Students' Mathematical Reasoning Ability in the Use of RME Based on Gender and Student Motivation

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Abstract
The problems of students' low mathematical reasoning skills, gender differences, and the low motivation to learn mathematics it is indeed a problem that occurred at the school after the observation was condusted , so a relevant learning approach is required. Realistic Mathematics Education (RME) is learning that connects mathematics with students realistic problems. This study aims to find out the differences and influence of the intersection of the use of RME on the mathematical reasoning ability of students based on gender differences and motivation. The research design used is experimental research. Data collection for the research was done using test instruments and lifts. The results showed that there were differences in mathematical reasoning skills between learning approaches and gender but not with student motivation, and there was an influence of interaction between study approaches, student motivations, and genders on students' ability to mathematically reason. The results showed that Fo (ABC) = 4,611 > F_{table} = 4,040, or Ho is rejected, or there is an influence of the interaction factors learning approach, student learning motivation, and gender.
Keywords: Mathematical Reasoning Ability, Realistics Mathematics Education, Gender Difference, and Student Motivation

Introduction

The student situation in Indonesia is reversed to meet the demands of the 21st century. The mathematics competence of students in Indonesia is still very low, and the ability to solve mathematical problems occurs because students more often work on matters that only train memory (Abidin et al., 2020). According to Maskur et al. (2020) the cognitive aspect of students in Indonesia, such as the ability to use mathematical reasoning is still low, which is reflected in their ability to think critically when solving problems mathematically. Competencies that students must possess in the 21st century in mathematics include mathematical reasoning abilities, one of which is to solve mathematical problems in school learning.

The student's reasoning ability is also a starting point in solving mathematical problems, after which the student will have the ability to draw logical conclusions (Mendrofa, 2021). According to Marasabessy (2021) mathematical reasoning becomes the primary foundation for acquiring the concept of mathematical understanding because mathematical reasoning is a thought activity and a proven process of drawing conclusions.

Therefore, the student's ability to mathematically reason should be improved because there are benefits when the student can apply it well, so it is expected that the student can feel confident that math can be understood.In addressing the problem of students' low mathematical reasoning skills, teachers must be able to create effective learning that is student-centered. According to Chong et al. (2019) teachers should not only provide learning material but also make students the center of the entire learning process by teaching and providing understanding and mathematical skills. Thus, students can have the ability to regulate their own thinking. According to Asdarina & Ridha (2020) indicators of mathematical reasoning ability are: (1) submitting a presumption; (2) conducting a mathematical manipulation; (3) preparing evidence or giving a reason against the truth of the solution; and (4) drawing conclusions from the statement.

Another factor to consider in learning mathematics is gender. Gender is divided into two categories: male and female. According to Jia et al. (2020) mathematical achievement gender differentiation is still an interesting topic because there are differences that can be seen from contextual factors as a kind of mathematical problem (Hutchison et al., 2019). Therefore, men and women must have many differences in the study of mathematics that can affect their mathematical achievement. According to Farman et al. (2021) the forms of learning used by teachers still pay less attention to the differences between each student and the characteristics of each student. The differences in each student also include gender differences, but less attention is given to teachers. The gender difference in education can be seen in the influence of male and female students at the time of learning through the involvement of males and females in learning very differently (Aguillon et al., 2020). When you give mathematics to a few individuals, you get a different solution.

As explained earlier, a student's ability to reason mathematically can be influenced by gender differences. These differences in character are one of the factors that indicate students' habits and behaviors in understanding problems, as well as reasoning against certain concepts that will be used to solve problems that are faced (Negara, 2023). In conclusion, gender is one of the factors that influences students' ability to learn mathematics, especially their ability to reason mathematically.

