

Research Article

## Assessing students' self-efficacy when solve mathematical problem based on gender

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### ABSTRACT

Self-efficacy, problem solving, and gender differences are aspects that many researchers concern to today. Therefore, the purpose of this study was to describe the profile of students' self-efficacy in solving problems based on gender. We used a qualitative approach with exploratory research to answer the research objectives. We used the Mathematical Ability Test (TKM) instrument, Mathematical Problem-Solving Tasks (TPMM), and interview guidelines to consider the selected subjects. Next, two students were selected (14 years old, of different gender, and had good math skills) to participate in the study. Data from transcripts and student work were used to perform data analysis. The results revealed that there were fundamental differences between the two subjects based on three dimensions of self-efficacy (magnitude, strength, and generality). This is discussed further in this article. Finally, we suggest to explore the influence of regional culture on students' self-efficacy in the classroom.

**Keywords:** self-efficacy; gender; mathematical problem

### 1. INTRODUCTION

Problem solving is one of the important skills developed by students at every level (Lyn D. English & Jane M. Watson, 2016; Shanta & Wells, 2022; Sriraman & Kaiser, 2006). This ability encourages students to not only explore or study mathematics, but also helps them apply it in other fields of study, and in everyday life. The success of students in solving problems is influenced by many factors, such as prior knowledge, belief in achieving success, background of the problem, and students' cognitive and affective aspects (Henry et al., 2008; Ndlovu et al., 2020; Pintrich & De Groot, 1990). Of the various factors that can affect success in solving problems, it appears that one of them is self-efficacy, which is related to affective, desire, and motivational aspects (Bandura, 2010; Williams & Williams, 2021). Of course, from this aspect, it was found that there was a significant relationship between affective and problem solving for students (Singer et al., 2017; Singer & Voica, 2013; Voica et al., 2020). This shows that the affective aspect cannot be ignored in learning mathematics.

Self-efficacy is one of the factors or aspects that determine success in solving problems (Ramdass & Zimmerman, 2008). Students with low self-efficacy will avoid lessons that have a lot of tasks, especially challenging tasks. In contrast to students with low self-efficacy, students who have high self-efficacy have a great willingness to complete the tasks given (Williams & Williams, 2021). In this case, students are required to increase their confidence in solving problems. In addition, when students study, they must also be able to appreciate the usefulness of mathematics such as students who have attention, curiosity, interest in learning mathematics have a tenacious attitude and confidence in solving problems (Sutama et al., 2021; Voica et al., 2020). Therefore, students' self-efficacy can shape students' ability to solve problems, especially in math problems. Furthermore, most students perceive mathematics as a difficult, stressful, and boring subject, where high self-efficacy of students is able to help them reduce and even eliminate these problems (Supardi US, 2010). Therefore, student self-efficacy needs to be developed, so that it can foster self-confidence in dealing with problems, including solving math problems.

A number of studies have shown that students' efficacy and self-confidence related to mathematics and problem solving will significantly affect problem solving ability (Callejo & Vila, 2009; Phan & Ngu, 2016; Usher, 2009). Self-efficacy can determine students' actions in achieving something they want, including solving math problems. Self-efficacy is related to students' self-confidence in carrying out tasks based on their abilities. Students sometimes cannot show their abilities because students are often not sure that they are able to complete the tasks given by the teacher. One of the findings that show this phenomenon is the result of the author's interview in the preliminary study, which is as follows:

P: What do you think about this question?

S: In my opinion, this question is quite difficult

P: Do you want to solve questions like this? Why?

S: Yes sir. I feel challenged to try to solve it

P: Can you do it?

S: Maybe I can, I'll try first, sir.

This interview excerpt shows that the subject considers that the question given is quite difficult question, but he still wants to solve the problem. In addition, the subject has doubts about his ability to solve the given problem and prefers to try it to ensure his confidence. The belief possessed by the subject will determine their actions, influencing their efforts and hard work when they want to achieve the expected goals. The belief possessed by students can give encouragement to try or not, whether to try or not if they fail, whether they can form resilience or give up easily (Hegedus et al., 2016). In addition, self-confidence about their ability to solve problems can generate an optimistic attitude in dealing with problems (Gao, 2020; Williams & Williams, 2021). When students have confidence that they can achieve the expected goals, then these students will tend to try to pour all their abilities in achieving the expected goals.

## 2. LITERATURE REVIEW

### 2.1 Self-efficacy as an important aspect in student’s problem solving

Self-efficacy refers to a student’s belief that he or she is capable of performing certain actions. Self-efficacy refers to the component of self-confidence that a person has in dealing with a situation that will come, which contains uncertainty, cannot be predicted, and is often full of pressure (Kaskens et al., 2020; Zulkarnain et al., 2020). Although self-efficacy has an influence on a person’s actions, self-efficacy also combines with previous environment and behavior. Mathematics self-efficacy is an individual’s belief or perception related to his ability in mathematics (Öztürk et al., 2020; Tossavainen et al., 2021). Mathematics self-efficacy in this study is the students’ self-confidence about their ability to carry out mathematical tasks. Students’ belief that they will be successful in completing mathematical tasks can raise enthusiasm and increase effort and tenacity in completing mathematical tasks. In addition, students who have confidence that they are able to complete mathematical tasks tend to be able to develop themselves in solving more complicated mathematical tasks.

