplete in explaining the essence of the problem presented. SI did not write down and mention in full the information known at the time of the interview, subject I only mentioned the dimensions of the walls, doors and windows, the sides of the walls to be painted, and did not mention information regarding the two types of paint with different brands and prices. SI is not write down in full what is asked in the question regarding the most efficient type and size combination of paint that requires the minimum cost, but is able to mention in full during the interview. SI was able to mention concepts related to the problem, namely regarding flat shapes, the subject was initially wrong in explaining the relationship between the concept of flat shapes that were already owned and the information contained in the problem, subject I said that the sides of the meeting room to be painted were square, even though the sides of the meeting room to be painted were rectangular, but in the end it was correct in explaining the relationship. SI can decide on the information used in planning the finish by ignoring unnecessary information such as the sides of the top and bottom of the meeting room that are not painted, can determine the steps to be used in getting the finish, namely first by finding the area of the side of the wall to be painted then looking for paint needs and determining which brand is the most efficient. SI can carry out every step of completion that has been planned precisely by submitting reasons based on relevant facts or evidence at each step of solving the problem without making a calculation error so that the conclusion of the correct answer is obtained. Subject I was able to write the conclusion of the answer correctly but did not mention the conclusion of the answer at the time of the interview. SI can describe the use of the symbol or the purpose that has been written, namely related to the formula for the area of a rectangle. SI re-checking the answers that had been written from the beginning to the end but was not careful enough to find errors. Shown by the lack of information and what is asked in the questions written. After going through the process of collecting and analyzing data according to indicators of critical thinking skills in solving problems, the following results are obtained.

Students' Critical Thinking Ability with Reflective Cognitive Style in Solving Problems

Critical Thinking Ability in Understanding the Problem

Referring to the research of Ennis (2011), indicators of critical thinking ability that meet the criteria for critical thinking focus on the step of understanding the problem are students being able to understand the problem and being able to mention known and asked information from the problem given. Presented two problems that must be completed by the subject by writing the process of completion. Of the two questions that had been solved before the working process, the subject read and understood the questions carefully even by reading the questions 4 times. Subjects can explain the essence of the problems presented by quoting the language of the questions, this is in accordance with Oktaviani's research (2020) which states that students with a reflective cognitive style are able to find facts from the information provided. Subjects can determine concepts related to problems, namely related to the surface area and volume of blocks, this is in accordance with Ardani's research (2017) which states that students with a reflective cognitive style can associate problems with the material to be used in solving. The subject can write down and state in full what is known in the questions related to the size of walls, doors, windows, storage, cardboard and plywood, the side of the wall to be painted, the type of paint with different brands and prices, and lots of storage. Subjects were able to write down and state correctly what was asked regarding the most efficient type and size combination of paint that required the minimum cost and the number of boxes needed to send storage to the customer's home. This is in line with Ningsih's research (2012) which states that reflective cognitive style subjects know the information contained in the questions and what is being asked and in Noor's research (2019) which states that reflective subjects write down what is known and asked about the problem completely and clearly. The results of this study indicate that students with a cognitive-reflective style have very good focus critical thinking ability in the step of understanding the problem.

Critical Thinking Ability in the Steps of Devise a Plan

Referring to the research of Ennis (2011), indicators of critical thinking ability that meet the criteria for critical thinking in a situation at the planning settlement are that students can use all the information needed and use mathematical concepts related to the problem. From the two questions that have been solved, the subject can use mathematical concepts related to the problem and can explain the relationship between previous knowledge about the flat wake concept and the information obtained on the problem, namely related to the side of the meeting room to be painted in a rectangular shape and the side of the cardboard and storage which is flat. In line with Noor's research (2019) which states that reflective students are able to solve problems using related mathematical concepts. Subjects can decide which information to use to plan a solution by using all the information in the problem and ignoring information that is not needed such as the unpainted sides of the meeting room and the length and width of the plywood. In line with Ningsih's research (2012) which states that reflective subjects are able to use all the important information contained in the questions. The subject can also determine the steps that will be used to get a solution, namely

by finding the area of the side of the wall to be painted, then looking for paint needs, and determining which size and brand of paint is the most efficient. Pay attention to the size of the cardboard according to the size of the storage and the height of the plywood used as the thickness of the storage, then look for how much storage can fit into the cardboard. In line with Ardani (2017) which states that reflective students can plan specific steps that lead to completion solutions. The results of this study indicate that students with a cognitive-reflective style have very good critical thinking skills in the situation planning settlement.