According Halif et al. (2020) the participation rate of Asian students in the classroom is still low, so student involvement at the time of learning is still low. In mathematics, there are still a lot of students who do not have the motivation to learn math because they don't understand the mathematical lesson. Therefore, teachers always pay attention to the factors that cause learning difficulties experienced by students so that they can affect their motivation to learn. The consistent support and guidance given by the teacher is very important because it can increase confidence and improve the motivation of students during the teaching process (Chong et al., 2019). Based on this, the role of teachers in mathematics learning activities is very important because teachers must be able to increase confidence and create effective learning. A student with a high spirit must be motivated at the time of learning so that the student will get the maximum learning outcome and increase it to achieve the goal of learning.

According to Emanuel et al. (2021) difficulty learning mathematics is felt by students in the inability to understand the concepts and determine the solutions to the mathematical questions presented. Therefore, teachers need to create active class activities and teachers' skills to use the approach during classroom learning so that they can develop mathematical reasoning. The indicators of learning motivation, according to Nasrah (2020) include: (1) the desire to succeed; (2) the urge and need for learning; (3) the hope and aspirations for the future; (4) the appreciation of learning; (5) the appearance of interesting activities in learning; and (6) the presence of a conducive learning situation, thus enabling students to learn well.

The contextual principle emphasizes the ability of mathematics to relate mathematical concepts and understand concepts in a proper and logical way (Chong et al., 2019). So, one way is by providing relevant and realistic mathematical learning. Step: The learning step of RME, according to Nur & Lukman (2022) based on the characteristics of learning RME, is as follows: (1) In the first step, the teacher gives contextual problems; (2) In the second step, the teacher gives freedom to the student to solve a given problem; (3) In the third step, generating interaction; (4) In the fourth step, comparing and discussing answers (5) The fifth step is concluding. The measures of RME can indirectly train mathematical reasoning for solving contextual problems and create active classes.

According to Mendrofa (2021) the approach of RME is a mathematical learning approach with the priority of reality and environment as a first step in learning. According Palinussa et al. (2021) one of the recommended learning approaches is RME because it makes use of real-world situations for students to build students' understanding and knowledge. With the application of the RME, students are expected to be able to solve and imagine mathematics problems not far from everyday life, so that indirectly, the RME can have the ability to improve a student's mathematic reasoning.

Based on the above exposure, the researcher will investigate the ability of the student to reason mathematically using RME, gender, and motivation level in his mathematical learning. Therefore, the purpose of this study is to know the difference and the influence of the interaction of the use of RME on the student's ability to reason matematically based on gender differences and student motivation.

Method

This research is experimental. The research was carried out in the strange semester of the 2023/2024 academic year, with the research population being the ability of mathematical reasoning of students and the motivation of students to study mathematics in the eighth grade of secondary school State 2 Sindang, consisting of 10 classes. In this study, researchers took two groups: control and experimental classes. In the experimental class, the researchers used RME, while in the control class, they used conventional learning. This sampling method uses purposive sampling. The researcher uses the sample because the researcher needs the teachers' perceptions to help conduct the research that supports the research variables. Based on the recommendation from the teacher, the class that can represent the research population is class VIII B as the experimental class and VIII C as the control class. The study sample consisted of class VIII B of 30 pupils and class VIII C of 27 pupils. The total sample was 57 pupils, of which 30 were in the experimental class and 27 were in the control class.

The instruments used to collect data in research are test instruments and lifting instruments. The test is given to measure the student's level of mathematical reasoning ability. In addition, the elevator in this study is used to determine the students's motivational responses during the study. The test is given as a question in the form of an objective test or a description test (essay) consisting of 4 items of the subject which is compiled by presenting four indicators of questions in the mathematical reasoning ability test, namely submitting conjectures, carrying out mathematical manipulations, compiling evidence or providing reasons for the truth of the solution and interesting conclusions from the statement. and the student’s motivation there are 18 elements of the statement which is compiled by presenting six indicators, the existence of desire and wish to succeed, the existence of motivation and need in learning, the existence of hope and future ideals, the existence of appreciation in learning, the existence of interesting activities in learning, and the existence of a conducive learning situation.