The dimensions of self-efficacy that can be used as a basis for measuring one’s self-efficacy are magnitude, strength, and generality (Dixon et al., 2020). Magnitude is related to the individual’s belief in the ability to solve problems/tasks (questions) according to their level, namely how difficult the problem is according to their thinking. Strength is related to the stability of the heart and the strength or weakness of a person’s belief regarding his abilities in completing tasks. Generality relates to the breadth of the tasks performed. Furthermore, Ramdass & Zimmerman (2008) state that the dimensions of self-efficacy involve: (1) Level is related to the level of difficulty of a particular task, such as increasing difficulty in math addition problems; (2) Generality is an assessment of a person’s ability to do several tasks or activities such as math problems with different materials; and (3) Strength is the strength of one’s belief in doing certain tasks. When students believe that they are proficient in mathematics, students will increasingly try to solve mathematical problems. Students’ mathematics self-efficacy can determine future career choices (Goulet-Lyle et al., 2020; Ndlovu et al., 2020; Siegle & McCoach, 2007). In this case, mathematics self-efficacy determines whether students will choose a mathematics-related career in college or not. Students who believe that they are able to solve mathematical problems will tend to develop their self-efficacy to try and solve more complex mathematical problems (Williams & Williams, 2021). Self-efficacy can lead to different behavior in each individual, even they have the same abilities. This is because self-efficacy can affect students in determining goals, overcoming problems, tenacity and choice in overcoming problems. The indicators or characteristics of self-efficacy that are used as measures in determining student self-efficacy in this study adapt the previous theories (Bandura, 2010; Dixon et al., 2020), which are shown in **Table 1**.

**Table 1.** Indicators of Self-Efficacy in Solving Mathematical Problems

Dimensions	Indicators
Magnitude	Students' views on math problem solving tasks
	Students can find out the level of difficulty of math problem solving tasks.
	Students have difficulty in completing mathematical problem-solving tasks
	Success in completing mathematical problem-solving tasks.
	Students are confident in their ability to complete mathematical problem-solving tasks
	Students can use all the information to complete math problem solving tasks
	Students check the work
	Planning in completing math problem solving tasks
	Students have a plan in completing mathematical problem-solving tasks
	Students have confidence in planning and completing mathematical problem-solving tasks
Strength	Students have a commitment (diligent/independent/enthusiastic) to complete mathematical problem-solving tasks.
	Students have readiness in overcoming/completing mathematical problem-solving tasks.
	Students have experience that can support in completing mathematical problem-solving tasks.
Generality	Students have mathematical ideas that are used in solving mathematical problem-solving tasks.
	Students know the mathematical ideas used in solving mathematical problem-solving tasks
	Students are confident in the mathematical ideas used in solving mathematical problem-solving tasks
	Students have confidence in their ability to complete mathematical problem-solving tasks with similar or different contexts.

## 2.2 Research Rationale

Problem solving can train students in the use of various mathematical principles, concepts, and skills that have been or are being studied, so that they can solve mathematical problems and even problems in everyday life (Filloy et al., 2010; González-Calero et al., 2015; Soneira et al., 2018). Problem solving develops cognitive skills, problem solving fosters creativity, problem solving is part of the process of applying mathematics, and problem solving motivates students to learn mathematics (Nolte & Pamperien, 2017). One of the affective factors that are considered to be able to influence students' problem solving is "mathematics self-efficacy" (Güven Akdeniz & Argün, 2021). Self-efficacy is an aspect of self-knowledge that is influential in everyday life. This shows that self-efficacy can influence a person in determining actions, so that they can achieve goals. Self-efficacy in mathematics is a student's belief related to ability in mathematics.

Students often cannot show their achievements optimally according to their abilities. This can happen because students do not have confidence in themselves in terms of completing the tasks given to them. Students who have high self-efficacy will believe in their abilities that they can do something to change the events around them and prefer to imagine success (Renninger et al., 2011; Williams & Williams, 2021). Students who have low self-efficacy will consider themselves unable to do everything around them and imagine failure more than things that can hinder the achievement of success. Students who have low self-efficacy will more easily give up, while students with high self-efficacy will try harder to overcome existing challenges. Students who perceive themselves as capable will try and are committed to achieving their goals. Furthermore, mathematics is a form of culture, which has actually been integrated into all aspects of people's lives wherever they are (Bishop et al., 2014). Basically, mathematics is a symbolic technology that exists in a cultural skill or activity environment. This shows that cultural background affects a person's mathematical ability because they do something based on what they see and feel. Mathematics education has actually been integrated with the life of society itself. Some ethnomathematics experts assume that basically the development of mathematics is inseparable from the culture and values that exist in society. Indonesia, which consists of various ethnic groups, has different cultures. South Sulawesi, for example, is inhabited by several ethnic groups and has different cultures. One of the ethnic groups in South Sulawesi is the Bugis ethnic group, which has the largest population. Bugis society has a system of life and values that are guided in domestic life and in society. The main values in Bugis culture include lempu (*honesty*), amaccang (*intellect*), assitinajang (*property*), agettengeng (*determination*), reso (*effort*), siri (*shame principle*). These values are passed down through Papangaja (*advice*) and paseng (*mandate*).

## 3. RESEARCH METHOD

### 3.1 Types of research

This study aimed to explore the self-efficacy of junior high school students in solving math problems based on gender. Students' self-efficacy in solving math problems could be seen from students' behavior when they completed math problem solving tasks which could reflect students' mental activity. Student behavior would be tracked when faced with mathematical problem solving tasks and in-depth interviews. Therefore, this research included exploratory research with a qualitative approach (Creswell, 2012; Yin, 2011).

### 3.2 Participants

This study was conducted in public schools in the central part of Indonesia. The selection of this area was based on the closeness of the community's culture to the Bugis ethnicity, so that it matched the characteristics of the desired subject in this study. The desired subjects in this study were students of the Bugis ethnicity, namely students with a background of Bugis ethnic descent (Father and Mother of Bugis ethnicity). The participating students were aged 10 – 14 years and currently pursuing secondary education. We assigned research subjects based on gender by taking into account the equality of students' mathematical abilities. Previously, students were given Mathematics Ability Test (TKM) questions to determine their mathematical abilities. Then, Students were selected with mathematical score at a difference of less than 5 for the range 0-100. The main criterion was the male subject and the female subject with relatively similar mathematical ability. In addition to the things mentioned above, the determination of the subjects carried out in the study also considered the character of the students, namely students having good oral communication based on observations in class and information from the mathematics teacher in the class. This was done because teachers knew better the characteristics of their students. In addition, students selected as subjects were students who were willing to spend their time outside of class hours to be interviewed, so that the research subjects were not disturbed by their study time in class, and interviews could be carried out according to agreement with the research subjects. The participating subjects are shown in **Table 1**.

