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Analysis of High School Students' Mathematical Problem-Solving Ability Based on Mathematics Anxiety and Gender

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Abstract

The purpose of this study was to analyze the mathematical problem-solving abilities (KPMM) of high school students based on math anxiety and gender. The methodology use in this study is qualitative, specifically using a case study approach. The study utilized students from SMA Negeri 31 Tangerang Regency, who were in the 11th grade and studying arithmetic sequences and series. The research subjects were six people, two from each category of math anxiety, chosen through purposive sampling using Winstep and based on an analysis of the person map table. The instruments used were a six-item math problem-solving ability test and a 27-item math anxiety questionnaire that had been validated by expert lecturers and mathematics teachers and was therefore feasible to use. Reduction, categorization, synthesis, and a conclusion were all used to analyze the data in this study. Based to the study's results, gender did not have a significant impact on students' mathematical problem-solving abilities. However, what distinguished them was the category of math anxiety. Male and female students with high levels of anxiety in maths were only able to fulfil one KPMM indicators, but those with moderate and low levels of anxiety were able to fulfil three.

Keywords: Problem-Solving Ability, Math Anxiety, gender

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INTRODUCTION

Mathematics makes an important contribution to human life, so it must be studied at all levels of schooling, from elementary to high school (Sumartini, 2016). In addition to possessing numeracy skills, students should also have logical and critical problem-solving abilities when solving problems in the form of routine queries and in the real world (Kusumawardani et al., 2018). Problem solving is the activity of working on word problems, questions that require further thought in the process, implementing mathematics in everyday life, and creating or checking conjectures (Fitria et al., 2018; R. Hidayat & Evendi, 2022).

Mastering problem-solving skills is a crucial ability that students must acquire (Hidayatulloh et al., 2020; Mulyati, 2016). Article 1 of RI Minister of Education and Culture No. 21 of 2016 regarding national education standards states that problem-solving ability is one of the goals of mathematics education that students must attain (Mendikbud, 2016). By trying to solve problems, students will develop a way of thinking, begin to be persistent in learning, and increase their curiosity and confidence both in and outside the mathematics class (Laila et al., 2023). In addition, when students are able to solve problems, they will learn how to implement what they have learned in everyday life (Elita et al., 2019). According to (Sriwahyuni & Maryati, 2022), the crucial importance of problem-solving abilities is to offer students with the convenience and fluency build a concept and make mathematical assumptions, as well as to have a good understanding of the problem.

Weak abilities for problem-solving are not exempt from mathematics learning activities. Research conducted by (Komarudin, 2017) explains that weak math problem-solving abilities are caused by students having difficulty understanding the problem, choosing a solution step, and re-checking the results of their work. This is also present since students often memorize math concepts, which impacts to their ability to solve problems (Sriwahyuni & Maryati, 2022). Furthermore, in accordance with (Amam, 2017), a learning method that motivates students to attempt problem-solving is still inadequate. It indicates that improving students mathematics skills is crucial specifically their ability to solve problems (R. W. Utami & Wutsqa, 2017).

A feeling of anxiety that students experience when learning mathematics is the cause of their inability to solve math problems (W. Hidayat & Ayudia, 2019). According to (Saputra, 2014), math anxiety refers to a person's emotional expression of fear, tension, or anxiety when confronted with math problems or taking math lessons, expressed in a variety of ways. Excessive math anxiety could impact learning in the classroom (Hakim & Adirakasiwi, 2021). Research conducted by (Setiawan et al., 2021) indicated that problem-solving abilities are connected with math anxiety; it is suspected that anxiety results from students' inability to understand concepts from the provided material. According to (F. Rizki et al., 2019) research, there is a reverse correlation between students' math anxiety and ability to solve problems.

Regarding the ability to solve problems, it is undeniable that pupils possess a wide range of problem-solving abilities; Gender-based differences were the most frequently observed different types (Etmy & Negara, 2017). Men and women will have different psychological and physiological approaches to learning based on gender differences; these differences can be seen in the manner that they acquire mathematical abilities (Iswanto et al., 2022). As shown in studies by (Annisa et al., 2021), female students better than male students regarding of problem-solving abilities. This is demonstrated by comparison the average rate of male and female participants with correct answers. Also, according to study done by (Lestari et al., 2021), male students are better at solving problems than female students; this is because of male students are normally better at solving problems and writing down exactly what is known and asked in the questions.

Based on early observation at SMAN 31 Tangerang regency, some students encounter difficulties when learning mathematics. These difficulties consist of fear, difficulty with concentration, unwillingness to learn, and unknowns when solving problems. According to (A. H. Utami & Warmi, 2019) research, these are symptoms of anxiety experienced by students learning mathematics. The teacher additionally said that students' problem-solving abilities vary, with high-learners being able to solve questions but sometimes being careless and forgetting to write conclusions at the end, while low-learners have difficulty with the teacher's questions. In agreement with (Nur Azizah & Haerudin, 2021), students' incompetence during lessons makes it hard for them to understand and solve math problems, resulting in low math learning results.