Further, the researchers analyzed the study results to see the differences and the influence of the use of RME on the mathematical reasoning ability of students based on gender and motivational differences. In this study, the researchers carried out a number of analysis designs, namely a prerequisite test using the Kolmogorov-Smirnov normality test, which means testing the normality or non-normality of an instrument's data, and the Fisher/Hartley test (F test) to test the homogeneity of the data. After the prerequisite test, we continue with the ANOVA three-way.

Results and Discussion

The research was conducted to find out the differences and influences of the interaction of mathematical reasoning skills in the use of RME based on gender differentials and the level of motivation of students. The sample in this study is class VIII B as the experimental class and class VIII C as the control class of the second class of these 57 respondents. Before the study is carried out, the researchers perform a validity and rehabilitation test, an intrumen test, and a lift first, after which the data is declared valid and reliable. Subsequently, the researchers prepared the Learning Implementation Plan (RPP) that had been checked by the school's mathematics teacher using indicators and learning measures using RME. The research was conducted at two meetings in the experimental class and one meeting in the control class. In the experimental class, the first meeting uses RME with the equation of a straight line, and the learning steps using RME at the first session have not included data collection in the form of tests and lifts.

The learning process with the use of RME exposes students to many questions, discussions with friends in solving group matters, courageous answering and presenting in front-, and understanding-line equation materials. In the second meeting, using RMEs with equation matters straight lines, with learning steps that use RME, after doing so, the learning process involves students' mathematical reasoning capabilities and then distributed learning motivation instruments. In the control class, which is performed once, the meeting of students is a distributed instrument test for penal ability mathematics. Students are then a distributed instrument for motivational student learning. This is aimed at obtaining data on the students' penal ability mathematical motivation and student motivation angle.

This research is analyzed using a three-way ANOVA. Before doing this test, there is a prerequisite test to be done. The normality test aims to determine the normal diffusion of data. In this study, the results of the normality test using Kolmogorov-Smirnov showed a significant magnitude = 0,05 with $n_{experiment}$ = 30 and $n_{control}$ = 27. In the experimental class A_{1max} = 0,207 and in the control class A_{1max} = 0,205. Since $A_{1max} \leq D_{table}$ then Ho accepted. That means the sample comes from a normal-distributed population.

Once the data from the mathematical reasoning ability test is known, the control class and the experimental class are normally distributed, proceeding with the homogeneity test. Test homogenity using the Fisher-Hartley test (F test). As for the calculation results obtained, data showing significant gradients = 0,05 with $db_{experiment}$ n = n – 1 = 30 – 1 = 29 and $db_{control}$ n = n – 1 = 27 – 1 = 26, obtain F_{table} = 1,907 and $F_{calculation}$ = 1,626. Since $F_{calculation} \leq F_{table}$ Ho is accepted, and on the basis of the homogeneity test criteria, it can be concluded that the results of the test of the mathematical reasoning ability of students from both groups have a homogenous variance. Based on the calculation of the normality test and homogenity variance to the data of the student's mathematics reasoning skills test results, in the data test of the experimental class and control class, students have a normal distribution, and the two groups have homogenic variances.

Variance analysis, or abbreviated ANOVA three-way, can be used to test hypotheses that indicate the difference in the average variable criterion between groups of samples formed on the basis of three factors.

Table 1 ANOVA Three-Way Preparation

Statistics	A1B1C1	A1B1C2	A1B2C1	A1B2C2	A2B1C1	A2B1C2	A2B2C1	A2B2C2	SUM
N	9	7	5	9	9	10	3	5	57
$\sum Y_1$	97	73	46	88	50	164	62	120	700
$\sum Y_1^2$	1055	779	434	888	288	1626	522	1098	6690
$\bar{Y}$	10,778	10,429	9,200	9,778	5,556	9,100	5,333	6,400	67

Statistics	A1	A2	B1	B2	C1	C2
N	30	27	35	22	26	31
$\sum Y_1$	304	189	311	182	209	284
$\sum Y_1^2$	-	-	-	-	-	-
$\bar{Y}$	10,133	7,000	8,886	8,273	8,038	9,161

After creating the preparation table, proceed to the calculation using the ANOVA Three Paths. Based on the results of the calculations, we obtained the result of ANOVA three paths by using Excel calculations as follows.