**Table 1.** Description of research participants

No	Subject Candidate Name	Gender	TKM Value
1	CSP-1 (UM)	P	90
2	CSP (AM)	P	84
3	CSP-3 (HU)	P	77
4	CSP-4 (RM)	P	77
5	CSP-5 (NA)	P	74
6	CSP-6 (AL)	P	73
7	CSP-7 (ZA)	P	72
8	CSL-1 (FI)	L	87
9	CSL-2 (FE)	L	85
10	CSL-3 (AG)	L	70

### 3.3 Research Instruments

The study instrument consisted of the main instrument and the supporting instrument. The main instrument of this research was the researchers himself, because it was the researchers who planned, collected data, prepared observation or study documentation, then analyzed, interpreted, and reported the research data. Researchers who acted as instruments would make it easier to extract interesting information, including information different from the others (interesting findings), information not planned in advance, or information not unexpected in advance or not common. This study also used supporting instruments, namely the Mathematical Ability Test (TKM), Mathematical Problem Solving Tasks (TPMM), and interview guidelines. Mathematical Ability Test (TKM) was used to obtain one male subject and one female subject with relatively the same level of ability. Mathematical Problem Solving Tasks (TPMM) was used to explore students' self-efficacy when solving mathematical problems. The interview guide was used as a reference to reveal students' self-efficacy in solving math problems. The interview guide contained open-ended questions that referred to the research problem.

Supporting instruments used needed to be developed before being used in research. The development of these supporting instruments was carried out as follows. First, the Development of Mathematical Ability Test (TKM) in this study aimed to control the mathematical ability of male and female subjects, so that research subjects had the same or relatively the same level of mathematical ability. The Mathematical Ability Test (TKM) in this study was arranged in the form of an essay test containing 10 National Examination (UN) questions, namely in 2013, 2014, 2016, 20017, and 2018. The scoring technique used was 0–100 scoring. The National Examination questions were chosen based on the consideration that the National Examination questions had passed the national validity and reliability test, so that they could measure the achievement of student competencies, in this case the students' mathematical abilities. Meanwhile, the descriptive form questions were chosen because the description questions could show how students' abilities in the process of solving the Mathematics Ability Test (TKM) questions were.

Second, the Mathematical Problem Solving Task (TPMM) was an assignment sheet given to students which was a mathematical problem in the form of non-routine story questions, containing the concepts of rectangles and algebra (See Figure 2). Third, data mining through interviews was carried out by combining structured and unstructured interviews. A structured interview was an interview in which the interviewer set his own problems and questions to be asked in the hope of finding answers to the allegations. Furthermore, to find non-standard information and to go deeper into a problem, researchers needed to emphasize the possibility of irregularities, unusual interpretations, and reinterpretations, therefore unstructured interviews were conducted. In unstructured interviews, questions were not prepared in advance but were adapted to the unique circumstances and characteristics of the respondent. To obtain information according to the research objectives, the development of interview guidelines referred to several provisions, namely: (1) the questions asked did not directly mention the research indicators, (2) the questions asked were open-ended. For example, "tell me what you're thinking!", (3) the question asked was adjusted to the subject's response in the form of writing or explanation, (4) if the subject's response to the question asked was not in accordance with the research objectives and the response given was not interesting to reveal according to the researcher's analysis, then the question was asked with different sentences, but still in the core of the problem. However, if the response given by the subject was interesting to reveal even it was not in accordance with the research objectives, then the researchers asked exploratory questions. This was done to obtain information that could be used as interesting findings or data verification, (5) the questions asked were exploring and avoiding guiding nature, which was done to avoid researcher intervention on the subject.

Ibu Sitti menggunting daun pisang yang akan digunakan membungkus *barongko*. Lebar daun pisang adalah setengah dari panjangnya, dan kelilingnya adalah 90 cm. Tentukan luas daun pisang yang akan digunakan untuk membungkus kue *barongko* tersebut!

#### Translated

Mrs. Sitti cuts a banana leaf which will be used to wrap *barongko* (Bugis' traditional food). The width of a banana leaf is half of its length, and its circumference is 90 cm. Determine the area of the banana leaf that will be used to wrap the *barongko*!

Figure 2 Problem Solving of Task Instruments

### 3.4 Data Collection Procedure

The data collection procedure in this study was transcripts of interviews and student work. First, students were given a Mathematical Problem Solving Task (TPMM), then the subject was asked to tell in detail the subject's self-efficacy (belief in his own ability) in completing the Mathematical Problem Solving Task (TPMM). Second, interviews in research were used to reveal or dig up information about the subject's self-efficacy in solving mathematical problems. Therefore, the implementation of the research used Mathematical Problem Solving Tasks (TPMM) and interviews. To obtain valid and reliable data, validity and reliability tests were also carried out. Testing the validity of the research was carried out by testing the credibility of the data through time triangulation, checking peers, and checking referential adequacy. Time triangulation was carried out by giving Mathematical Problem Solving Tasks (TPMM) at different times and conducting

reinterview, so that consistent data were obtained. Examination/checking with colleagues through discussions with friends, with the intention that the researcher maintained an open and honest attitude and provided an opportunity to explore something arising from the researcher’s thoughts regarding the study of Bugis ethnic students’ self-efficacy in solving math problems in terms of gender. Referential adequacy meant the use of an audio recorder equipped with interview transcripts that could be used to check the correctness of the interpretation of the data.