According to research conducted by (Hella Jusra, 2020), students with low math anxiety tend to have excellent problem-solving abilities, and vice versa. This is supported by research published by (F. Rizki et al., 2019) that demonstrates a significant correlation between math anxiety and problem-solving abilities. There is a negative sign in the study's findings indicating that if problem-solving ability is low, the anxiety level is in the high category. Also, (Tomigolung & F Tauran, 2021) research found that male students had higher anxiety than female students, and (Anggraeni & Herdiman, 2018) found that female students have better problem-solving skills.

The indicators used for the problem-solving ability variable were adapted from (Purnamasari & Setiawan, 2019) and consisted of: (1) Finding problems, interpreting problems correctly, stating what is known and being asked; (2) Planning problem-solving strategies and defining appropriate models or formulas; (3) Making problem solutions according to plans, performing calculations using appropriate methods; and (4) Draw inferences and examine the computations based on the results. And the indicators used for the math anxiety variable are adapted from (Istiqomah & Miatun, 2022), whose indicators are derived from (Mahmood & Khatoon, 2011) and (Santoso, 2021). These four indicators are: (1) avoiding of math class; (2) Physical discomfort; (3) Struggles with learning mathematics; and (4) Inability to solve math problems.

Given the importance of mathematical problem-solving abilities, there is a need for research on the analysis of high school students' mathematical problem-solving abilities based on mathematics anxiety and gender. The difference between this study and previous studies conducted by (Safitri et al., 2022) and (Pattisina & Sopiany, 2021), which both discussed the ability of mathematical problem-solving students, is that it was determined from the math anxiety obtained results that mathematics anxieties had a negative impact on the student's ability to solve problems. According to the previous presentation, there has been no research on problem-solving abilities as they relate to mathematics anxiety and gender. Therefore, the novelty of this study resides in the addition of gender variables and the conditions of students who transition from limited face-to-face learning to full asynchronous learning. The goal of this study is to raise awareness among educators and students regarding the significance of problem-solving abilities. It aims to motivate students to enhance their mathematical problem-solving abilities, which can help them reduce their anxiety about learning mathematics.

METHOD

This study employs a qualitative case study approach to reveal data collected in the field by analyzing students' problem-solving abilities in relation to math anxiety and gender. The study was conducted at State High School 31 in the Tangerang district on March 7, 2023, with a total of seventy class XI MIPA candidates. Using the Google Form link, a math anxiety survey was sent to these students with a goal to obtain research participants. This study's subjects were recruited using a technique of purposive sampling with the use of the Winstep application, which was derived from an analysis of the person map table using the Rasch model. Winstep converts Excel raw scores into odd logit or log unit data. Winstep was able to categorize students into one of three math anxiety categories after analyzing the data (Nurjanah & Alyani, 2021). The research subjects were selected from a selection of a total of six students, with one female and one male student in each anxiety category (severe, medium, and low).

Math anxiety, math problem-solving ability tests (TKPMM), and interview guidelines were the instruments that were utilized for this study. Experts have validated the instrument, so it is suitable for use. The validity and reliability of the problem-solving ability instrument and the math anxiety questionnaire were tested using SPSS software. A problem-solving instrument with a total of 6 points had a count r value greater than the table r (0,329), and a Cronbach's alpha value more than 0.804 showing that the instrument was valid and reliable. Because the r count exceeds the r table value (0.325) and the Cronbach's alpha value is 0.90, which is greater than 0.7, 27 statement items from the math anxiety questionnaire can be considered valid and reliable. The instrument for the math anxiety questionnaire was adapted from (Istiqomah & Miatun, 2022), whose indicators were derived from (Mahmood & Khatoon, 2011) and (Santoso, 2021). The questionnaire contains 27 questions, which are divided into four indicators: (1) avoiding of math class; (2) Physical discomfort; (3) Struggles with learning mathematics; and (4) Inability to solve math problems. The responses are scored using a five-point Likert scale: strongly agree (SS), agree (S), neutral (N), disagree (TS), and strongly disagree (STS).

The TKPMM instrument is a six-question description test on Arithmetic Rows and Series material adopted from (Purnamasari & Setiawan, 2019) consisted of: (1) Finding problems, interpreting problems correctly, stating what is known and being asked; (2) Planning problem-solving strategies and defining appropriate models or formulas; (3) Making problem solutions according to plans, performing calculations using appropriate methods; and (4) Draw inferences and examine the computations based on the results.

Students chosen as research subjects will endure a TKPMM on the Material of arithmetic sequences and series to assess their problem-solving ability. In addition, interviews were conducted to obtain more specific information regarding answers to the problem-solving test administered to students. Semi-structured interviews are used to make sure the interview guidelines are followed, but they can also be adapted to the situation so that the researcher can ask questions that aren't in the interview guidelines (Suci & Miatun, 2022). Technical triangulation was utilized to corroborate data and review answers through interviews.