Tabel 2. ANOVA Three-Way Analysis

Source Variance	JK	db	RJK	Fo	F_{table} α =0,05	η^2
Antar A	139,516	1	139,516	66,621	4,040	0,576
Antar B	5,076	1	5,076	2,424	4,040	0,015
Antar C	17,827	1	17,827	8,513	4,040	0,148
Int. AB	14,581	1	14,581	6,962	4,040	0,124
Int. AC	30,945	1	30,945	14,777	4,040	0,232
Int. BC	4,768	1	4,768	2,277	4,040	0,044
Int. ABC	9,656	1	9,656	4,611	4,040	0,086
Dalam	102,614	49	2,094	-	-	-
Total	324,982	56	-	-	-	-

Based on the results of the ANOVA three-way calculation above, the following results are obtained.

A. Main Effect

1) Learning Approach Factor Impact (A), that is RME Learning approach with conventional (A1 x A2)

   The result of the analysis obtained is Fo(A) = 66.62 > F_{table} = 4.040, or Ho is rejected. Thus, there is a difference in the mathematical reasoning ability of the students between the RME approach and the conventional. Therefore, such learning approaches have an influence on the ability to use mathematical reasoning. Lessons can explain a 57.60% variation in the scores of mathematical reasoning skills. The one-sided right-hand test for the difference between RME (A1) and conventional learning approaches (A2) was performed with the t-test using t_{table} of 1,670 as a comparator. Thus, t_0 = 30,769 > t_{table} = 1.670, or H0 was rejected.

2) Influence of Student Motivation Factor (B) Learning Motivation of Higher Students with Low Student Motivation (B1 x B2)

   The result of the analysis obtained is Fo(B) = 2,424 < F_{tabel} = 4,040, or Ho accepted. Thus, there is no difference in the ability of mathematical reasoning between students with higher motivation and students with low motivation.

3) The influence of the gender factor (C) is a male student with a female student (C1 x C2).

   The result of the analysis obtained is Fo(C) = 8,513 > F_{table} = 4.040, or Ho is rejected. Thus, there is a difference in the ability of students to use mathematical reasoning between male and female students. Gender explains a 14.80% variation in mathematical reasoning scores. The one-sided right-hand test for the difference between male and female students (C1) was performed with the test-t using t_{table} = 1,670 as comparison. So, t_0 = 10,972 > t_{table} = 1.670, or H0 was rejected. Thus, the mathematical reasoning ability of male students is higher than that of female students.

B. Interaction Effect

1) Learning Approach Interaction with Student Learning Motivation (AxB)

   Analysis results obtained Fo (AB) = 6,962 > F_{table} = 4,040 or Ho rejected. Thus, there is an influence on the interaction of the "A" approach and the "Motivation" approach. The interaction of learning approaches and student motivation can explain a 12.40% variation in the scores of mathematical reasoning skills.

2) The influence of the interaction of the learning approach with gender (AxC)

   The result of the analysis obtained was Fo (AC) = 14,777 > F_{table} = 4,040, or Ho was rejected. Thus, there is an influence on the interactions between the applicant (A) and gender approaches (C) on the ability to use mathematical reasoning. The interaction of learning approaches and gender can explain a 23.20% variation in the scores of mathematical reasoning skills.

3) Influence of Student Learning Motivation Interaction with Gender (BxC)

   Results of the analysis obtained: Fo (BC) = 2,277 < F_{tabel} = 4,040, or Ho accepted. Thus, there is no influence of student learning motivation interaction (B) or gender (C) on the ability to do mathematical reasoning.

