Analysis of Student's Critical Thinking Ability Based on Gender

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Abstract. This study aims to determine the analysis of student's critical thinking ability based on gender in the arithmetic sequence and series material at MTs Negeri 1 Palembang. This study's type is a qualitative descriptive study. This study was performed with a population of seven classes and a sample of one class, namely class VIII D, in the odd semester of the 2018/2019 academic year. Data collection techniques used documentation, tests, and interviews. At the same time, the test data analysis technique used descriptive narrative. Based on the research results, the results obtained: 1) Female students have higher critical thinking ability than male students in arithmetic sequence and series material. This is because female students have more complex thoughts than male students. 2) Male students are slightly superior by 10% over female students in achieving conclusions. 3) Male and female students have the same ability in indicators to make further explanations.

Keywords: Critical Thinking, Gender, Arithmetic Sequence and Series

1 Introduction

Mathematics as a science discipline that relies on the process of thinking is deemed very good to teach the students. It contained a variety of aspects that substantially lead students to think logically according to patterns and rules that have been arranged by default. So often, the purpose of teaching mathematics is not another to get used to that students were able to think logically, critically, and systematically [21]. This is following the Regulation of the Minister of Education and Culture of 2016 number 21 concerning Content Standards, which states that the purpose of learning mathematics in schools is that the students can show the attitude logical, critical, analytical, meticulous and conscientious, responsible accountable, responsive, and do not easily give up in solving the problem.

Critical thinking is indispensable for students' lives; by thinking critically, they can filter information, choose between appropriate or not a need, question the truth, and all things that can be a harmful impact on their live [21]. Critical thinking is a method used in mental activities that is guided and straightforward and solves problems, makes decisions, persuades, believes, and performs scientific research [10]. While the definition of critical thinking, according to Adinda [1], contains three things. First, in the sense of dealing with oneself, the world of others, or their environment, critical thinking is a problem-solving technique. Second, critical thinking is a method of reflective reasoning based on previously collected, concluding data and assumptions. Third, critical thought ends with the conviction and implementation of choices.

AECon 2020, December 19-20, Purwokerto, Indonesia

DOI 10.4108/eai.19-12-2020.2309168

Improving critical thinking skills requires a good learning process. Surna and Panderiot [20] said that each student had individual differences that will affect the learning process. The individual differences of learners consist of intellectual, cultural, socio-economic, and gender backgrounds.

Some researchers claim there are gender-based disparities in mathematical skill. Based on the [13] PISA (*Program for International Student Assessment*) in 2015, on the subjects of mathematics, female students in Indonesia slightly outperformed male students, namely with a score of 387 for female students and a score of 385 for male students. Differences of this indicate that there is an interest, talent, style of learning that is diverse and ability is hidden students Indonesia in studying mathematics.

One of the mathematical abilities is critical thinking. The critical thinking process of students has differences between each individual. Male and female students can go through 4 phases of the critical thinking process: the recognition phase, analysis phase, evaluation phase, and thinking about alternatives. However, in the recognition phase, male students had trouble, namely incomplete in stating questions. Then, in the analysis phase, evaluation phase, and thinking about alternatives, both male and female students can do it well [2]. This reinforces the statement that female students are superior to male students in mathematics, which is influenced by their critical thinking abilities.

However, there are different statements regarding the comparison of these critical thinking abilities. According to Santrock [15], male students are a little better than female students in math and science. The ability of male students is the same as female students. Still, male students have better abstraction power than female students do, which allows male students are better off than female students in mathematics. Because, in general, mathematics is concerned with abstract notions. Martin, et al [11] has a similar result to Santrock. He found that in 21 countries, boys performed better at the grade 4 level than girls on various subjects, while the mean score for girls in seven states was higher than for boys. Rodriguez, et al [14] conclude that: (1) in most countries, girls in grade 4 show a lower self-concept in mathematics, although the effect of mathematical achievement is taken into account; (2) not only in countries where girls performed less well in mathematics than boys, but also in countries where girls performed more or less well than boys, girls viewed their mathematical abilities more negatively compared to boys. Zawistowska and Sadowski [22] showed that women are distracted from mathematics-related employment by a relatively low likelihood of alternate track failure.

The situation when male students are a little better than female students in math is caused by some factors like confidence and linking in mathematics. Ganley and Lubienski [6] found that in third through eighth grades, girls are less optimistic and less interested in mathematics than boys. Some researchers also assume that the effect of mathematical gender factors are triggered by biological differences in the brains of boys and girls, which are understood through observation, that in the fields of language and writing, girls are usually superior, whereas boys are superior because of better spatial abilities in mathematics. Ingalhalikar et. al [9] have found differences in brain function in men and women. The male's brain is optimized for intrahemispheric and the female brain for interhemispheric communication. The male brain is designed to encourage connectivity between perception and concerted action, while the female brain is designed to facilitate coordination between modes of analytical and intuitive processing.