The data analysis technique used uses fixed comparison data analysis techniques, according to Moleong (2000), consisting of data reduction, categorization, and synthesis, as well as developing working hypotheses and conclusions. Observation, mathematics anxiety questionnaires, test descriptions of problem-solving abilities, interviews, and documentation were used to reduce data. The categorization and synthesis of data is accomplished by presenting data on problem-solving abilities based on math anxiety and gender in narrative form, as determined by the results of the analysis. Data processing resulted in working hypotheses and conclusions based on students' math anxiety levels and gender.

The problem-solving aptitude test is calculated by combining the results of student work on each indicator, then calculating the percentage of student test results by dividing the student's score by the maximum score and multiplying by 100 percent (Apriyani & Imami, 2022). The obtained scores for each indicator are then categorized according to Table 1.

Table 1. Categories of Problem-Solving Ability

Value	Category	Code
85,00 – 100	Very Good	SB
70,00 – 84,99	Good	B
55,00 – 69,99	Average	C
40,00 – 54,99	Deficient	K
0 – 39,99	Very Deficient	SK

Source: (Apriyani & Imami, 2022)

RESULTS AND DISCUSSION

Math Anxiety

The categorization of math anxiety was determined using the Winstep application to analyze the research results. The data is processed based on the Rasch model's analysis of the person map table. The following information is derived from Winstep results.

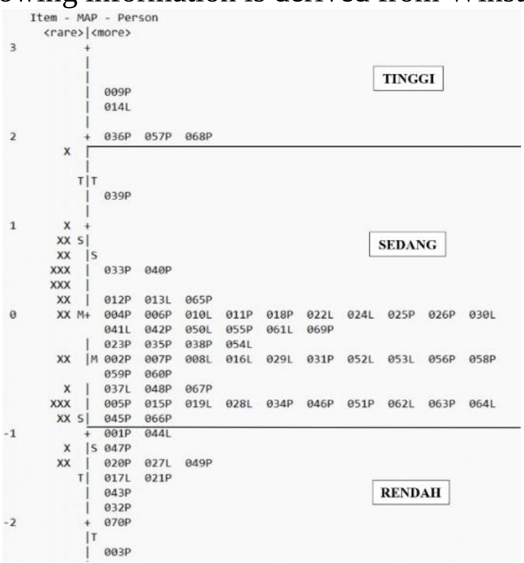


Figure 1. Math Anxiety Person Map

Based on Figure 1, the results of the data processing of the mathematics anxiety questionnaire for the person section showed that there were 5 students in the category of high math anxiety, 53 students in the category of moderate anxiety, and 12 students in the category of low anxiety. Next, a pair of students, one male and one female, were chosen to serve as representatives for each category of math anxiety. Six students were chosen as research subjects based on the results of data processing, consideration of subject teachers, and student learning outcomes in class, as shown in Table 2.

Table 2. Research Subjects

Students	Categories	Measure
009P	High	2,52
014L	High	2,27
053L	Moderate	-0,34
059P	Moderate	-0,34
017L	Low	-1,48
043P	Low	-1,72

The math anxiety questionnaire scores of 70 students were used to collect data on math anxiety. Based on the results of previous data processing, math anxiety is categorized into three categories: high, moderate, and low math anxiety. The results obtained from the student math anxiety questionnaire have been provided in Table 3.

Table 3. Categories of Math Anxiety

Categories of Math Anxiety	Total of students	Percented
High	5	7%
Moderate	53	76%
Low	12	17%

Based on Table 3, the analysis of mathematical anxiety levels scores yielded the following results for 70 students: 5 students with high categories (or 7%), 53 students with moderate categories (or 76%), and 12 students with low categories (or 16%). The category of moderate anxiety is the most common when compared to other anxiety categories. According to (Ikhsan, 2019; Juliyanti & Pujiastuti, 2020; Suci & Miatun, 2022), moderate anxiety is the most common anxiety category.

Each student's conversations will be transcribed and analyzed to determine the problem-solving abilities of the students. In order to facilitate the writing of interview results, coding is required; the code for researchers is PNLT, and the code for research subjects is presented in Table 4.

Table 4. Code of Subject Research

Initials	Code	Explanation
FBS	SKTL	Subjects with high mathematical anxiety men
CDL	SKTP	Subjects with high mathematical anxiety female
MH	SKSL	Subjects with moderate mathematical anxiety men
OTA	SKSP	Subjects with moderate mathematical anxiety female
HD	SKRL	Subjects with low mathematical anxiety men
BRS	SKRP	Subjects with low mathematical anxiety female

Problem Solving-Ability

On the basis of the results of the work on the description of students' understanding of the material Arithmetic Rows and Series, data on problem-solving ability was obtained. Analysis of each indicator presented in Table 5.