4) The influence of the interactions of the learning approach on the learning motivation of students with gender (AxBxC)

   The result of the analysis obtained was Fo (ABC) = 4,611 > F_{table} = 4,040, or Ho was rejected. Thus, there is an influence of the interaction of the apprenticeship approach (A), student learning motivation, and gender (C) on the ability to do mathematical reasoning. The interaction of these three factors can explain 8.60% of the of the variation in the scores of mathematical reasoning.

C. Effect Size (η^2)

Effect size, as the results are summarized in the ANOVA three-way table and have been discussed in the main effect and interaction effect testing on the decoration process, is presented as follows.

Tabel 3. ANOVA Three-Way Effect Size

Effect Size	
Factor A	0,576
Factor B	0,015
Factor C	0,148
Interaction AB	0,124
Interaction AC	0,232
Interaction BC	0,044
Interaction ABC	0,086
(A, B, C, AB, AC, BC, ABC)	0,684

Effect Size (A, B, C, AB, AC, BC, ABC) means that learning approaches, student learning motivation, gender, learning approach interaction (student motivation learning approach), learning-gender approach interfacing, student-general motivation interaction, as well as the interaction-learning-motivation-student learning approach gender simultaneously, can explain a variation in matematical reasoning skill scores of 68%.

D. Simple Effect Testing

From the table obtained, Fo (ABC) = 4,611 > F_{table} = 4,040, or Ho is rejected, or there is an influence of the interaction factors Learning Approach (A), Student Learning Motivation (B), and Gender (C). The consequence of this significant interaction influence is the testing of simple effect hypotheses with test-t statistics, with t_{table} of 1,670.

1) Simple Effects of Learning Approaches (A)
   a) Differences between RME (A1) and conventional (A2) learning approaches on students' learning motivation (B1) Male students (C1)
   Results of analysis obtained: t_0 = 8,906 > t_{table} = 1,670 or Ho rejected. Thus, the mathematical reasoning ability of students using RME with high motivation for male gender is better than the conventional approach with high motivation for male gender.
   b) Difference between the Learning Approaches of RME (A1) and Conventional (A2) on the Learning Motivation of Higher Students (B1) Female Students (C2)

Results of analysis obtained: t_0 = 2,103 > t_{table} = 1,670 or Ho rejected. Thus, the mathematical reasoning ability of the students using RME with high motivation for female gender is better than the conventional approach with high motivation for female gender.

c) The difference between the learning approaches of the RME (A1) and conventional (A2) on the learning motivations of the students with low (B2) and male gender (C1) The analysis result obtained is t_0 = 4,458 > t_{table} = 1,670, or Ho rejected. Thus, the mathematical reasoning capacity of the learners using RMEs with low motivation in male genders is better compared to the conventional approach with low gender motivation.

d) Difference between RME (A1) and Conventional Learning Approaches (A2) on Low Students' Learning Motivation (B2) Female Students (C2)

Results of analysis obtained: t_0 = 5,135 > t_{table} = 1,670 or Ho rejected. Thus, the mathematical reasoning ability of students using RME with low motivation for female gender is better than the conventional approach with low motivation for feminine gender.

2) Simple Effects of Students' Learning Motivation (B)

a) Differences in Higher Students' (B1) and Low Students' Learning Motivations (B2) on the RME Learning Approach (A1) Male Students (C1)

Results of the analysis obtained: t_0 = 2,399 > t_{table} = 1,670, or Ho is rejected. Thus, the ability of mathematical reasoning of students with high motivation to use RME in the male gender is better than the ability to mathematically reason students with low motivation to use RME on men.

b) Difference in High School Students (B1) Learning Motivation and Low Student Motivation (B2) on the RME Learning Approach (A1) Female Student (C2) Results of the analysis obtained: t_0 = 1,016 < t_{table} = 1,670, or Ho accepted. Thus, the mathematical reasoning ability of high-motivated students using RME in the female gender is no better than the ability to mathematically reason with low-motivated students using RME in the feminine gender.