Problems with arithmetic sequence and series material can show students' critical thinking abilities or abilities [3]. This is because the material for arithmetic sequences and series can be more easily made into critical thinking problems. Therefore, researchers are

interested in examining the analysis of student's critical thinking abilities based on gender on the arithmetic sequence and series material that is to demonstrate a student's critical thinking ability.

The formulation of the problem in this study is how to analyze student's critical thinking ability based on gender on the arithmetic sequence and series material at MTs Negeri 1 Palembang? Then, the purpose of this study is to find out how the analysis of students' critical thinking abilities based on gender in the arithmetic sequence and series material at MTs Negeri 1 Palembang.

2 Method

This research type is a qualitative descriptive study. Based on the opinion of Satori and Komariah [17], Saryono [16] and Sugiyono [19], it is concluded that qualitative research is research that aims to analyze and describe an object based on its quality and the researcher as a vital instrument of the research itself. The subject of this research was carried out purposively, namely 20 male students and 20 female students of class VIII MTs Negeri 1 Palembang for the 2018/2019 academic year. The goal of this research was to see the critical thinking ability of male and female students so that purposive sampling was focused on the high mathematical skills of the students.

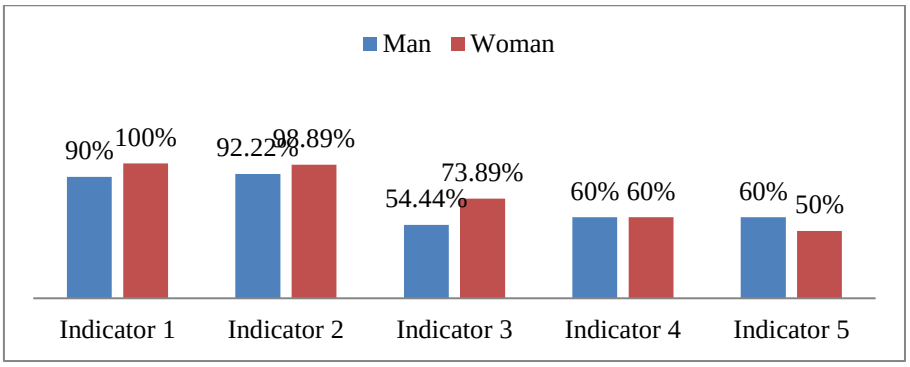
Documentation, test, and interviews were data collection methods used in this study. Documentation is done to get an overview of student's critical thinking abilities. The test was then used to collect research data regarding the critical thinking levels of female students and male students in arithmetic sequence and series material. The test questions are based on critical thinking indicators. The test questions are in the form of essay questions with a total of 5 questions. Then, interviews are conducted to obtain information that cannot be obtained from tests and documentation.

This is because researchers want to capture students' perceptions, thoughts, and opinions about the material that has been taught. After that, the data will be processed. The processing of the data itself is calculating student scores, recapping student scores, calculating the average value of students, calculating the percentage of students' critical thinking abilities, and percentage descriptive analysis.

3 Result and Discussion

After a test given to students in the form of questions about critical thinking abilities, the percentage of critical thinking abilities of male and female students per predictor can be seen in diagram 1, which is calculated based on the criteria for scoring the critical thinking abilities of students.

Diagram 1. Percentage of Students' Critical Thinking Ability per Indicator



Information:
Indicator 1: Provides a simple explanation
Indicator 2: Builds the necessary skills
Indicator 3: Determining strategy and tactics
Indicator 4: Making further explanation
Indicator 5: Making conclusions

The critical thinking abilities of male and female students are spread out in three indicators, namely very high, high, and low. Male students' critical thinking ability to provide simple explanations and build necessary skills is included in the very high category, determining strategies and tactics, making further explanations, and making conclusions included in the low category. Meanwhile, in providing simple explanations and building necessary skills, women students' critical thinking abilities are included in the very high category, determining strategies and tactics included in the high category, making further explanations, and making conclusions in the low category.

Based on the results of the data analysis of student's answers to the critical thinking abilities test questions on the arithmetic sequence and series material in class VIII D MTs Negeri 1 Palembang, in the following table, the results of the students' critical thinking skills test can be seen:

Table 1. Students' critical thinking ability test results.