Critical Thinking Ability in the Steps of Carry Out the Plan

Referring to the research of Ennis (2011), indicators of critical thinking ability that meet the criteria for critical thinking reason, inference, and clarity in solving problems according to plan are students being able to convey reasons based on relevant facts/evidence at each step in making decisions or conclusions, able to draw conclusions correctly, able to convey relevant reasons to support decisions or conclusions that have been made, and able to explain symbols or intentions that have been written. Of the two questions that have been solved, for the first question the subject can solve the problem correctly according to the steps previously planned and can convey reasons based on relevant facts/evidence at each step of completion. For the second question, the subject experienced a calculation error in solving the problem, but this did not affect the final result because the subject used another method to determine the solution. So, it can be concluded that the subject can solve the problem according to the steps that have been planned and can convey reasons based on relevant facts/evidence at each step of completion. Subjects can explain the symbols or intentions that have been written to solve problems, namely related to the use of the formula for the area of a rectangle, the concept of volume of a block, and the rules for converting units of length. In line with Ningsih's research (2012) states that reflective subjects are able to explain the terms contained in the questions. Subjects can draw conclusions appropriately and can convey relevant reasons to support decisions or conclusions that have been made in line with Armudin's research (2022) which states that reflective subjects are able to write down and state conclusions about answers accompanied by relevant reasons. The results of this study indicate that students with a cognitive-reflective style have very good critical thinking skills of reason, inference, and clarity in solving problems according to plan.

Critical Thinking Skills in the Steps of Look Back

Referring to Ennis' research (2011), indicators of critical thinking ability that meet the overview critical thinking criteria in the re-checking step are students being able to re-examine the steps or strategies that have been used to solve problems. Of the two problems that have been solved, the subject always re-examines the steps or strategies that have been used in solving the problem from start to finish. This is in line with Ningsih's research (2012) which states that reflective students re-examine their work, starting from the problem, each step of the work, and the final results and the results of Saudi research (2018) which states that reflective students re-examine everything written. However, when re-examining the subject, it did not find inappropriate calculations, so it did not justify it. The results of this

study indicate that students with a reflective cognitive style have good overview critical thinking skills in the re-checking step.

Students' Critical Thinking Ability with Impulsive Cognitive Style in Solving Problems

Critical Thinking Ability in Understanding the Problem

Referring to the research of Ennis (2011), indicators of critical thinking ability that meet the criteria for critical thinking focus on the step of understanding the problem are students being able to understand the problem and being able to mention known and asked information from the problem given. Presented two problems that must be completed by the subject by writing the process of completion. From the two questions that were solved before the processing, the subject understood the questions by reading the questions 2 times. The subject cannot explain the essence of the problems presented. Subjects can determine concepts related to the problem, namely related to the surface area and volume of the beam. The subject could not write down and mention in full what was known, the subject could not write down and mention information related to two types of paint with different brands and prices. This is in line with research by Noor (2019) that impulsive students are incomplete in writing down what is known in the questions. The subject was not precise in writing down what was asked regarding the most efficient type and size combination of paint that required the minimum cost and the cardboard needed to send storage from the production site to the customer's home, in line with Ningsih's research (2012) which stated that impulsive students could not catch what was being asked in the questions. The results of this study indicate that students with an impulsive cognitive style have the ability to think critically well enough to focus on the step of understanding the problem.