c) Difference in High School Students' Learning Motivation (B1) and Low Student Learning Motivations (B2) on Conventional Learning Approach (A2) Male Students (C1) Results of analysis obtained, t0 = 0.295 < ttable = 1.670 or H0 accepted. Thus, the mathematical reasoning ability of high-motivated pupils using conventional approaches to male gender is no better than that of low-motivated pupils using conventional gender approaches.

d) Difference in High Students Learning Motivation (B1) and Low Student Motivation (B2) on the Conventional Learning Approach (A2) Female Student (C2) Results of the analysis obtained: t_0 = 4,220 > t_{table} = 1,670, or Ho is rejected. Thus, the mathematical reasoning ability of high-motivated pupils using conventional approaches to female gender is better than that of low-motivated pupils using conventional gender approaches.

3) Simple Effects of Gender (C)

a) Differences between male students (C1) and female students (C2) on the learning approach of RME (A1) Higher learning motivation (B1)

Results of the analysis obtained: t_0 = 0,570 < t_{table} = 1,670, or Ho accepted. Thus, the mathematical reasoning ability of students of the male gender using RMEs with high motivation is not better than that of participants of the female gender using RMEs with higher motivation.

b) The difference between males (C 1) and females (C2) on the learning approaches of RMEs (A 1) Low motivation for learning (B2)

The analysis results are obtaining t_0 = -0,794 < t_{table} = 1,670, or Ho accepted. Therefore, the mathematical reasoning capacity of students of the male gender with low motivation who use RMEs is no better than the penal mathematics ability of teaching participants of the female gender using gender-motivated RMEs.

c) Difference between male and female students (C1) in conventional learning approaches (A2) Higher learning motivation (B1)

Results of analysis obtained, t_0 = -6,145 < t_{table} = 1,670 or Ho accepted. Thus, the mathematical reasoning ability of the pupils of the male gender using conventional approaches with low motivation is no greater than that of the that of the female gender using conventional methods with high motivation.

d) Difference between male and female students (C1) in conventional learning approaches (A2) Low learning motivation (B2)

Results of analysis obtained, t_0 = -1,126 < t_{table} = 1,670 or Ho rejected. Thus, the mathematical reasoning ability of the pupils in the male gender using a conventional approach with low motivation is no better than the ability to reason mathematically in the female gender.

4) Summary of Simple Effect

Test Results The results of further test analysis with Dunnett test-t statistics are presented as follows.

Tabel 4. ANOVA Three-Way Advanced Test Analysis Results

Contrast Value	t_0	t_{table}
$\bar{Y}_{111} - \bar{Y}_{211}$	8,906	1,670
$\bar{Y}_{112} - \bar{Y}_{212}$	2,103	1,670
$\bar{Y}_{121} - \bar{Y}_{221}$	4,458	1,670
$\bar{Y}_{122} - \bar{Y}_{222}$	5,135	1,670
$\bar{Y}_{111} - \bar{Y}_{121}$	2,339	1,670
$\bar{Y}_{112} - \bar{Y}_{122}$	1,016	1,670
$\bar{Y}_{211} - \bar{Y}_{221}$	0,295	1,670
$\bar{Y}_{212} - \bar{Y}_{222}$	4,220	1,670
$\bar{Y}_{111} - \bar{Y}_{112}$	0,570	1,670
$\bar{Y}_{121} - \bar{Y}_{122}$	-0,794	1,670
$\bar{Y}_{211} - \bar{Y}_{212}$	-6,145	1,670
$\bar{Y}_{221} - \bar{Y}_{222}$	-1,126	1,670

Based on the calculation of the normality and homogeneity variance test data based on the results of the student's mathematical reasoning skills test, in the experimental class, students' mathematics reasoning test data and the control class are normally distributed, and both groups have homogenous variance. This research can be continued using ANOVA Three Paths with calculations using Excel. By answering the problem, the formula can be explained as follows.

