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Research Article

Analysis of Junior High School Students' Ability to Understand Mathematical Concepts in Statistics Materials Reviewed from Gender

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ABSTRACT

Male students are different from women in acquiring, understanding and mastering mathematical concepts. This study intends to describe the ability of students to understand mathematical concepts from a gender perspective. The ability to understand mathematical concepts is analyzed from problem solving. This study applies a qualitative descriptive method. The subjects of the study were male and female students in grade IX of the Medan National Hero Private Junior High School as many as 12 people each. The research instrument used was in the form of a written test of mathematical concept comprehension ability consisting of 3 valid essay questions and an interview. The data was analyzed based on gender indicators of mathematical concept comprehension ability, namely restating concepts that have been learned, using certain procedures or operations, and applying concepts in meaningful problem solving to the concepts studied. Data are compared by gender. The results of the study showed that the ability to understand mathematical concepts of female students was better than that of male students on the indicators of restating the concepts that had been learned, using certain procedures or operations and applying concepts in meaningful problem solving to the concepts studied, which can be seen from the average achievement of female students 72.183 while male students reached an average of 58.3.

Keywords: Gender; Understand Mathematical Concepts; Statistics

1. INTRODUCTION

Mathematics learning can hone and develop various ability to think. Mathematics is composed of structured concepts, from simple to complex, systematic and interrelated concepts (Cahani et al., 2021). The understanding of a mathematical concept is very important for students to have to use the concepts that have been understood in solving problems Mathematics (Humaira Syaifar et al., 2022). Understanding mathematics concepts determine the success of students studying mathematics (Afsari et al., 2021). Understanding concepts is the key in reaching learning objectives.

Basically, the ability to understand concepts becomes the foundation for learning mathematics so that students are not just knowing the material but make meaningful learning (Yulianty, 2019). Concept understanding is the basis of understanding the principles and theories, so to understand the principles and theories first students must understand the concepts that compile these principles and theories, because that is very fatal if students do not understand mathematical concepts (understanding et al., 2020). Understanding mathematical concepts must be mastered first so that students understand the next concept and apply the concept to solve mathematical problems in the surrounding environment (Jeheman et al., 2019). The ability to understand concepts is a foundation in developing the ability of connections, communication, representation, arguments, problem solving, critical thinking and mathematical creative. (Humaira Syaifar et al., 2022).

Understanding the concept is very important in the learning process of mathematics. The function of understanding the concept itself plays an important role, especially in learning because understanding is a fundamental ability that students must have in learning further mathematical concepts (Aledya, 2019). The ability to understand mathematical concepts has an important purpose in learning mathematics, providing an understanding that the material taught is not just memorization, but more than that with understanding students can better understand the concept of subject matter.

One essential mathematical concept is statistics. Where statistical material is included in the category that is quite complex in mathematics, which is studied from elementary, junior high, high school level to university, a deep understanding and critical thinking is needed. This can be a challenge for junior high school students who are new to more complicated mathematical concepts. This in-depth understanding of this mathematical concept is important because it can help students in building a strong foundation for further mathematical material at the high school and university level. Understanding of mathematical concepts that are lacking at the junior high school level can have a negative impact on student academic achievements in the field of mathematics as a whole.

The low ability of understanding the mathematical concepts of students, can be caused by several factors, both the external factors of the teacher and the internal factors of students (Arief Al Hafizh and Ramadoni et al., 2023). External factors originating from outside students, such as learning methods or strategies. Meanwhile, internal factors originating from within students, such as emotions and ways of thinking. The effect of the ability to understand low mathematical concepts in students can include difficulties in understanding more complex mathematical material, difficulty in solving problems, and decreasing overall performance in mathematics. This can also have an impact on students' confidence and their motivation in learning mathematics. This way of thinking is influenced by gender. Gender is a term to explain the differences in men and women who have innate nature (God's creation) and cultural formation (social construction) including differences in solving problems (from et al., 2020). Judging from the thoughts of every man and woman indeed looks different and has different sex and sex hormones and hormones, and therefore there is an assumption that men and women are certainly different in the way they think, act and feel something. Male students are different from women in obtaining, understanding and mastering mathematical concepts in each school (Humaira Syaifar et al., 2022).