Critical Thinking Ability in the Steps of Devise a Plan

Referring to the research of Ennis (2011), indicators of critical thinking ability that meet the criteria for critical thinking in a situation at the planning settlement are that students can use all the information needed and use mathematical concepts related to the problem. From the two problems that have been solved, the subject can use mathematical concepts related to the problem and can explain the relationship between prior knowledge about the concept of flat shape and information obtained on the problem, namely regarding the side of the meeting room to be painted in a rectangular shape and the side of the cardboard and storage in the form of a flat shape. In line with Noor's research (2019) which states that impulsive students can solve problems with concepts. Subjects can decide which information to use to plan a solution by using all the information in the problem and ignoring information that is not needed such as the unpainted sides of the meeting room and the length and width of the plywood. In line with Ningsih's research (2012) which states that students are impulsive knowing what information should be used in solving problems. The subject can determine the steps to be used in obtaining a solution, namely by finding the area of the wall to be painted, then looking for paint needs, and determining which size and brand of paint is the most efficient. Pay attention to the size of the cardboard according to the size of the storage and the height of the plywood used as the thickness of the storage, then look for how much storage can fit into the cardboard. The results of this study indicate that students with an

impulsive cognitive style have very good critical thinking ability in the situation planning settlement.

Critical Thinking Ability in the Steps of Carry Out the Plan

Referring to the research of Ennis (2011), indicators of critical thinking ability that meet the criteria for critical thinking reason, inference, and clarity in solving problems according to plan are students being able to convey reasons based on relevant facts/evidence at every step in making decisions or conclusions, being able to draw conclusions appropriately, be able to convey relevant reasons to support the decisions or conclusions that have been made, and be able to explain the symbols or intentions that have been written. Of the two questions that have been solved, for the first question the subject can solve the problem correctly according to the steps previously planned and can convey reasons based on relevant facts/evidence at each step of completion. For the second question, the subject experienced a calculation error in solving the problem, but this did not affect the final result because the subject used another method to determine the solution. So, it can be concluded that the subject can solve the problem according to the steps that have been planned and can convey reasons based on relevant facts/evidence at each step of completion. The subject can explain the symbols or intentions that have been written to solve the problem, namely related to the use of the formula for the area of a rectangle and the volume of a block. Ningsih (2012) also states that impulsive students can correctly explain the terms contained in the questions. Subjects can make conclusions appropriately and can convey relevant reasons to support the decisions or conclusions that have been made. In line with Armudin's research (2022) which states that impulsive students can write down and state the conclusions of the final results that are written. The results of this study indicate that students with an impulsive cognitive style have very good critical thinking ability of reason, inference, and clarity in solving problems according to plan.

Critical Thinking Skills in the Steps of Look Back

Referring to Ennis' research (2011), indicators of critical thinking skills that meet the overview critical thinking criteria in the re-checking step are students being able to re-examine the steps or strategies that have been used to solve problems. Of the two problems that have been solved, the subject always re-examines the steps or strategies that have been used in solving the problem from start to finish. In line with the results of Saudi research (2018) which states that students are impulsive to re-check the answers written. However, when re-examining the subject, it did not find inappropriate calculations, so it did not justify it. The results of this study indicate that students with an impulsive cognitive style have good overview critical thinking ability in the looking back step.

CONCLUSION AND SUGGESTIONS

Reflective cognitive style students have very good critical thinking ability focus, reason, inference, situation, clarity in the steps of understanding problems, planning settlement, and solving problems according to plan. Meanwhile, in the step of checking again, student with a reflective cognitive style have good overview critical thinking ability. Impulsive

cognitive style students have very good critical thinking ability reason, inference, situation, clarity in the steps of planning settlement and solving problems according to plan. Meanwhile, in the step of understanding the problem, student with an impulsive cognitive style have well enough focus critical thinking ability. And in step of checking again student with an impulsive cognitive style have good overview critical thinking ability.

Based on the results of the research and discussion, it is better for teachers to be advised to provide more practice questions in the form of problems and discuss them because students with reflective and impulsive cognitive styles are less thorough in finding mistakes in the looking back step, besides that the teacher is expected to be able to design learning that takes into account the differences in the cognitive styles of each student abilities of each student and for other researchers, are expected to carry out further research that is relevant to this research related to the critical thinking skills of junior high school students in solving mathematical problems in terms of other cognitive styles or using other content.

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