1) Difference in student mathematical reasoning ability based on learning approach

Data analysis in this study using Excel showed that the ANOVA triangular test obtained Fo(A) = 66,621 > F_{table} = 4.040, or Ho rejected. Thus, there is a difference in the mathematical reasoning ability of the students between the RME approach and the conventional. Therefore, such learning approaches have an influence on the ability to use mathematical reasoning. Lessons can explain a 57.60% variation in the scores of mathematical reasoning skills. The one-sided right-hand test for the difference between RME (A1) and conventional learning approaches (A2) was performed with the t-test using t_{table} of 1,670 as a comparison. So, t_0 = 30,769 > t_{table} = 1,670, or Ho is rejected. Thus, the mathematical reasoning ability of the students given the RME approach is higher than that given the conventional approach.

2) Difference in students's ability to reason mathematically based on student motivation

The analysis of the data in this study using Excel showed that the ANOVA three-way test obtained Fo(B) = 2,424 < F_{table} = 4.040, or Ho accepted. Thus, there was no difference in the ability to reason mathematically between students with higher learning motivation and students with low learning motivation. Therefore, there is no influence on the motivation of students to learn.

3) Differences in students' ability to reason mathematically based on gender

The analysis of the data in this study using Excel showed that the ANOVA three-way test obtained Fo(C) = 8,513 > F_{table} = 4.040 or Ho rejected. Thus, there is a difference in the mathematical reasoning ability of the students between male students and female students. There is therefore a gender influence on the ability to mathematically reason. Gender explains a 14.80% variation in mathematical reasoning scores. The one-sided right-hand test for the difference between male and female students (C1) was performed with the test t_{table} = 1,670 as a comparison. So, t_0 = 10,972 > t_{table} = 1.670, or Ho was rejected. Thus, the mathematical reasoning ability of male students is higher than that of female students.

4) Impact of interaction between learning approaches and student motivation on student mathematical reasoning ability

Data analysis in this study using Excel showed that ANOVA Triple Way Testing acquired Fo (AB) = 6,962 > F_{table} = 4,040 or Ho rejected. Thus, there is an influence of the interaction of students' approaches (A) and learning motivation (B) on the ability to mathematically reason. The interaction of learning approaches and student motivation explains a 12.40% variation in the scores of mathematical reasoning skills.

5) The influence of interactions between learning approaches and gender on students' mathematical reasoning abilities

Data analysis in this study using Excel showed that the ANOVA Triple Way test obtained Fo (AC) = 14,777 > F_{table} = 4.040 or Ho rejected. Thus, there is an influence of the interactions of the (A) and (C) gender approaches on the ability of mathematical reasoning.

6) The influence of the interaction between student motivation and gender on students' ability to reason mathematically

Data analysis in this study using Excel showed that an ANOVA triangular test obtained Fo (BC) = 2,277 < F_{table} = 4,040, or Ho received. Thus, there is no influence on the interaction of student learning motivation (B) and gender (C) on the ability to do mathematical reasoning.

7) The influence of interactions between learning approaches, student motivation, and gender on students' mathematical reasoning abilities

Data analysis in this study using Excel showed that the ANOVA Triple Way test acquired Fo (ABC) = 4,611 > F_{table} = 4,040 or Ho rejected. Thus, there is an influence of the interaction of the apprenticeship approach (A), student learning motivation, and gender (C) on the ability to do mathematical reasoning. The interaction of these three factors can explain 8.60% of the of the variation in the scores of mathematical reasoning.

Mathematical reasoning is the ability of the student to understand, formulate, and solve mathematical problems, thereby enhancing critical thinking so that it can solve problems related to mathematics, especially in the matter of straight line equations. The ability of students to reason mathematically based on gender differences is also influenced by psychological and emotional factors. In addition to the ability to use mathematical reasoning, the motivation of students to learn mathematics is an important factor in math that can affect their creativity and academic performance. It is not only important to encourage students to learn but also to achieve the goal of learning math. Therefore, one of the relevant learning approaches is RME. Learning activities using RME involve learning mathematics not far from everyday life, so that students can imagine the problems in daily life related to mathematical sciences.