Some gender -related studies in giving influence to students in the ability to understand their mathematical concepts show various results. The results of the Khasanah et al., (2020) research using trigonometric material states that the ability to understand the mathematical concepts of students of male sex is superior compared to female students. This is in agreement with the results of Rahmat et al., (2020) that for the high motivation level of understanding of the concept of male and female students' concepts, whereas to be seen from the level of moderate and low motivation levels of understanding the concepts of male students are better than women In his research using the material system of the two Vaabel Equation (SPLDV). But different from the other side, for example in terms of thinking with Legowo's research (2020: 56) shows that in elementary school there is no different in the ability of mathematical creative thinking of female and male students. Based on the research above, with the difference in sex, it allows the ability to think mathematics between men and women is different. Stereotype circulating often interprets that in general women are superior in terms of remembering, while men are superior to thinking using logic. In general, male and female students are actually the same, but male students have a slightly better abstraction power than female students. This is in agreement with the statement of Purwanto et al., (2019) gives the possibility of male students superior to the field of mathematics, because in general mathematics is related to the abstract understanding.

In this study, the problem to be examined is the ability to understand the mathematical concepts of students who are considered in terms of gender differences in statistical material. The importance of statistical material to be examined, among others, we can see in terms of critical thinking skills where through learning statistics, students learn to think critically and make decisions based on data and evidence, not assumptions and opinions. While that statistics statistics are not only used in the academic context, but also in everyday life, such as understanding health statistics, surveys. Or social trends, this ability makes students better prepared to actively participate in the community. This is supported by a statement (Ahmad et al., (2017). In the field of statistical health it is used for various studies of medical, nursing, pharmacy and others known as biostatistics. In this research will show how aspects of understanding the mathematical concepts of students between Men and women can be achieved. Where physically male and female students have differences) which states that sex differences allows the psychological differences of student learning, where male and female students certainly have many different things to the learning process of mathematics. Physiological alone, reasons that may be more than just an interest and innate mathematical talent allow the ability to understand students.

2. RESEARCH METHOD

This type of research is descriptive research with a qualitative approach. This descriptive research itself aims to systematically describe the phenomenon in the field. The research is intended to describe the ability to understand students' mathematical concepts in terms of gender differences. Popoulation of this study is a student of Medan National Heroes Middle School. The subjects in this study were conducted in class IX in the odd semester of the 2024/2025 school year. The subjects who took the test were 24 students, who were subsidized by 12 female students and 12 male students

who had a variety of capable and had studied statistics material. Research data are collected through tests and interviews. The test instrument used is the concept of understanding capability test sheet consisting of three valid description essay questions. Each question contains an indicator of the ability to understand different mathematical concepts. From the results of the subjective tests carried out students will later be corrected based on the scoring rubric modified from Kasum (Kartika, 2018) to show the ability to understand mathematical concepts in the scoring statistical material 0 to 4 then compare the total score of students with the maximum score on each indicator to find out its level of ability.

3. RESULTS AND DISCUSSION

3.1 Results

Table 1. Descriptive Data on the Ability to Understand Mathematical Concepts of Male Students

Statistical Analysis	Total score	Scores/Indicators		
		1	2	3
Mean	58,3	3,25	2,333	1,417
Max value	100	4	4	4
Min value	33,3	0	0	0
Range	66,7	4	4	4
SD	23,038	1,422	1,826	1,782
Varian	530,758	2,023	3,333	3,174
Respond		12		

Based on the results of the analysis according to the data above, the researcher categorized the results of the study by level categorization (ordinal) with the formula:

Category:

Low : $X < M - 1\,SD$

Keep : $M - 1\,SD \leq X < M + 1\,SD$

Tall : $M + 1\,SD \leq$

Information:

$M = Mean$

$SD = Standard\ deviation\ or\ standard\ deviation$

The purpose of the level category is to place individuals into groups whose position is tiered according to a continuum based on measured characteristics (Azwar, 2014: 149), categorization is presented in the following table:

Table 2. Categorization of Understanding the Concept of Male Students

No	Indicators	Mean/indicator	Mean total score	Category	Frequency	Percentage
1	Restate the concepts learned	3,25	58,3	Tall	2	16,66 %
2	Using certain procedures or operations	2,33		Keep	7	58,33%
3	Apply concepts in meaningful problem-solving to what is learned	1,41		Low	3	25%

Based on **Table 2**, it can be seen that the level of mathematical concept comprehension ability of male students is centered on the medium category of 7 students, low 3 students and high 2 students.

Table 3. Descriptive Data The ability to understand the mathematical concepts of female students

Statistical Analysis	Total Score	Scores/indicators		
		1	2	3
Mean	72,183	2,5	3,167	3,083
Max value	100	4	4	4
Min value	41,6	1	2	2
Range	58,4	3	2	2
SD	17,184	0,905	0,937	0,900
Varian	295,287	0,818	0,879	0,811
Respond		12		

Tabel 4. Categorization of the ability to understand the concept of female students

No	Indicator	Mean/indicator	Mean total score	Category	Frequency	Percentage
1	Restate the concepts learned	2,5	72,183	Tall	1	8,33 %
2	Using certain procedures or operations	3,167		Keep	9	75%
3	Apply concepts in meaningful problem-solving to what is learned	3,083		Low	2	16,66%

Based on **Table 4**, it can be seen that the level of understanding of the mathematical concept of female students centered on the medium category amounted to 9 students, low 2 students and 1 student high. Based on tables 3 and 5 it can be seen that the level of understanding of mathematical concepts of students is centered on the medium category. Based on these values, group data diagrams can be formed as follows:

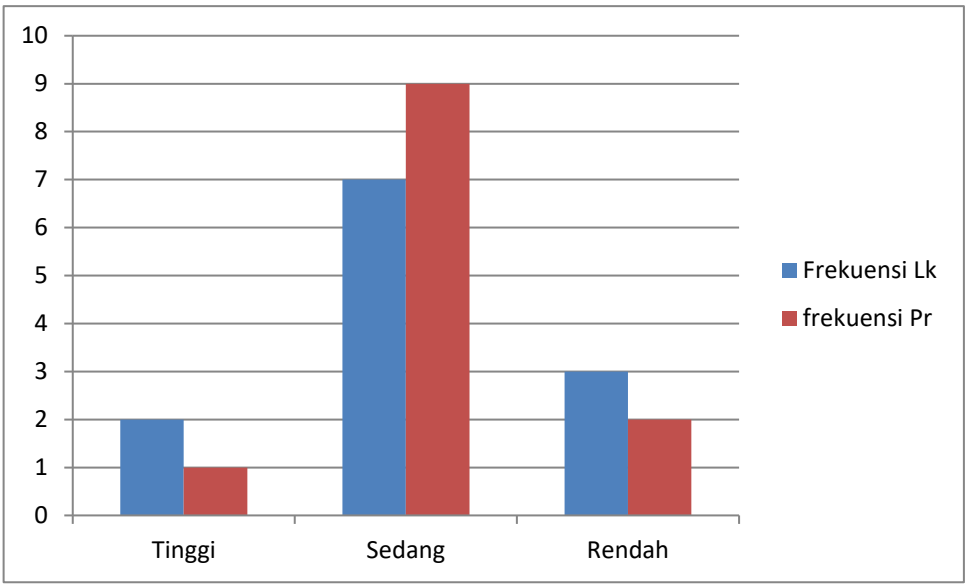

Figure 1. The stem diagram of the level of understanding of student mathematical concepts

The results of the study are presented on a bar chart consisting of high, medium, and low categories on each indicator of mathematical concept comprehension ability and the test results grouped by gender can be seen in figure 1. **Figure 1** shows that the high category level of male students is 2 while female students are 1 person, in the medium category there are 7 male students and 9 female students, then in the low category there are 3 male students and 2 female students.