Score (X)	Category	Frequency		Percentage	
		Male	Female	Male	Female
$81{,}25 < X \leq 100$	Very High	3	9	15%	45%
$71{,}5 < X \leq 81{,}25$	High	6	5	30%	25%
$62{,}5 < X \leq 71{,}5$	Average	3	4	15%	20%
$43{,}75 < X \leq 62{,}5$	Low	8	2	40%	10%
$0 < X \leq 43{,}75$	Very Low	-	-	-	-

From table 1, it can be seen that there are no students who have critical thinking abilities with a deficient category. Students' critical thinking abilities are divided into four categories: high, high, medium, and low. Three-person students (15%) and nine female students (45%) have very high critical thinking abilities, six-male students (30%) and five female students

(25%) have high critical thinking abilities, three-person students -Male (15%) and four-female students (20%) had moderate critical thinking abilities, eight-male students (40%) and two female students (10%) had low critical thinking abilities. These results prove that the students' critical thinking abilities between boys and girls are different in the arithmetic sequence and series material.

The results of the interviews also confirmed the test results. At the time of the interview, the answers from female students were more detailed than that of male students. One example is when asked about other formulas from finding the sum of the first n terms of an arithmetic series, female students still try to remember a little about the formula even though in the end they fail to pronounce the formula correctly in contrast to male students who tend to give up immediately to remember the formula. Female students also had exciting answers when asked for examples of arithmetic sequences in real life, even though they were still not quite right.

Female students have higher critical thinking abilities than male students. This statement is supported by Dahlan's statement [4] that boys from a young age until the age of 18 had their right brain developed first, while girls from a young age to 18 years of age both their right brain and left brain developed simultaneously. According to Munawaroh and Haryanto [12], the left brain functions for rational, analytical, sequential, linear, and scientific thinking, such as learning to read, language, count, spatial, and metaphoric absorbing more synthetic mathematical concepts.

Female students' critical thinking abilities are higher than male students, which can also be supported by comparing the number of student frequencies per category of critical thinking abilities. In a very high category, female students' frequency is more than the frequency of male students. Then, in the low category, male students' frequency is more than the frequency of female students. Whereas in the high and medium categories, there was no significant difference in frequency between male and female students.

The results of female students' high critical thinking abilities are also because they excel in achieving three indicators of critical thinking abilities, namely providing simple explanations, building necessary skills, and determining strategies and tactics. This is confirmed by the statement of Fajari et. al. [5], which states that the critical thinking process of female students is more complicated than male students because female students fulfill the characteristics of reflective and rational thinking. Meanwhile, male students are only able to fulfill the characteristics of rational thinking. In line with the statement of Fajari et al., The results of research conducted by Haryani [8] also stated that female students fulfill all aspects of critical thinking at every stage of problem-solving.

However, even though the results of women students' critical thinking abilities were higher than men students, the percentage of achievement of the indicators made conclusions that women students had a lower percentage value of achievement than the percentage value of achievement of male students. Many female students do not work on questions containing indicators to make conclusions, which are theoretical questions. This shows that Hardy et. al. [7] stated that women tend never to have a broad interest in theoretical problems like men.

The interview results also reinforce this. More female students answered that the statement on the test questions about making inferences did not apply if the numbers in the arithmetic series were multiplied by another number. Their answers showed that they did not fully understand the arithmetic sequence concept, and we're still lacking in making conclusions. This result is also strengthened by the statement of Siswandi et. al. [18] that the types of errors of female students are misunderstanding, transformation errors, errors in the completion process, and errors in determining the final answer.

Thus, it can be concluded that female students have higher critical thinking abilities than male students. Female students scored higher percentages on indicators providing simple explanations, building necessary skills, and determining strategies and tactics. Male students had a slightly higher critical thinking ability than female students on the indicators of making conclusions. Meanwhile, in the indicator making further explanations, male and female students achieved the same percentage value. This same considerable percentage value shows that Fajari et. al. [5] states that there is no difference between male and female students in critical thinking.

4 Conclusion

Based on the theoretical study and analysis of the research results stated previously, it can be concluded that male students and female students have different critical thinking ability. Female students have higher critical thinking ability than male students. Female students scored higher percentages on indicators providing simple explanations, building necessary skills, and determining strategies and tactics. This is because female students have more complex thoughts than male students. Then, male students have a slightly higher critical thinking ability than female students' on making conclusions. This is because making conclusions requires a reasonably good interest in theory. Meanwhile, women tend to have less interest in theoretical matters, so that most female students do not solve theoretical problems. Finally, in the indicator making further explanations, male and female students achieved the same percentage value. This is because basically, the abilities of male students and female students are the same.

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