Analysis of Critical Thinking from Student with Quantive Approach

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Abstract. This study aims to describe critical thinking of male and female students in solving story problems. This type of research is qualitative descriptive research. The subjects in this study were class VIII Tunggangri MTsN consisting of one male student and one female student. Subject selection with purposive sampling technique. The instruments used are test sheets and interview guidelines. Collection techniques with tests and interviews. The data analysis technique is done by categorizing the data at the level of critical thinking and analyzing each level of critical thinking based on gender. Based on the results of the research and discussion it can be concluded that students' critical thinking skills in solving story problems include male and female students having different levels of critical thinking. Critical thinking ability of male students can fulfill 1 critical thinking indicator from 4 critical thinking indicators. Whereas female students can fulfill 2 indicators of critical thinking from 4 indicators of critical thinking. With this research, it is expected to help teachers in developing students' critical thinking skills both male and female students.

1. Introduction

One of the subjects taught in school is mathematics, where mathematics shape the character of students to think logically, systematically, critically, and creatively [1]. Through mathematics learning, students are expected to have the ability to work together, the ability to think logically, analytically, systematically, creatively, and critically [2]. Critical thinking is reflective thinking in depth in decision making and problem solving to analyze situations, evaluate arguments, and draw conclusion. According to Anindia, people who are able to think critically are people who know how to use information, deduce what is known and be able to find relevant sources of information [3].

But the reality on the ground is different. The critical thinking ability of junior high school students in Indonesia is still relatively low. This is based on an international four-year study of Trends in the International Mathematics and Science Study (TIMSS) conducted on junior high school students with characteristics of high cognitive level questions that measure students' critical thinking skills indicating that Indonesian students are ranked lower [2]. According to Agoestanto, Suksesiyarno and Rochmad the students' mathematical critical thinking skills are still low [4]. According to Indarti the students' mathematical critical thinking skills are very low because they are rarely used in class or even never [5]. Critical thinking is needed in students, because in carrying out various activities, everything must be done with careful thinking in order to minimize the risks or negative impacts that arise [6].

Critical thinking ability is an important matter, students are expected to be able to think critically in each lesson, because critical thinking is reasoned and reflective thinking by emphasizing decision-making about what to believe or do [1]. Critical thinking indicators used in this study by adapting from Ennis as follows:
Table 1. Indicator of Critical Thinking Ability According to Ennis

| Indicator of Critical Thinking | Sub-Indicator of Critical Thinking | Description |
|-------------------------------|-----------------------------------|-------------|
| 1. Elementary clarification   | Analyze questions                 | Students are able to understand and explain problems story. |
| 2. Advance clarification      | Identifying assumptions           | Students are able to give guesses by writing what is known in the form of mathematics. |
| 3. Strategies and tactic      | Determine the solution to the problem in the problem. | Students are able to determine the concepts or formulas used in completion |
|                               | Write down answers or solutions to problems in the problem | Students are able to write answers to problems in the problem |
| 4. Inference                  | Determine the conclusion of the solution to the problem that has been obtained | Students are able to determine the results of the final answer requested in the problem |

Research on critical thinking has been carried out like Fatmawati investigating the Analysis of Students' Critical Thinking in Solving Mathematical Problems Based on the Polya in the Subject of Quadratic Equations. The difference with this research is in terms of gender[7]. So it is necessary to do research on the role of gender in critical thinking. The existence of this research is expected to help teachers improve students' critical thinking skills by encouraging students to understand the problem of story problems first so that they are able to change to their mathematical form.

2. Research Method

This type of research is qualitative descriptive research. The subjects in this study were class VIII Tunggangri MTsN consisting of one male student and one female student [8]. Selection of subjects using Purposive Sampling. The instruments used in this study were test sheets and interview guidelines. Data collection techniques in this study were tests and interviews. The technique of checking the validity of the data in this study is triangulation technique. The data analysis technique is done by: 1) categorizing the data in the level of critical thinking (TBK) based on indicators of critical thinking according to Ennis. 2) analyze each TBK based on gender.