The study dependability test was carried out by independent research auditors, namely experts who were indirectly involved in this research, starting from the researchers determined the focus of the problem, entered the field, determined the data source, conducted data analysis, and tested the validity of the data to making conclusions. The dependability test in this study was carried out by the supervisor. Transferability testing in research was carried out by compiling a detailed, clear and systematic report on research results (dissertation), including theory suitability, subject selection, development of supporting instruments, collecting data in accordance with theory, conducting data analysis, and reporting research results, especially about students who became research respondents. Confirmability (objectivity) of the study would be fulfilled automatically if the dependability test of this study was met. After the data were collected, the validity of the data was checked to obtain valid data.

### 3.5 Analysis of Data

The data analysis process started from the time the researchers collected data to complete the task in the field. Data analysis was intended to sharpen the focus of observation and deepen problems that were considered important and relevant to the research problem. The collected data were still in the form of recordings, then should be transformed into interview transcripts. Activities in data analysis were data reduction, data presentation, and drawing conclusions (Miles et al., 2018). The data analysis activities were not hierarchical in nature, but were a chain of interacting activities, starting from before, during, and after data collection. The results of the interview transcripts shown by the subject were analyzed with the following steps. **First**, analyzing the data, the data from the interview transcripts were reviewed by reading repeatedly. **Second**, performing data reduction by sharpening, selecting, focusing, discarding, and organizing data in a way where final conclusions could be drawn and verified. The data collected were usually highly variable, irregular, and complex. Therefore, it was necessary to reduce data by making a summary consisting of the core, process, and questions that needed to be kept within the research objectives. **Third**, data presentation. The presentation of the data was directed so that the reduced data were organized and arranged in a relationship pattern, so that they would be easier to understand for planning further research work. In this step, the researchers tried to organize the relevant data into information that could be concluded and had a certain meaning. Fourth, checking the validity of the data after the data were collected. Fifth, the analyzing students’ self-efficacy based on gender, namely analyzing the similarities and differences between male and female subjects in solving mathematical problems. Finally, drawing conclusions based on findings and data verification. The initial conclusions put forward were still temporary and would change if no supporting evidence was found at the next stage of collection. If the conclusions put forward at the initial stage were supported by valid evidence and were consistent with the conditions found when the researchers went to the field, then the conclusions obtained were credible conclusions

## 4. RESULTS AND DISCUSSION

### 4.1 Results

Based on the results of the study, first coded the self efficacy indicators to facilitate the data analysis process (See [Table 2](#)).

**Table 2.** Coding of self-efficacy indicators in solving problems

Dimensions	Indicators	Code
Magnitude	Students’ views on math problem solving tasks	
	Students can find out the level of difficulty of mathematical problem-solving tasks.	L11
	Students have difficulty in completing mathematical problem-solving tasks	L12
	Success in completing math problem solving tasks.	
	Students have confidence in their ability to complete mathematical problem-solving tasks	L21
	Students can use all the information to complete math problem solving tasks	L22
	Students check the work	L23
	Planning in completing math problem solving tasks	
	Students have a plan in completing mathematical problem-solving tasks	L31
Students have confidence in planning and completing mathematical problem-solving tasks	L32	
Strength	Students have a commitment (diligent/independent/ enthusiastic) to complete math problem solving tasks.	St1
	Students have readiness in overcoming/completing mathematical problem-solving tasks.	St2
	Students have supportive experiences in completing math problem solving tasks.	St3
Generality	Students have mathematical ideas that are used in solving mathematical problem-solving tasks.	
	Students know the mathematical ideas used in solving mathematical problem-solving tasks	G11
	Students believe in mathematical ideas used in solving mathematical problem-solving tasks	G12
	Students have confidence in their ability to complete mathematical problem-solving tasks with similar or different contexts.	G2

### Data explanation of male subjects (SL)

For the magnitude dimension, SL had an initial description of the given problem. Thus it can be concluded that SL had an initial view of the level of difficulty of the mathematical problem solving task being faced. Data from interviews in SL.1.M.29, SL.1.M.37, and SL.1.M.40 showed that SL had difficulties in solving the problems given, even though he understood the information from the questions easily. Therefore, it can be concluded that SL had difficulty in completing mathematical problem solving tasks. Data on SL.1.M.19, and SL.1.M.49 showed that SL used his knowledge of the problems presented to solve problems. Thus, it can be concluded that SL had confidence in being able to successfully complete mathematical problem solving tasks. Interview data on SL.1.M.38 and written answers showed that SL used the information known in the questions to achieve the objectives of the questions. Based on these activities, it can be concluded that SL could use all information to complete mathematical problem solving tasks. The data on SL.1.M.46 and SL.1.M.47 revealed that SL used information from the problem to match the results of the solutions obtained. In addition, SL made observations on the length and width obtained by comparing them and recalculated the circumference using the length and width that had been obtained. Thus, it was concluded that SL checked the results of the work. In addition, the SL.1.M.21, SL.1.M.22 and SL.1.M.23 data indicated that SL made plans that would be used in solving the problems at hand. Based on this, it can be concluded that SL had a plan in completing mathematical tasks. Even SL could arrange/make a good plan, the results of observations showed that SL had difficulty in compiling a settlement plan. This is indicated by the results of observation showing that SL did not immediately work on the questions after writing down all the information from the questions. SL read over and over again, tried to understand, and looked for a formula as an appropriate first step to solve the problem. The data on SL.1.M.24 and SL.2.M.27 showed that SL convinced himself to be successful in solving the rectangular problem. Therefore, it can be concluded that SL had confidence in planning and completing mathematical problem-solving tasks.

