Research Article https://doi.org/10.12973/ejmse.3.2.155

European Journal of Mathematics and Science Education

Volume 3, Issue 2, 155 - 170.

ISSN: 2694-2003

http://www.ejmse.com/

A Study of Students' Self-Efficacy in Mathematics Performance Based on Bugis Ethnicity and Gender

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Received: July 4, 2022 ▪ Revised: October 4, 2022 ▪ Accepted: December 4, 2022

Abstract: The study on mathematical performance was significant enough to be studied further to measure students' self-efficacy. Although studies on student self-efficacy in math performance from a gender perspective were abundant, studies on this relationship from the perspectives of ethnic culture and gender were scarce. Therefore, the objective of this study was to examine the self-efficacy of Bugis Junior High School students in solving math problems based on gender. The researchers used an algebra problem in the context of the Bugis ethnic culture. For this data set, two of 25 students at a public junior high school in Bone, South Sulawesi, Indonesia, were interviewed based on ethnicity and gender. Qualitatively, the triangulation technique was employed for data analysis. The study results revealed that male students outperformed girls in terms of self-efficacy, namely magnitude, strength, and generality, in math performance. Furthermore, female students had lower self-efficacy in terms of confidence, supportive experience in completing math tasks, and confidence in their ability to complete math tasks in similar or different contexts, compared to male students, who had higher self-efficacy. This result provided new knowledge by exploring the characteristics of students' self-efficacy by integrating ethnicity and gender.

Keywords: *Bugis ethnic, gender, mathematics performance, self-efficacy.*

To cite this article: Alam, S., Budiarto, M. T., & Siswono, T. Y. E. (2022). A study of students' self-efficacy in mathematics performance based on bugis ethnicity and gender. *European Journal of Mathematics and Science Education, 3*(2), 155-170. https://doi.org/10.12973/ejmse.3.2.155

Introduction

The self-efficacy of students in mathematics is investigated in this study. There is extensive research on the self-efficacy perspective of performance on particular tasks (Choi, 2005; Williams & Williams, 2010). Bandura (2000) reported that a person's self-efficacy expectations regarding the ability to carry out a particular job successfully provide a reliable predictor of whether the person tries to perform the task. In addition, the perceived effect of self-efficacy is also influenced by one's cognitive style and preferences, excitement, and task performance (Bandura, 1988). Initial support for the mediating role of self-efficacy between attitude variables as exogenous variables and endogenous variables is provided by correlation studies and path analysis (Arslan, 2019; Pajares & Kranzler, 1995; Simonsen & Rundmo, 2020).

Researchers who investigate the use of self-effectiveness theories in education and professional development are particularly interested in the relationship between mathematical performance and mathematical self-efficacy (Falco, 2019; Tossavainen et al., 2021). However, based on social learning theory, it is suggested that self-efficacy expectation is a more significant factor in math performance and that it influences math attitudes, hobbies, and careers (Hwang, 2021; In'am & Sutrisno, 2021; Sides & Cuevas, 2020).

Self-efficacy among students is essential for solving math problems (Bakar et al., 2020; Fan & Williams, 2010; Morán-Soto & Benson, 2018; Mukuka et al., 2021; Sides & Cuevas, 2020; Yates, 2002). The demand for self-confidence in this study is referred to as *self-efficacy*. It means that *self-efficacy* needs to be developed in learning mathematics. The *self-efficacy* that needs to be developed to learning mathematics is that students have curiosity, attention, interest, a tenacious attitude, and are attentive in learning mathematics. Thus, students' *self-efficacy* can shape their ability to solve mathematical problems (Mukuka et al., 2021; Pajares & Graham, 1999; Ramdass & Zimmerman, 2008; Usher, 2009). Junior high school students' self-efficacy must be developed in order to foster students' confidence in dealing

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with a variety of problems, including math problems. The demand to develop mathematics *self-efficacy* is contained in the mathematics curriculum, which states that students learning mathematics must be able to appreciate the usefulness of mathematics, such as by having attention, curiosity, and interest in learning mathematics, a tenacious attitude, and confidence in solving problems (Bandura, 2000; Joët et al., 2011; Tseng et al., 2013).