RME represents an effective approach to math learning activities because students can have the ability to reason mathematically and have the motivation to learn math. This RME plays a great role in finding solutions to the matter of equations of straight lines because, in learning given the problems of daily life, students can also discuss them with their friends. There are also differences in the mathematical reasoning abilities of male and female students. However, the motivation of students in mathematical learning has no influence on the students' ability to reason mathematically because students who have low motivation obtain a high degree of reasoning ability. Therefore, there is an influence of interaction between learning approaches, student motivation, and gender on students' ability to reason mathematically.

The variable mathematical reasoning ability of students and RME, in line with the relevant research results carried out by Zubaidah Amir et al. (2021) demonstrated that there is a difference in the ability to reason mathematically between students taught using the RME approach and those taught with hands-on learning. The variables mathematic reasoning skills of pupils and RMEs, in accordance with the results of relevant research conducted by Palinussa et al. (2021) prove that the approach of RME has a significant influence on the ability of mathematics reasoning. Thus, RME can be recommended for improving the students's mathematical reasoning.

The variable mathematical reasoning ability of students and RME, in line with the results of the relevant research carried out by Siregar et al. (2022) is that in the group of students whose learning uses realistic mathematics education, the average student score increased by 41.1%, whereas the increase in average student value of the group whose study is conventional was only 17.3%. That means the group's achievement in terms of the number of students studying with a realistic mathematical education increased significantly when compared to a group of conventional students.

The variable mathematical reasoning ability of students and RME in line with the results of the relevant research conducted by Purnamatati et al. (2023) showed that (1) There was a difference in the improvement of the mathematic reasoning skills of students after given the RME approach shown with a N-gain value of 55.5 on the medium of the category and for the experimental class 36.8 on the lower category then the control class in the test t (independent) so obtained Sig value. 0,001<0,005, but to be determined in the independent test of the sample t-test. It was concluded that there was a significant difference between the average score of the mathematical reasoning ability of the students treated with the RME approach and the Conventional approach. (2) There is an influence of the RME approach on the mathematical reasoning ability of students with an effect size score of 1.44 which belongs to the high category.

Students' motivation variables and RME are not consistent with the relevant research results carried out by Lestari et al. (2019) showing that students' learning motivation is significantly increased. Results of research hypothesis using comparative t test $t_{calculutio}$n (6,997) > t_{table} (2,039). The gender and RME variables are not consistent with the relevant research results conducted by Trisnawati et al. (2023) : (a) the mathematical communication ability of male and female students between those taking mathematics learning with the PMRI approach does not differ from the students who follow conventional learning; and (b) there is no interaction between learning approaches, and gender differences enhance the ability to communicate mathematically.

Conclusion and Suggestion

Based on the results of the research and analysis of the data obtained, the conclusion is that there is a difference in the ability of the student to reason mathematically based on the learning approach, there is no difference in student's mathematical reasoning ability based on student motivation, there are differences in student mathematics reasoning skills based on gender, the interaction between learning approaches and motivation of students on students' mathematic reasoning capabilities is influenced by the influence of the interactions between the learning and gender approaches on the ability to reason the students, no influence between the students' motivation and the gender interaction on the students'mathematical motivation capability, there's an influence on the interaction approaches between students' learning, the motivations of the students and genders on the student' s mathematological reasoning ability.

On the basis of the above conclusion, then the researcher can provide some suggestions that can be expected to be beneficial. According to the following suggestions submitted, as for other researchers, it is expected to follow up on the findings of these researchers with different subjects and levels of education to develop this research, and it is also expected for further research to improve further the motivation to learn the student, because at the time the student has not been in the process of learning the ability for the students to do well in math and also specifically the subject of mathematics during lessons using Realistic Mathematics Education (RME) as an alternative in the learning process. By using Realistic Mathematics Education (RME), the learning process presents problems related to everyday life, thereby improving students' mathematical reasoning abilities. Therefore, the importance of implementing Realistic Mathematics Education (RME) on students' mathematical reasoning abilities based on gender and students' motivation in learning the topic of linear equations.

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