In the Strength dimension, the results of interview data on SL1.S.19, SL.1.S.34, SL.1.S.20 and SL's written answers indicated that SL had a high enthusiasm for solving the problems given. This means that SL had independence and an attitude of readiness to solve math problems faced. Thus it can be concluded that SL had a commitment to complete mathematical problem solving tasks. Data for SL.1.S.4, SL.1.S.5 and SL.1.S.6, SL.1.S.7 indicated that SL had prior knowledge regarding the problems at hand. Therefore, it can be concluded that SL had readiness in completing mathematical problem solving tasks. The data for SL.1.S.31, SL.1.S.32, and SL.1.S.33 showed that SL had previous experience in solving mathematical problems. Therefore, it can be concluded that SL had experience that could support solving mathematical problem solving tasks (See [Table 3](#)). In the dimension of generality, interview data on SL.1.G.14, SL.1.G.17, SL.1.G.21, and SL.1.G.22 indicated that SL knew the materials to be used in solving the questions. SL would also use the formula for circumference, area, multiplication operation, addition operation, and substitution in solving problems. In addition, data SL.1.G.53, SL.1.G.54, SL.1.G.55, SL.1.G.56, and SL.1.G.57 showed that SL knew the used concepts in solving problems, namely comparison, division, algebraic addition, and multiplication. This means that SL had initial thoughts regarding the steps and concepts used in solving mathematical problems. Thus, it can be concluded that SL had mathematical ideas used in solving mathematical problem tasks.

Interview data on SL.1.G.18, SL.1.G.28, SL.1.G.45, and SL.1.G.46 indicated that SL had confidence in all the information obtained. SL stated that the methods and ideas used were in accordance with the information in the questions. SL also had confidence in the correctness of the settlement results found from the steps taken. This proves that SL believed in the methods and designs prepared previously to solve the problems at hand. This shows that SL had confidence in mathematical ideas used in solving mathematical problem tasks. Data SL.1.G.58, SL.1.G.59, SL.1.G.60, SL.1.G.61, and SL.1.G.62 showed that SL believed in his ability to solve mathematical problems similar to the problem at hand. SL was confident in his ability to solve problems because he had experience in solving similar problems. In addition, SL also believed that he was able to solve problems different from the questions given. SL stated that when the questions given were different and still had a relationship with the problems at hand, then SL resolved them with the experience he had. In addition, SL also provided an overview of problems solved previously, such as rectangular and story questions. This means that SL guaranteed his ability to solve similar and different problems. Therefore, it can be concluded that SL had confidence in its ability to complete mathematical problem tasks with similar or different contexts (See [Table 4](#) and [Table 5](#)).

**Table 3.** The results of the analysis

TPMM1	TPMM2
The data (SL.1.M.9, SL.1.M.10, SL.1.M.11) showed that SL understood the problems faced, including the category of easy questions.	The data (SL.2.M.8, SL.2.M.9, SL.2.M.10, SL.2.M.11) showed that SL had knowledge related to the questions given.
The data (SL.1.M.29, SL.1.M.37, SL.1.M.40) showed that SL knew the level of difficulty of the questions given.	The data (SL.2.M.32 and SL.2.M.33) showed that SL did not find it difficult to understand the information on the questions. However, the data (SL.2.M.43 and SL.2.M.44) showed that SL had a little difficulty in solving the problems given when making mathematical models.
The data (SL.1.M.19, SL.1.M.49) showed that SL had confidence in himself to solve problems similar to the questions given.	The datum (SL.2.M.22) showed that SL had confidence in being able to solve the given problem because he already understood well all the information and had an overview of the solution to the given problem.
The answer written in (SL.1.M.38) showed that SL used all the information from the problem to solve the given mathematical problem.	The data (SL.2.M.14 and SL.2.M.15) showed that SL knew all the information on the questions given and believed the information interpreted was correct.
The datum (SL.1.M.46) showed that SL checked the written information and the problem solving steps taken.	The data (SL.2.M.53 and SL.2.M.54) illustrated that SL checked the results that had been done by rereading the questions, then matching the information known and asked in the questions, and checking each step taken and

TPMM1	TPMM2
	performed, including the calculation operations.
The data (SL.1.M.21 and SL.1.M.22) showed that SL used the formulas for circumference, area, multiplication, and addition, as well as substitution methods in solving the given problem.	Interview data (SL.2.M.24, SL.2.M.25, SL.2.M.26) showed that SL knew the material related to the problem by thinking about the solution method that would be used.
The datum (SL.1.M.24) showed that SL had confidence in the accuracy of the method used in solving the problem.	The datum (SL.2.M.27) showed that SL believed in the success of the plan that would be used because they already knew the information from the questions.

**Table 4.** The results of the analysis

TPMM1	TPMM2
The data (SL1.S.19 and SL.1.S.34) showed that SL had a high enthusiasm for solving new problems given. In addition, the datum (SL1.S.S20) also showed that SL had a commitment to solving the new problems given.	The data (SL.2.S.22 and SL.2.S.23) showed that SL had a commitment to solving new problems similar to the questions given. Reinforced again by datum (SL.2.S.40) showing that SL was willing to solve the new problems given, describing that he liked solving math problems.
The data (SL.1.S.4, SL.1.S.5, SL.1.S.6, SL.1.S.7) showed that SL understood the information from the questions given to solve the problems.	Interview data (SL.2.S.4, SL.2.S.5, SL.2.S.6) showed that SL knew the meaning of the information in the questions given. SL understood the terms in the questions and then translated them into mathematical language.
The data (SL.1.S.31 and SL.1.S.32) showed that SL had ever solved problems similar to the questions given. It provided an overview of the problems that had been solved before.	The data (SL.2.S.35 and SL.2.S.36) showed that SL had experience on solving problems similar to the questions given. SL told about problems that had been solved before, namely story questions related to rectangles like the questions given, but with different completion goals.

**Table 5.** The results of the analysis

TPMM1	TPMM2
The data (SL.1.G.14, SL.1.G.17, SL.1.G.21, SL.1.G.22) showed that SL had an idea of all the information contained in the questions. SL explained the material and the method used in solving the problem.	The data (SL.2.G.13 and SL.2.G.16) showed that SL knew the material used in solving the given problem.
The data (SL.1.G.18 and SL.1.G.28) showed that SL had confidence in the ideas used in solving the problems given.	The data (SL.2.G.21 and SL.2.G.31) showed that SL believed in the accuracy of his answer based on all the information he obtained.
The data (SL.1.G.58 and SL.1.G.59) showed that SL believed in his ability to solve mathematical problems similar to the questions given.	Interview data (SL.2.G.69 and SL.2.G.71) showed that SL believed in his ability to solve problems, based on his experience in solving the questions given. This information shows that SL used the method he ever utilized to solve the given problem.