Hoffman and Schraw (2009) suggest a positive relationship between students' *self-efficacy* in solving problems and their metacognition. It means self-efficacy is one of the affective aspects that influences students to choose their activities. Students with low self-efficacy will avoid lessons with many tasks, especially incredibly challenging tasks. It contrasts with students with high self-efficacy, who have a great will to complete the tasks given. Some studies have shown that students' efficacy and confidence in mathematics and problem-solving significantly affect their problem-solving (Callejo & Vila, 2009; Phan, 2014; Usher, 2009; Williams & Williams, 2010). Self-efficacy can determine students' actions in achieving something they want, including solving math problems. Self-efficacy is related to students' beliefs that they can carry out tasks based on their abilities. Students sometimes cannot show their achievements optimally according to their abilities. They often feel unsure that they can complete the tasks given by the teacher (Joët et al., 2011; Zimmerman, 2000). The results of previous studies show that "mathematical self-efficacy is a significant positive predictor of mathematical achievement" (Parker et al., 2014; Siegle & McCoach, 2007). Another aspect that becomes the focus of the study is ethnic culture.

The application of mathematics to solve social problems is a cultural practice. Dossey and Orey argue that mathematical knowledge results from social interactions where relevant ideas, facts, concepts, principles, and skills are acquired due to the cultural context (Rosa et al., 2017). Cultural products show creativity that contains elements of mathematics, such as traditional house architecture, which contains three-dimensional geometric shapes. Cultural values need to be integrated into mathematics education because cultural values cannot be separated from mathematics and learning. Current values are not taught but implicitly used as a means for students to appreciate the nation's culture through mathematics. Syed et al. (2011) state that it *"for decades, concern over the lack of success of many ethnic/racial minority students despite years of educational reform."* It explains that culture-based learning grew as a result of ethnic minority students' failure to succeed despite years of educational reform.

In German schools, ethnic minority students perform academically worse than their ethnic majority peers (Siegert & Olszenka, 2016). They are more likely to repeat the school year and risk being transferred to schools with lower academic pathways (Stark et al., 2017). Academic achievement can differ from one ethnicity to the next. A study on ethnic differences in academic achievement has been carried out by Patton and Roye and the *National Center for Educational Statistics*. The results show that Asian students outperform white students, who outperform African-American and Hispanic students (Zhang et al., 2011).

Furthermore, according to Aldous (Zhang et al., 2011), disparities in academic expectations among students based on race are major factors in achievement gaps. A study conducted by Edman and Brazil found ethnic differences in perceptions of campus climate, social support, and academic efficacy among students. The study finds that African-American and Caucasian students have higher cultural conformity than Asian students and higher academic self-efficacy than Asian and Latino students (Edman & Brazil, 2009). Cultural appropriateness and self-efficacy are correlated with Latino students' GPA. Academic efficacy is correlated with Asian students' GPA (Edman & Brazil, 2009). The description above explains that students in Germany and America with different ethnic backgrounds have different academic achievements.

Having hundreds of ethnic groups is one of Indonesia's riches (Arifin et al., 2015; Klinken, 2003). One of the areas in Indonesia that still maintains its identity and cultural uniqueness is South Sulawesi. The population of South Sulawesi province can be broadly divided into four ethnic groups, namely Bugis, Makassar, Toraja, and Mandar (Amir et al., 2020). However, after the division of South Sulawesi province and the formation of West Sulawesi province, the Mandar ethnic group is no longer a large ethnic group that characterizes the ethnic diversity in South Sulawesi. The Bugis ethnic group is the ethnic group with the largest population inhabiting the South Sulawesi region. Therefore, this study's limitation is the Bugis' ethnicity.

Culture in society distinguishes men's and women's positions. *Gender* differences in education are one of the most crucial issues. As a result, these differences in positions can lead to differences in learning achievement between men and women. This *gender* difference is fascinating for experts to study, with very mixed results. Several studies have shown differences in student achievement between men and women in terms of math achievement (Geary et al., 2019; Mejía-Rodríguez et al., 2021; Parker et al., 2018; Rodríguez et al., 2020).