Table 5. Problem-Solving Ability Test Results

Indicators	ST		SS		SR		Average	
	L	P	L	P	L	P	L	P
Finding problems, interpreting problems correctly, stating what is known and being asked	75 (B)	62.5 (C)	91.6 (SB)	95.8 (SB)	87.5 (SB)	95,8 (SB)	84,7 (B)	84,7 (B)
	68.7 (C)		93.7 (SB)		91.6 (SB)		84.7 (B)	
Planning problem-solving strategies and defining appropriate models or formulas.	54.1 (K)	50.3 (K)	83.3 (B)	83.3 (B)	83,3 (B)	91,6 (SB)	73,5 (B)	75,1 (B)
	54.3 (K)		83.3 (B)		91.6 (SB)		76.3 (B)	
Making problem solutions according to plans, performing calculations using appropriate methods.	54.1 (K)	41.6 (K)	91.6 (SB)	83.3 (B)	100 (SB)	100 (SB)	81,9 (B)	74,9 (B)
	47.8 (K)		87.4 (SB)		100 (SB)		78.4 (B)	
Draw inferences and examine the computations based on the results	16.6 (SK)	4.1 (SK)	8.3 (SK)	25 (SK)	0 (SK)	50 (K)	8,3 (SK)	26,4 (SK)
	10.4 (SK)		16.6 (SK)		25 (SK)		17.35 (SK)	

According to Table 5, each indicator is analysed based on math anxiety and gender. Each indicator's first line shows the percentage of students based on gender disparities at each level of math anxiety, followed by the average percentage of male and female students based on the overall degree of math anxiety. The next section of each indicator depicts the average percentage results for each level of math anxiety, as well as the overall average for each TKPMM indicator. The first line of the TKPMM's initial indicator shows students with high anxiety; males and female get percentages of 75 and 62.5 in the good and sufficient categories, respectively. For male and female students, the average percentage of the first indicator is 84.7, which falls into the good category. In the second row, each level obtains a percentage of 68.7, 93.7, and 91.6 for moderate, very good, and very good, respectively. Therefore, it can be concluded that, for the first indicator, 84.7 percent of subjects were classified as good. The results stated in Table 5 are consistent with the findings of (Purnamasari & Setiawan, 2019), who found that students have the highest average percentage in the first indicator. In addition, research by (Apriadi et al., 2021) indicates that almost all students do not reach the last indicator because they are not accustomed to reviewing their answers.

The analysis of the six subjects shows disparate results. It will be displayed in question 2 of the problem-solving ability description examination, along with the following questions: A company produces 4,000 units of products in the first month and 300 additional units per month thereafter. Determine the quantity of products manufactured during a semester. Students are required to solve contextual arithmetic problems in this question. The results of the mathematics problem-solving aptitude test (TKPMM) for male and female subjects in the high, medium, and low anxiety categories are shown in the figure, and the results of the interviews are presented in the table below.

Subjects with High Math Anxiety

Figures 2 and 3 show the TKPMM results of male and female high math anxiety students.

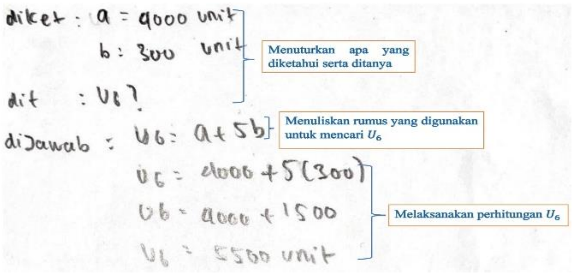


Figure 2. Results of TKPMM - SKTL

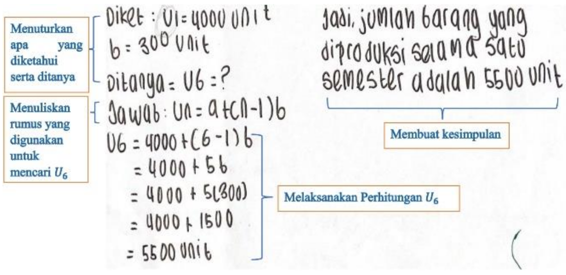


Figure 3. Results of TKPMM - SKTP

The following table 6 provides a summary of the interviews conducted based on the SKTL and SKTP answers:

Table 6. Problem-Solving Ability Test Interview Results on SKTL and SKTP

SKTL		SKTP	
PNLT	Do you understand question number 2?	PNLT	Do you understand question number 2?
SKTL	a little bit	SKTP	A little bit
PNLT	Are there arithmetic or geometry problems in it? Why?	PNLT	Are there arithmetic or geometry problems in it? Why?
SKTL	If I'm not wrong, number 2 is an arithmetic problem. Why I still don't understand	SKTP	Arithmetic problems, because the difference is still 300 units every month.
PNLT	Is there something you forgot to include in known and asked?	PNLT	Is there something you forgot to include in known and asked?
SKTL	Does not seem	SKTP	Hmm, it looks like I forgot to put "number of items (n)" in the "known" part.
PNLT	The question shows that products are made during one semester. What part is that?	PNLT	what does the first month mean in the question?
SKTL	I'm not sure if that's what's known from the question.	SKTP	It is u_1
PNLT	Is the written answer complete or does it match what was proposed?	PNLT	Is the written answer complete or does it match what was proposed?
SKTL	Yes, if the question is about how many things there are in a semester, the answer is U_6 or 5,500.	SKTP	I don't think so, but I have no idea what to do next.
PNLT	Did you drawn any conclusions and review your answers?	PNLP	Did you double-check your answers?
SKTL	No, I usually just write down the conclusion, but I forgot this time.	SKTP	No

Figure 2 and the interviews showed that SKTL was hesitant and could not describe the questions being worked on. SKTL is able to find and interpret problems, but it has difficulty discovering new forms, such as not writing n as the quantity of products manufactured. SKTL is incapable of writing problem-solving formulas; specifically, SKTL only writes the U_6

formula. In addition, SKTL was only able to solve some of the problems according to plan, namely by only making U_6 solutions and not searching for S_6 solutions as the final answer. In the final stage, SKTL neither draws conclusions nor reviews the obtained answers. On the basis of the previous explanation, it can be concluded that SKTL does not comprehend the material for arithmetic sequences and series, and thus is less capable of completing TKPMM well. According to (Aminah & Ayu Kurniawati, 2018) ignorance of a mathematical concept can lead to a mistake.

Based on Figure 3 and the results of the interviews, SKTP did a fine job of answering the researcher's questions and explaining the types of questions being worked on during the interview. In terms of the first indicator, SKTP is quite capable of finding and interpreting problems, However, in explaining what was known and requested, SKTP erred by using U_1 as the initial term and skipping n as the quantity of products produced. SKTL is incapable of writing the formula used in solving problems; namely, SKTL only writes the U_6 formula. In addition, SKTL was only able to solve some of the problems according to plan, namely by only making U_6 solutions and not searching for S_6 solutions as the final answer. SKTP has derived conclusions from the obtained results but has not reviewed the calculations. On the basis of the previous explanation, it can be concluded that SKTL does not comprehend the material for arithmetic sequences and series, and thus is less capable of completing TKPMM well. In accordance with research conducted by (N. Rizki et al., 2021), female students have difficulty understanding problems, namely incompleteness and inaccuracy when writing is known in questions, when making plans, and when writing formulas that are not yet correct, resulting in incorrect results when performing calculations and not proving the answers obtained.

Subjects with Moderate Math Anxiety

Figures 4 and 5 show the TKPMM results of male and female high math anxiety students.

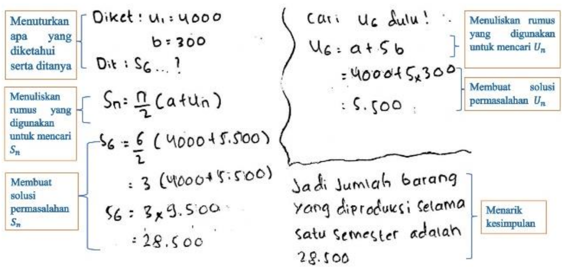
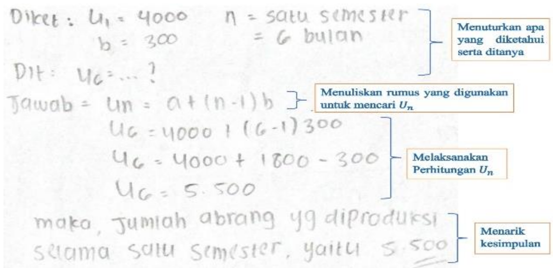


Figure 4. Results of TKPMM - SKSL



Gambar 5. Results of TKPMM - SKSP

The following table 7 provides a summary of the interviews conducted based on the SKTL and SKTP answers:

Table 7. Problem-Solving Ability Test Interview Results on SKSL and SKSP

SKSL		SKSP	
PNLT	Do you understand question number 2?	PNLT	Do you understand question number 2?
SKSL	Understand	SKSP	A little bit
PNLT	Are there arithmetic or geometry problems in it? Why?	PNLT	Are there arithmetic or geometry problems in it? Why?
SKSL	Arithmetic problems, because the difference is still 300 units every month.	SKSP	Arithmetic problems, because 300 is added to each month.
PNLT	Is there something you forgot to include in known and asked?	PNLT	What does the first month mean in the question?