### Data explanation of female subjects (SP)

In the dimension of magnitude, interview data SP.1.M.14, SP.1.M.15 and written answers from SP indicated that SP had an initial picture of the problem given. Therefore, it can be concluded that SP had knowledge related to the level of difficulty of mathematical tasks. Data from interviews in SP.1.M.19, SP.1.M.66, and SP.1.M.67 showed that SP found it difficult to solve the problems given, even she has an easy understanding of the information from the questions. Therefore, it was concluded that SP had difficulty in completing mathematical tasks in certain sections. Data SP.1.M.44, SP.1.M.45, and SP.1.M.54 showed that SP used her knowledge of the problems presented to solve similar problems. Thus, it can be concluded that SP had confidence in being able to successfully complete mathematical tasks.

Interview data on SP.1.M.72 and written answers showed that SP used information on the questions to achieve the objectives of the questions. Based on these activities, it can be concluded that SP could use all the information to complete mathematical tasks. SP.1.M.91, and SP.1.M.92 data showed that SP had strong confidence in the results of her work, even she did not re-check. Interview data on SP.1.M.36, SP.1.M.41, SP.1.M.44, SP.1.M.46, and SP.1.M.48 indicated that SP had a plan that would be used to solve the problem at hand. Therefore, it can be concluded that SP had a plan in completing mathematical tasks. Furthermore, interview data on SP.1.M.42 showed that SP had confidence about her success in solving rectangular problem. This shows that SP had confidence in planning and completing mathematical tasks. The results of the analysis are shown in **Table 6**.

In the Strength dimension, interview data SP.1.S.22, SP.1.S.32, SP.1.S.68 and written answers from SP indicated that SP had an enthusiastic attitude and high commitment to solving math problems faced. Therefore, it can be concluded that SP had a commitment to complete mathematical tasks. Interview data on SP.1.S.7, SP.1.S.8, SP.1.S.9, SP.1.S.11, SP.1.S.12, SP.1.S.27, SP.1.S.28, SP.1.S.29, and SP.1.S.30 indicated that the SP had an overview of prior knowledge regarding the problems encountered. This shows that SP had readiness in completing mathematical tasks. Interview data SP.1.S.57, SP.1.S.59, SP.1.S.62, SP.1.S.63, and SP.1.S.64 indicated that SP had previous experience in completing math problem. Therefore, it can be concluded that SP had experience supporting her to complete mathematical tasks. The results of the analysis are shown in **Table 7**.

**Table 6.** The results of the analysis

TPMM1	TPMM2
SP understood the problem at hand, including moderate category question.	SP understood the problem at hand, including moderate category question.
SP knew the difficulty level of the questions given.	SP could state the difficulty level of the questions given.
SP reasoned that the information contained in the questions could provide an overview of the problem solving.	SP reasoned that the information contained in the questions could provide an overview of the problem solving.
SP used all the information from the question to solve the given math problem.	SP used all the information from the problem to solve a given math problem. In addition, the SP described all the completion steps carried out. In addition, SP also believed in her ability to examine all the information on the question to solve problems
SP did not check the written information and problem solving steps taken.	SP did not check the results of the work done. SP felt confident about the accuracy of her work.
SP used the circumference and area formulas in solving the given problem.	SP used the formula for the circumference and area of a rectangle in solving problems.
SP had confidence in the success of the methods used in solving problems.	SP had confidence in the success of the methods used in solving problems.

**Table 7.** The results of the analysis

TPMM1	TPMM2
SP had a high enthusiasm for solving similar problems given. In addition, SP data showed that SP had a commitment to solving new problems given.	SP had a high enthusiasm and commitment to solving similar problems.
SP understood the information from the questions given, so she was sure that she could solve the questions given.	SP understood the information from the questions given and she believed that she was able to solve the questions given. She explained all the information representing a rectangular geometry. In addition, SP was confident that she understood all the information provided.
SP once solved problems similar to the questions given, namely rectangles and story questions. She explained the general picture of the problems she solved before. In addition, SP also felt that she was able to solve the new questions given.	SP had never solved a problem similar to the given question. However, SP had solved problems related to rectangles and story problems. In addition, she provided an overview of the problems solved before.

For the generality dimension, interview data on SP.1.G.36, SP.1.G.37, SL.1.G.21, SL.1.G.22 and SP’s written answers showed that SP had an initial planning regarding information, methods of completion, as well as the concepts used in solving mathematical problems. Therefore, it can be concluded that SP had mathematical ideas used in completing mathematical tasks in the form of concepts. Interview data SP.1.G.39, SP.1.G.40, SP.1.G.73, SP.1.G.74, and SP.1.G.75 showed that SP had high confidence in mathematical ideas used in solving math tasks. Interview data SP.1.G.106, SP.1.G.107, and SP.1.G.108 showed that SP guaranteed her ability to solve similar and different problems. Therefore, it can be concluded that SP had confidence in her ability to complete mathematical tasks with similar or different contexts. The results of the analysis are shown in **Table 8**.

**Table 8.** The results of the analysis

TPMM1	TPMM2
SP had knowledge related to information on the questions. He explained the material used in solving the problem and the method used. SP also explained the mathematical form of the problem, found length and width of geometry, found area of geometry, and explained how to use the circumference formula.	SP had knowledge related to information on the questions. SP explained the material used in solving problems, namely the formula for the circumference and the formula for the area of a rectangle. SP also explained how to find area, find length and width, and explained how to use the circumference formula.
SP had confidence in the ideas used in solving the problems given.	SP had confidence in the materials, ideas, and concepts used in solving the given problems, and believed in ideas and ways to get the length and width.
SP believed in her ability to solve mathematical problems similar to the given problem.	SP believed in her ability to solve mathematical problems similar to the given problem.