3.2 Discussion

Based on the overall data analysis, it was obtained that the average level of mathematical concept comprehension ability of female students was greater than the level of mathematical concept comprehension of male students with an average score of female = 72.183, male average = 58.3 which was centered on the medium category. Where there are 2 male students in the high category with a percentage of 16.66%, in the medium category as many as 7 students with a percentage of 58.33%, and in the low category as many as 3 students with a percentage of 25%. Meanwhile, there were 1 female student in the high category with a percentage of 8.33%, in the medium category as many as 9 students with a percentage of 75%, and in the low category as many as 2 students with a percentage of 16.66%.

For the average indicator, the difference in the average number of scores between male students and female students was obtained in each indicator, where restating the concepts learned, male students were superior with an average score of 3.25 while female students with an average score of 2.5. This is because male students are more careful and creative in the process of working on questions than female students. In indicators using certain procedures or operations, female students are superior with an average score of 3.167 while male students with an average score of 2.33. This is because female students have more ideas and are meticulous but have not completely answered questions with systematic answers, but some men are also unable to master their understanding of concepts on indicators using certain procedures or operations. Meanwhile, in the indicator of applying concepts in meaningful problem-solving to the concepts learned, female students again excelled with an average score of 3.083 while male students with an average score of 1.41. Based on the results of the answers between male and female students, the more perfect and complete students are males, there are 2 male students and the high category compared to female students, there are 1 female students with high categories. The following is an explanation of each indicator of the ability to understand the concept of education in grade IX of SMP Pahlawan Nasional Medan.

3.2.1 Indicators to re-express the concepts learned

This indicator contained in question number 1 students are able to express the correct statement regarding the meaning of the mode and the results of the statement of who is correct in the question. Here is question number 1:

Salisah dan Riski sedang bermain permainan dadu, dengan pelemparan sebanyak 25 kali. Angka yang keluar datanya:
1, 2, 3, 4, 5, 5, 6, 2, 3, 4, 5, 6, 6, 4, 3, 2, 1, 4, 3, 5, 6, 6, 5, 4, 5. Riski menyatakan modus dari pelemparaan dadu adalah 4, sedaangkan salisah menyatakan modus dari pelemparan dadu terbeut adalah 5. Dari pernyataan Riski dan Salisah menurut kamu, manakah pernyataan yang benar berikan alasannya!

Figure 2. Question number 1

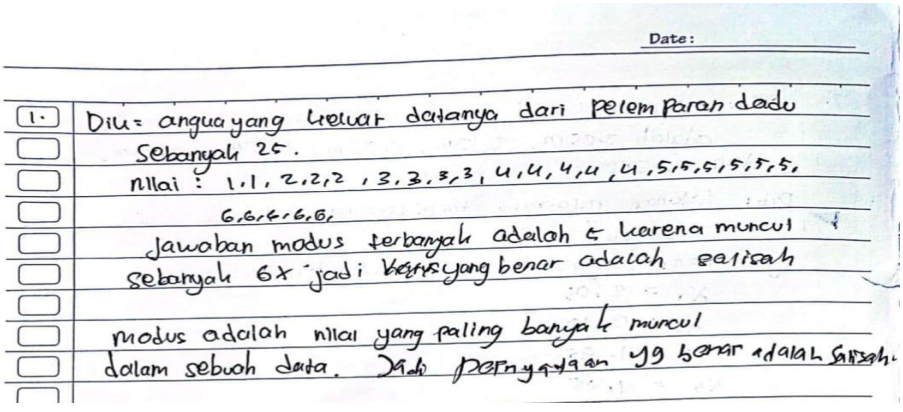

Figure 3. Male student answer

Figure 3 shows that male students can re-express the concepts that have been learned, namely male students can rewrite the understanding of the mode. Based on the results of tests and interviews of male students are very mastering in the first indicator where male students write the understanding of the mode, namely the mode is the value that most appears in a data. This is supported by the statement of Khasanah et al., (2020) that in the ability to understand the mathematical concepts of male students are superior to mastering more than female students