SKSL		SKSP	
SKSL	I don't think so, because I have everything written down.	SKSP	It is u_1
PNLT	The question shows that products are made during one semester. What part is that?	PNLT	How should the second question be answered? What formula do you use?
SKSL	I'm sorry, I wasn't careful	SKSP	It must search U_n and S_n. Initialy, the formula $U_n = a + (n-1)b$ was used.
PNLT	Did you double-check your answers?	PNLT	Do you know the formula for calculating S_n ?
SKSL	No	SKSP	Sorry, I'm forget about S_n formula
		PNLT	Did you double-check your answers?
		SKSP	No

Based on Figure 4 and the interview results, SKSL can explain the answers well. SKTL is able to find and interpret problems, but it has difficulty discovering new forms, however, careless when mentioning the known in the problem and incorrect when using U_1 as the first term. SKSL excels at making problem solutions according to plans, performing calculations using appropriate methods. However, SKTP did not reexamine the obtained answers and only drew conclusions. On the basis of these answers, we can conclude that SKSL is quite capable of completing TKPMM. according to (Isnaini et al., 2021), students' abilities when comprehending problems, planning solutions, and implementing them fall into the good category, but when re-examining, they fall into the poor category.

Based on Figure 5 and interview results, SKSP is able to explain the answers given. SKTL is able to find and interpret problems, however, it was incorrect to state what was known and requested, specifically when using U_1 as the initial term. SKSP is unable to write down the formulas used to solve problems; specifically, SKSP only records the U_6 formula. Furthermore, SKSP could only solve some of the issues as planned; SKSP did not calculate S_6. SKSP is capable of drawing conclusions, but not reviewing calculations. On the basis of the provided responses, it can be concluded that SKTL is less capable of completing TKPMM. According to the findings of (Gunanda & Roswiani, 2019) study, when solving problems, students were less meticulous, forgot, did only a portion of the problem solving, and were in a hurry to work on the questions.

Subjects with Low Math Anxiety

Figures 6 and 7 show the TKPMM results of male and female high math anxiety students.

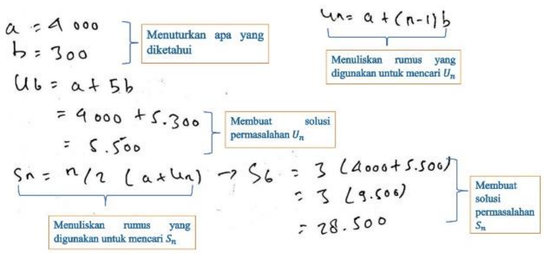


Figure 6. Resulf of TKPMM - SKRL

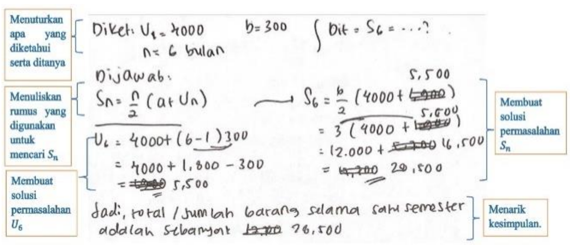


Figure 7. Result of TKPMM - SKRP

The following table 8 provides a summary of the interviews conducted based on the SKTL and SKTP answers:

Table 8. Problem-Solving Ability Test Interview Results on SKRL and SKRP

SKRL		SKRP	
PNLT	Do you understand question number 2?	PNLT	Do you understand question number 2?
SKRL	Understand	SKRP	Understand
PNLT	Are there arithmetic or geometry problems in it? Why?	PNLT	Are there arithmetic or geometry problems in it? Why?
SKRL	Arithmetic problems, because the difference is still 300 units every month.	SKRP	Arithmetic problems, because 300 units are added each month.
PNLT	Is there something you forgot to include in known and asked?	PNLT	Are you sure that U_1 is the first month in arithmetic?
SKRL	Yes, a semester is 6 months or n	SKRP	Should a
PNLT	Are you used to deriving conclusions from the answers you get?	PNLT	Did you double-check your answers?
SKRL	I wrote it down if I can remember.	SKRP	On question 2, I didn't double-check. However, if the questions are in the form of concepts, like in questions 1 and 4, I prove the answers.
PNLT	Did you double-check your answers?		
SKRL	No		

Based on Figure 6 and the results of the interviews, SKRL can confidently respond to the researcher's questions. SKRL is able to identify and interpret problems, but it is less thorough when describing what is known in the questions. SKSL excels at making problem solutions according to plans, performing calculations using appropriate methods. However, SKSL not draws conclusions or reviews the obtained answers. On the basis of these answers, it was concluded that SKRP was able to complete TKPMM. Agreed with (Aras et al., 2020) findings. In the re-examination phase, male students did not examine the answers they had obtained and were satisfied with their results, despite the fact that they had occasionally made unconscious errors during the calculation process.

Based on Figure 7 and the results of the interviews, SKRL can confidently respond to the researcher's questions. SKRL is able to identify and interpret problems, but careless in using U_1 as its initial term. SKRP excels at planning problem-solving strategies, but it does not record the formula used to compute U_n, instead entering the numbers directly, SKSP can solve problems according to plans and perform calculations using the right method. SKRP is able to draw conclusions based on the responses obtained; however, SKRP does not review the answers to question 2 and has only reviewed the calculations for two questions in the form of a concept. On the basis of these answers, it was concluded that SKRP was able to complete TKPMM. According to (Harti & Imami, 2023), female students have adequate problem-solving abilities, SKRP excels at problem planning and problem planning execution, but in the final stage it only writes conclusions and does not provide evidence of its work.