## 4.2 Discussion

### *Students’ self-efficacy based on magnitude*

Male student was confident in his ability to solve the problems at hand, he thought that the difficulty of problem was in line with their thinking. In a sense, self-efficacy on the dimension of magnitude, a person would be faced with problems or tasks according to a certain level of difficulty. Therefore, a person’s self-efficacy will be limited to easy, moderate, and difficult tasks according to the perceived ability limit to meet the behavioral demand required at each of these levels (Bandura, 2010; Kim et al., 2013; Liu et al., 2008). Furthermore, if someone gets into a problem, he will try to solve the problem he is facing. This is in line with the statement put forward by Edman & Brazil (2009), that culture is correlated with one’s self-efficacy in academic terms.

In addition, male student had confidence that he was successful in completing a math task. He felt he was able to solve the problems given because he already knew the formulas, solutions, and calculation operations used in new problems. This indicates the competence of the student in solving similar problem. Actions based on firm belief about success will play a

major role in solving mathematical problems. This spirit is a motivation to act that comes from inner voice of a person (Ramdass & Zimmerman, 2008). Therefore, male student had the ability to parse and provide solutions to the problems he faced. In contrast to male student, female student had moderate self-efficacy towards math tasks, namely stating the level of difficulty of the problems faced was classified as “medium”. Female student had the ability to compare the level of difficulty of the questions with her knowledge. In addition, some of the information on the questions that were still in the form of contextual terms could be well understood and expressed in mathematical form. Therefore, female subject had prior knowledge of the given problem. The activity of female student showed that the student had knowledge related to the level of difficulty of math tasks. In self-efficacy assessment on the magnitude dimension, a person was faced with problems or tasks arranged according to a certain level of difficulty. Therefore, a person’s self-efficacy will be limited to easy, moderate, and difficult tasks according to the perceived ability limit (Hill, 2010; Yurekli et al., 2020).

In this dimension, female subject also had self-efficacy, namely confidence in herself in completing mathematical tasks. She stated that she could solve the given problem. This is based on the information contained in the question, where the student was able to provide an overview of problem solving. In this case, female student used her knowledge of the questions presented to solve problems. Furthermore, female student had a plan in completing math tasks. With the initial knowledge possessed by the female student, she was able to organize the formulas used to solve problems, namely the formula for the circumference and area of a rectangle. This is in line with the finding of Kim et al., (2013), stating that someone who has self-efficacy can control his/her feelings, thoughts, and actions. Self-efficacy in this case is the planning of completing mathematical tasks. Finally, female student had confidence in the planning of completing math tasks. SP confidence referred to the information obtained on the question, which was in accordance with the plan she had.

### *Students’ self-efficacy based on strength dimension*

The activity of male student in solving mathematical problems on the strength dimension was indicated by his commitment to solving mathematical problem tasks. As for some of the activities carried out, namely having a high enthusiasm for solving similar problems given, being willing and stating that he was able to solve new problems given based on experience working on the problems at hand. Male student needed to focus his concentration when he was given a new math problem tasks. This means that SL had independence and an attitude of readiness to solve mathematical problems faced. In this case, the dimension of strength in individuals was indicated by the stability of a person’s heart or the level of belief in a person’s ability to complete tasks (Gunderson et al., 2012; Ndlovu et al., 2020). Furthermore, male student had readiness in completing math tasks. In this case, male student understood the information from the given problem and knew the meaning of the information on the problem and translated it into mathematical language. In addition, he also knew the material used in solving the given problem and believed in the accuracy of the information written and explained from the problem. This means that male student had prior knowledge of the problems at hand. Male student had experience supporting him in completing math assignments. He stated that he had experience in solving problems similar to the questions given, in the form of story questions related to rectangles such as the problems at hand. In other words, someone able to do something or has success experience in the past will experience increased self-efficacy in carrying out these activities (Groth et al., 2018; Guo et al., 2015).

Furthermore, female student on this dimension indicated that she had a commitment to solving mathematical problem tasks. In solving similar problems given, female student had a high enthusiastic attitude. She expressed her readiness and felt confident in her ability to solve the new problems given based on experience working on the problems at hand. On the other hand, the female student stated that she needed a long time to be able to solve the new problem. This shows that in this dimension the individual has a strong belief in her ability to complete tasks (Bong & Skaalvik, 2003; Cecil & Pinkerton, 2000). In addition, female student had readiness in completing mathematical problem solving tasks. Female subject had an understanding of the information from the questions given, in this case the representation of a rectangular geometry. She stated and believed that the information written and explained from the question was correct. This means that female student had prior knowledge in solving the problems at hand. This is in line with the finding of (Usher, 2009; Williams & Williams, 2021) stating that individuals have strength which refers to assertiveness and confidence in doing something with their abilities. Furthermore, the level of self-efficacy possessed by experienced female student would support her in completing math tasks. The female student stated that she had solved a problem similar to the one given, then she explained that the question in question was a rectangular question and a story problem. In addition, she had the readiness to solve problems if given a new question. In other words, female student had previous experience in solving math problems. Thus, past experiences can affect a person’s self-efficacy in the form of success and failure (Lee et al., 2019; Renninger et al., 2011; Yurekli et al., 2020).

### *Students’ self-efficacy based on the generality dimension*

There was solving problem activity that male student did on the dimension of generality, namely making comparison of length and width in accordance with the information on the problem. In this case, male student used the formula for the circumference, area, multiplication operations, addition operations, and substitutions in solving problems. In addition, male student also stated the concepts used in solving problems, namely comparison, division, algebraic addition, and multiplication. In this case, male student had initial thoughts or ideas related to ways and concepts used in solving mathematical problems. The initial knowledge of mathematical concepts and ideas possessed by male student was one of the success factors in completing math tasks. The activities carried out by male student are relevant to the findings of previous studies (Bandura, 2010; Kholid et al., 2020; Ndlovu et al., 2020). Furthermore, male student had confidence in the ideas used in solving mathematical problem tasks. He convinced himself that all the information he got was correct, then the steps, the ideas or concepts he took and used, and the results of problem solving were in accordance with the purpose of

the problem. This shows that male student was confident in the ways and designs of thinking prepared previously to solve the problems at hand.