3. Results and Discussion

3.1 Critical thinking analysis of male students in problems solving of story

Student write down statement of story problems question, this is shows that from the answers of student’s work as follows:

![Figure 1. Answer from male student](image)

Thus male students fulfill the first indicator which is able to provide a simple explanation.

Furthermore, male students cannot write what is known in the form of mathematics, write the formula used from the problem and cannot write the answer, cannot determine the solution to the problem in the problem and cannot write the answer to the problem in the problem, unable to determine the answer end requested in the question. this is indicated by written answers and excerpts of interviews giving the following.

*Researcher: "What steps did you use to solve the problem?"
Male student: "I don't know the next step to solve the problem."
Researcher: "What solution did you use to solve the problem from the story matter?"
Male student: "I know how to solve the problem so I don't know the answer."
Researcher: "What are the steps to conclude the decision?"
Male student: "I can't conclude from the question because I don't know how to solve the problem".*

based on indicators of critical thinking, male students are unable to identify assumptions. Thus male students cannot fulfill the second indicator which is able to make further explanations. Thus male students cannot fulfill
the third indicator in critical thinking, namely strategy and tactics. Thus male students cannot fulfill the fourth indicator, namely concluding.

3.2 Critical thinking analysis of female students in problems solving of story

Students write statements from the story problems presented, this can be shown from the results of student work as follows:

![Figure 2](image)

**Figure 2.** Answer from female student

The test results show that female students are able to analyze the questions presented. Thus female students fulfill the first indicator which is able to provide a simple explanation.

Students write about what is known in the form of mathematics, this can be shown from the results of student work as follows:

![Figure 3](image)

**Figure 3.** Answer from female student

The test results show that female students are able to identify assumptions. Thus female students can fulfill the second indicator which is able to make further explanations.

Students are able to write the formula used from the problem and but cannot write the correct answer, this can be shown from the results of student work as follows:

![Figure 4](image)

**Figure 4.** Answer from female student

*Researcher: "What solution did you use to solve the problem from the story matter?"
Female students: "I know the formula used to solve it is using mixed methods (substitutions) but I can't solve the answer".*

*Researcher: "why not continue?"
Female students: "I have trouble counting."

The results of tests and interviews show that female students are able to determine the solution to the problem in the problem and but cannot write the answer to the problem in the problem. Thus female students cannot fulfill the third indicator, namely strategy and tactics.

Students are not able to determine the results of the final answer requested in the problem. This is indicated by the following excerpt from the interview.

*Researcher: "What are the steps to conclude the decision?"
Female students: "I cannot conclude from the question because I cannot solve the problem".*

The results of the tests and interviews show that female students are not able to determine the results of the final answers requested in the questions. Thus female students cannot fulfill the fourth indicator, namely concluding.

In this study, the critical thinking ability of male students can meet 1 indicator of critical thinking from 4 indicators of critical thinking, so that the level of thinking of male students is low. Whereas female students can fulfill 2 indicators of critical thinking from 4 indicators of critical thinking, so the level of critical thinking of female students is being. This is in line with which classifies critical thinking processes into three, namely Strong, Medium and Low [9].
In addition, in this study gender shows a role in critical thinking. This is caused by several factors, among them students are not accustomed to working on the problem so students are less able to understand the problem [10], students are less able to change the story problem into a mathematical model so students have difficulty solving problems, students tend to often solve problems using only one method without regard other ways so students also often don’t check the results of their work after they are done [1].

4. Conclusion
Based on the results of research and discussion it can be concluded that gender plays a role in critical thinking. This is indicated by the critical thinking skills of female students better than male students. Male students only fulfill 1 critical thinking indicator from 4 critical thinking indicators. Whereas female students can fulfill 2 indicators of critical thinking from 4 indicators of critical thinking. Henceforth, the teacher must improve the critical thinking of both male and female students by providing training in critical thinking questions.

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