According to the findings of the research, SKTL and SKTP have poor problem-solving abilities; as a consequence, they cannot complete TKPMM properly. SKSL has sufficient problem-solving abilities, whereas SKSP has insufficient problem-solving abilities. Meanwhile, SKRL and SKRP have good problem-solving abilities, allowing them to finish well in TKPMM. The following is a description based on the results of TKPMM and interviews for all mathematical problem-solving ability indicators based on the overall subject of mathematical anxiety and gender, which will be described in Table 9.

Table 9. Description of Mathematical Problem-Solving Ability based on Mathematical Anxiety and Gender

Gender	The Subject of High Math Anxiety	The Subject of Moderate Math Anxiety	The Subject of Low Math Anxiety
	Finding problems, interpreting problems correctly, stating what is known and being asked		
L	SKTL is able to meet the first TKPMM indicator. In response to question 2, the SKTL only recorded what was partially known and requested, while for question 3, the SKTL did not record anything.	SKSL is highly capable of achieving the TKPMM's first indicator. In answer to question 2, SKSL was less thorough in describing what was known and requested.	SKRL is highly capable of achieving the first indicator of TKPMM. In response to question 1 and 2, the SKTL only recorded what was partially known and requested.
P	SKTP is enough to satisfy the first indicator on TKPMM. In question 2, SKTP determined the initial arithmetic term incorrectly. Then, for questions 3 and 5, do not write down exactly what is known.	SKSP is highly capable of achieving the first indicator of TKPMM. In question 2, SKSP determined the initial arithmetic term incorrectly.	SKRP is highly capable of achieving the first indicator of TKPMM. In question 2, SKSP determined the initial arithmetic term incorrectly.
	Planning problem-solving strategies and defining appropriate models or formulas.		
L	SKTL has less ability to meet the second indicator on the TKPMM. In question 2, SKTL was only able to devise a part of the problem-solving process, namely finding U_6. SKTL had trouble building the formula for numbers 3 and 4 since he was unable to differentiate the question type, so he couldn't design problem management.	SKSL is capable of achieving the second indicator of TKPMM. In planning a problem-solving strategy for question 3, SKSL incorrectly determined n, and in question 4, SKSL did not write down the calculation to determine r on the worksheet.	SKRL is capable of achieving the second indicator of TKPMM. When preparing a problem-solving strategy for questions 1 and 4, SKRL didn't write down on the worksheet how to determine a and r.
P	SKTP has less ability to meet the second indicator on the TKPMM. In question 2, SKTL could only plan a portion of the problem-solving strategy, namely searching for U_6; in question 6, he incorrectly determined r; and in questions 3 and 4, he is unable to plan a strategy.	SKSP is capable of achieving the second indicator of TKPMM. On question 2, SKSP was able to design a portion of the problem management, notably the discovery of U_6. In question 3, SKSP was incorrect in determining r.	SKRP is highly capable of achieving the second indicator of TKPMM. However, in question 2, SKRP did not write down the U_n formula.

	Making problem solutions according to plans, performing calculations using appropriate methods.		
L	SKTL has less ability to meet the third indicator on the TKPMM. SKTL was careless with the calculations; in question 1, SKTL wrote $1+3n-3$ in the final result, but it may be shortened to $3n-2$. At number 2, it doesn't count S_n. Then, on questions numbers 3 and 4, he did not carry out any calculations.	SKSL is highly capable of achieving the third indicator of TKPMM. However, SKSL incorrectly determined r in question 3, preventing him from completing the calculation correctly.	SKRL is highly capable of achieving the third indicator of TKPMM. SKRL is able to solve problems according to plan and perform exact calculations.
P	SKTP has less ability to meet the third indicator on the TKPMM. In question number 2, SKTP does not calculate S_n. In the third, fourth, and fifth question, SKTP did not record the solution or calculation. And in the sixth question, SKTL's search for r was incorrect, resulting in an incorrect calculation.	SKSP is capable of achieving the third indicator of TKPMM. In question 2, SKSP did not calculate S_n, and in question 3, SKSP was unable to complete the calculation because it determined r incorrectly.	SKRP is capable of achieving the third indicator of TKPMM. SKRP is able to solve problems according to plan and perform exact calculations.
	Draw inferences and examine the computations based on the results		
L	SKTL unable to satisfy the fourth indicator on the TKPMM. SKTL can only derive conclusions based on the obtained answers, but cannot re-prove them.	SKSL unable to satisfy the fourth indicator on the TKPMM. SKSL just draws conclusions on some of the questions and is not utilized to prove the obtained answers.	SKRL unable to satisfy the fourth indicator on the TKPMM. SKRL simply draws conclusions and does not prove answers.
P	SKTP unable to satisfy the fourth indicator on the TKPMM. SKTP only drew conclusions on question number 2 and did not re-examine the answers.	SKSP unable to satisfy the fourth indicator on the TKPMM. SKSP can only derive conclusions based on the obtained answers, but cannot re-prove them.	SKSP has less ability to meet the fourth indicator on the TKPMM. SKRP draws conclusions and reviewed the calculations on questions 1 and 4.