Self-efficacy in female student having mathematical ideas played a role in solving mathematical problem tasks. Female student who understood the information in the problem would solve mathematical problems by using mathematical forms/models, by finding length and width, by finding area, and by using the circumference formula. In addition, female student also applied mathematical concepts in solving problems, such as dividing both sides, algebraic addition operations, addition of fractions, and multiplication of integers. In this case, female student had initial ideas and concepts used in solving mathematical problems. In self-efficacy theory, the activities carried out by female student are relevant to previous findings (Bandura, 2010; Moores et al., 2006; Suzuki, 2013) saying that the generality dimension is related to the breadth of the task carried out by a person. Furthermore, female student on the generality dimension showed confidence and ability in completing mathematical problem tasks. She had confidence that all the information she got and the results of problem solving were correct. In this case, female student believed in the methods used and the prior knowledge prepared to solve the problems she faced. In other words, someone who has self-confidence based on peace of mind and wisdom in solving problems will feel calm, peaceful and happy (Williams & Williams, 2021; Yurekli et al., 2020). Finally, female student had confidence in her ability to complete mathematical tasks in similar or different contexts. She believed that she was able to solve the mathematical problems she was facing because she had experience working on similar problems. This was shown by the statement of the female student saying that the questions given were not too difficult, so she was able to solve the problems based on her experience. However, if the question was difficult, female student could not solve it correctly according to the purpose of the question. This means that female student was able to guarantee her ability to solve similar problems. This shows that someone who has self-efficacy can control his/her feelings, thoughts, and actions. Faith followed by passion; actions based on firm belief about success will stimulate the emergence of high morale (Ebony O. McGee, 2015; Goulet-Lyle et al., 2020; Gunderson et al., 2012).

## 5. CONCLUSION

The question in this study is how is the student's self-efficacy profile in solving problems based on gender? We highlight three dimensions of self-efficacy: magnitude, strength, and generality. First, the magnitude dimension: male student expressed all the information known and asked about, the purpose/objective of the problem, then considered the mathematical task he faced could be solved well on the grounds that it was easy to understand the language used, so that male student could clearly understand the information contained in the question. Although he considered the questions easy, male student had difficulty in making mathematical models. In completing math tasks, male student had confidence that he would successfully complete math tasks, use all the information to complete math assignments, and check the results of the work. In addition, male student had careful planning in completing math tasks and had confidence in his ability to complete math tasks according to plan.

Dimensions of strength: In solving math problems, male student's self-efficacy included commitment (diligent/independent/enthusiastic), readiness to solve problems, and supportive experiences. Male student had an enthusiastic attitude to solve similar problems given and he felt that he could solve the problems given based on experience working on the problems at hand. In completing math tasks, male student had prior knowledge related to the problems at hand. In addition, the male student had previous experience in solving math problems. The experience became a strong factor so that he was able to solve the problems given. Generality dimension: male student's self-efficacy in solving math problems included the mathematical ideas used and confidence in his abilities. In solving mathematical problems, male student had initial thoughts or ideas related to solutions and concepts used in solving mathematical problems and was able to believe in ways and designs prepared previously to solve the problems at hand. In addition, male student had confidence and able to guarantee his ability to complete mathematical tasks in similar or different contexts. Confidence in one's abilities was based on experience in solving the given problems. Second, for female student on the dimension of magnitude: In solving math problems, female student had views on math problems. In view of math problems, female student had prior knowledge of the given problem and able to describe the level of difficulty of math tasks at a moderate level. In addition, female student had difficulty in solving mathematical transformation problems. In completing the math task, the female student had confidence that she could successfully complete the math task and used all the information to complete the math task, but she did not check the results of the work. In terms of the planning of completing math tasks, female student had careful planning in completing math tasks and had confidence in the planning for completing math tasks.

Dimension of strength: female student's self-efficacy in solving math problems included commitment (diligent/independent/enthusiastic), readiness to solve problems, and supportive experiences. Female student had a high enthusiasm for solving similar problems given and able to solve new problems given based on experience working on the problems at hand. However, it took long time to be able to solve new problems. In completing mathematics tasks, female student had prior knowledge of the problems at hand used in solving problems. In addition, female student had previous experience in solving math problems. The generality dimension: female student's self-efficacy in solving math problems included the mathematical ideas used and the belief in her abilities. In solving math problems, female student had initial ideas and concepts used to solve math problems. Female student also believed in the methods and prior knowledge prepared in advance to solve the problems she faced. In addition, female student had confidence and able to guarantee her ability to complete mathematical tasks in similar or different contexts. Confidence in her abilities based on experience would help female student solved the problems given.

## RECOMMENDATIONS AND LIMITATIONS

The study findings show that students had high self-efficacy in solving math problems if the problems given involved contextual math problems (the daily life of Bugis people). Therefore, further researchers need to study more about students' self-efficacy in solving contextual problems in a wider scope. Furthermore, this study also showed a relevant relationship between the dimensions of self-efficacy and cultural characteristics. Therefore, further researchers need to study further the relationship between self-efficacy and Bugis culture. One of the limitations of this research is that it only involved male subject of Bugis ethnicity and female subject of Bugis ethnicity. Therefore, the research would be better if it was expanded to involve subjects from other ethnics such as Makassar ethnics, Toraja ethnics, and Mandar ethnics. Thus, the results of the research obtained are complete as consideration for the development of a theory of self-efficacy based on ethnicity and gender.

## AUTHOR'S CONTRIBUTIONS

The authors discussed the results and contributed to from the start to final manuscript.

## CONFLICT OF INTEREST

There are no conflicts of interest declared by the authors.

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