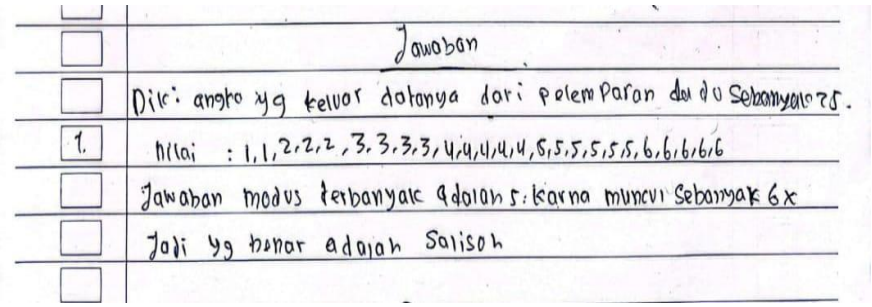

Figure 4. Female student answers

Figure 4 shows that female students can understand the first indicator of expressing the concepts that have been learned, but female students occur and lack of thorough so that they do not write down the understanding of what mode. This is supported by the statement of Davita et al., (2020) The ability to understand mathematical concepts between men and women has differences, the difference lies in how male students and female students in solving problems.

3.1.2 Indicators Using Certain Procedures or Operations

This indicator lies in question number 2, students are required to be able to use the average formula in statistics material.

Seorang atlet lompat tinggi ingin memasuki PON 2024 di kota Medan dengan syarat atlet tersebut lulus PON adalah rata-rata loncatan atlet tersebut ketika seleksi adalah 2 m. Jika seorang atlet ketika seleksi memiliki loncatannya 2,05 m, 2,10 m, 1,95 m, 1,85 m, 2,20 m, dan 2,15 m. maka dapatkah atlet tersebut mengikuti PON?