According to Table 9, high-anxiety male and female students can only meet the first TKPMM indicator. This is consistent with Table 5, which reveals that both male and female students averaged 75 and 62.5 marks in the good and sufficient categories, respectively. Male and female students with moderate and low levels of anxiety can meet three TKPMM indicators. This is also consistent with Table 5, which shows that male and female students with moderate anxiety receive average scores of 91,6 and 95,8 on the first indicator, indicating that both categories are excellent, Male and female students with low anxiety received scores of 87.50 and 95.80, both of which are excellent. On the second indicator, male and female students with moderate anxiety score an average of 83.3 in the good category, while male and female students with a low anxiety score an average of 83.3 and 91.6, respectively, in the good category. In regard to the third indicator, male and female students with moderate anxiety receive average scores of 91.6 and 83.3 in the very good and good categories, respectively, whereas both male and female students with a low anxiety receive average scores of 100 in the very good category.

Male and female students with moderate and low math anxiety bettered those with high math anxiety. According to research conducted by (Setiawan et al., 2021), students with high anxiety do not comprehend the material and experience nervous when answering questions. According to research conducted by (Satriyani, 2016), students with high math anxiety struggle to comprehend the problem, resulting in answers that do not match the questions posed. In their research, (Eka et al., 2016) found that students with a low math anxiety are able to interpret problems, design problem management plans, and implement resolution plans, but have not been able to re-examine. In addition, math anxiety hinders students' ability to solve mathematical problems. This is consistent with the findings of (F. Rizki et al., 2019) which indicates that students' problem-solving abilities will decrease as their math anxiety increases.

The results indicated that there was no significant difference between male and female students in TKPMM. In accordance with the findings of (Novikasari, 2018) and(Indrawati & Tasni, 2017) there is no significant difference between the cognitive problem-solving abilities of male and female students, (Hardy et al., 2015) also stated in their research findings that there were no gender-related differences in math problem-solving abilities. Basically, what makes the difference is the category of students' math anxiety. Students in the high anxiety category (both male and female) can only meet the first TKPMM indicator, while students in the medium and low anxiety categories can meet all three indicators. In accordance with the research of (Safitri et al., 2022), students with low anxiety can only meet the first indicator of TKPMM, but students with moderate anxiety can meet all three indicators, as well as research conducted by (Himawan, 2021), which explains that students with low anxiety are already able to meet the three TKPMM indicators, but at the stage of rechecking answers, students experience errors and difficulties.

Based on the results of the analysis, it is known that math anxiety has an effect on math problem-solving abilities, as demonstrated by students who are less able to derive conclusions from the obtained answers and review calculations. This is consistent with research conducted by (Isnaini et al., 2021), which found that students frequently do not compose conclusions and review calculations because they are not accustomed to doing so. Even though checking again is important to check for mistakes and avoid mistakes that occur when solving problems ((Anggraeni & Kadarisma, 2020).

CONCLUSION

Results and discussion of the study showed that the majority of students who experienced math anxiety were in the moderate anxiety category. 5 or 7% of students have high math anxiety, 53 or 76% have moderate anxiety, and 12 or 17% have low anxiety. The conclusion of this study is that male and female students with high math anxiety can only meet the indicators finding problems, interpreting problems correctly, stating what is known and being asked, where students are quite capable of mentioning the information and problems that exist in the problem. Male and female students with moderate and low levels of anxiety are able to meet the following three indicators of problem-solving abilities: Finding problems, interpreting problems correctly, stating what is known and being asked; Planning problem-solving strategies and defining appropriate models or formulas; and Making problem solutions according to plans, performing calculations using appropriate methods, where students are able to mention what is known and asked, manage problems, write formulas, and make appropriate solutions. However, students in the high, medium, and low categories are unable to meet the indicators of drawing conclusions and reviewing calculations based on the answers obtained;

this is because students are not used to drawing conclusions and examining calculations obtained. So, it can be concluded that the problem-solving skills of male and female students are equivalent.

RECOMMENDATION

The researcher makes the following recommendations based on the aforementioned research findings and conclusions: (1) Familiarize students with methods for solving problems, as problem-solving is one of the goals of mathematics education; (2) Questions about students' problem-solving abilities should be more varied, ranging from simple to complex; (3) Researchers and educators can use the information in this article to learn more about the effects of math anxiety and gender on students' problem-solving ability.

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