Figure 5. Question Number 2

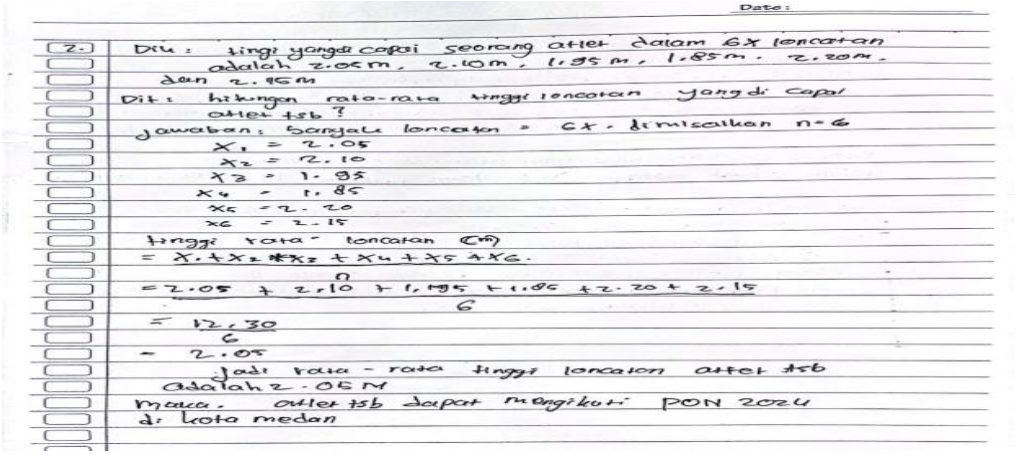

Figure 6. Male Student's Answer

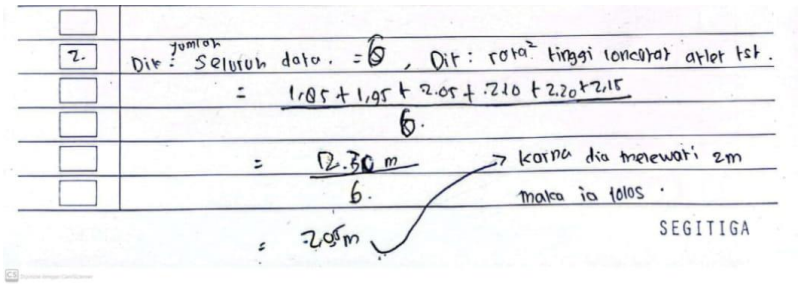

Figure 7. Female Student Answers

Figure 6 and Figure 7 show that between male students and male students better with the systematic processing while female students are more directly write the results this is in line with the results of interviews with female students that female students understand but only not systematic in the process between students Men with female students they both know what formula is used in determining the value or height of an athlete's average jump. This is not in line with the opinion of Utami et al., (2020) which in his research states that gender has no effect in the process of determining who has superior learning achievements between male students and female students.

3.1.3 Indicators Apply concepts in meaningful problem-solving to the concepts learned

This indicator is located in question number 3, here is question number 3.

Hasil panen kakek selama 5 bulan dalam ton adalah sebanyak 10,6,7,9,8. Dari hasil panen tersebut nenek menyatakan bahwa median dari data hasil panen adalah 9, setujukah kamu dengan pendapat nenek?

Figure 8. Question Number 3

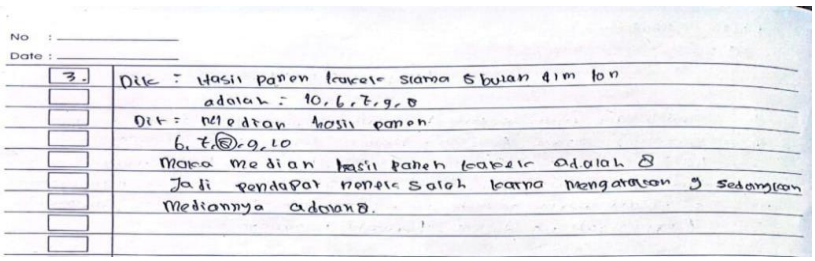

Figure 9. Male Student Answers

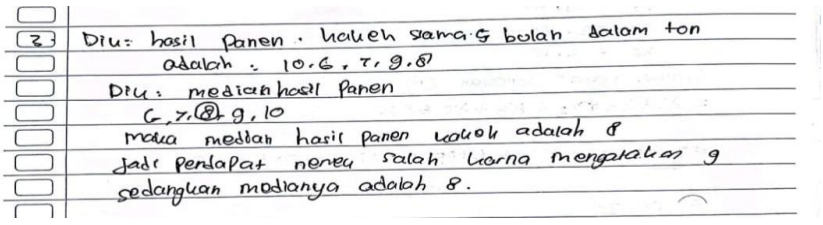

Figure 10. Answers of female students

Based on figures 9 and 10, male and female students have both understood and mastered the indicators of concept comprehension ability, namely applying concepts in meaningful problem solving to the concepts that have been studied. Based on the test and interview results, male and female students are able and master statistical material regarding the median or middle score. Some students admitted that actually these students already have a preference for learning about statistical materials.

4. CONCLUSION

Based on the results of the analysis of students' mathematical concept comprehension ability in grade IX of SMP Pahlawan Nasional Medan, which is reviewed from a gender perspective, the researcher can draw the following conclusions: The average overall test of mathematical concept comprehension ability of male students is 58.3, which is able to reach the high, medium, and low categories with a very good to sufficient interpretation range. Meanwhile, the overall average of the math concept comprehension ability test of female students was 72,183, which was also able to reach the high, medium, and low categories with a very good to sufficient interpretation range. Overall, male and female students in grade IX of SMP Pahlawan Nasional Medan have diverse mathematical concept comprehension skills, but in general, male students' abilities are lower than female students. However, in the high category, there were 2 male students and 1 female student who were included in the category.

RECOMMENDATION

Based on the results of this study, the suggestions that can be given are as follows: First, this research is only focused on mathematics subjects with sub-subjects of statistics, so it is recommended to conduct research on other mathematics subjects. Second, the variables in this study are only measured based on gender, therefore, researchers are expected to consider other variables in measuring students' ability to understand mathematical concepts. Third, other researchers can continue research that examines gender for other indicators of mathematical concept comprehension ability.

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