In addition, a study revealed that boys outperformed girls in math towards the conclusion of secondary school, whereas gender disparities between primary and secondary education are insignificant (Skaalvik et al., 2015). In a meta-analysis investigating gender differences in achievement in mathematics, Hyde et al. (1990) found that in middle school and college, boys outperform girls in problem-solving. Although most studies support the alleged strength or performance of men in mathematics, several current studies report that women's performance is actually on par with men's (Bridgeman & Wendler, 1991; Marsh, 1989). Furthermore, according to Ayalon and Livneh (2013), Goldman and Penner (2016), Mejía-Rodríguez et al. (2021), gender differences in mathematics vary by country. Other studies have shown gender differences in self-efficacy expectations; female students have significantly lower self-efficacy than male students in mathematics and other traditionally male-dominated subjects, including computer science (Betz & Hackett, 1981, 1983; Hackett, 1985; Hackett & Betz, 1989; Post-Kammer & Smith, 1985).

This article explores the traits of students' self-efficacy and mathematical problem-solving skills using this concept. Additionally, this study's features look at how self-efficacy and mathematical problem-solving skills differ between men and women from a gender perspective. The assumption is built because students' self-efficacy affects their learning patterns and their behavior in making decisions, both social and learning-related decisions, including mathematical problem-solving abilities. It is crucial to study problem-solving abilities based on a gender perspective to examine further the potential of male and female students in the mathematics field.

As a result, this study was undertaken to examine the self-efficacy of Bugis ethnic students based on gender in light of the backdrop discussed above regarding the significance of self-efficacy in mathematics performance. High student self-efficacy has been proven in previous studies to affect math performance. This study also provides new knowledge by exploring the characteristics of students' self-efficacy by integrating ethnicity and gender.

Methodology

Research Design

This descriptive-explorative study was designed to explore students' mathematical self-efficacy in mathematics performance in Bugis ethnicity. This method is a qualitative research strategy that seeks to pinpoint, examine, and understand the essence of a select few people or groups (Creswell, 2017).

Sample and Data Collection

The purposive sampling method was used to obtain data from 25 students of Junior High School, Bone, South Sulawesi, Indonesia. Students were grouped by ethnicity and asked to complete the Mathematics Ability Test. Next, to explore the mathematical self-efficacy of each group, both participants were instructed to solve algebraic problems. After that, task-based interviews were conducted with one student from each group. So, two students were interviewed. Both were chosen because they (1) met the criteria for the results of the mathematical ability test (requirement: Mathematics Ability Test 75, based on the standard minimum score), (2) were Bugis ethnic students, (3) had excellent and capable communication skills, and (4) were ready to participate in this study.

The questions used for the Mathematical Ability Test were adapted from the National Exam/Ujian Nasional (UN) question bank for the 2019-2020 school year, which consisted of algebra, geometry, and number material. The Mathematics Ability Test questions were modified into ten items in the descriptions by observing the students' self-efficacy processes and recording interviews. This process also consisted of several open-ended questions, which were used to explore students' understanding of solving mathematical problems (algebra). The instrument was also tested for validity and reliability before being used to validate the questions, and two mathematicians and one education expert conducted the interview sheets. The criteria for the instrument's validity included the appropriateness of the test questions, content, language, and appropriate instructions, which were used to reveal the process of self-efficacy of junior high school students. Furthermore, these results were used to instruct participants on math problems, such as algebra. Algebra problems in the contextual form were used to find the area of a plane on a plane figure. Therefore, it was very suitable to be used to explore students' self-efficacy. The problem was shown in Figure 1.

> Mrs. Sitti cut a banana leaf which would be used to wrap the "*Barongko*" cake. The width of a banana leaf was half of its length, and its perimeter was 90 cm. Determined the area of the banana leaf that would be used to wrap the "*Barongko*" cake!

Figure 1. Algebra Problems

In this study, self-efficacy dimensions indicators were used as the basis for measuring a person's self-efficacy based on Bandura's theory (Bandura & Adams, 1977; Cecil & Pinkerton, 2000; Dixon et al., 2020; Maurer & Pierce, 1998). The identification of self-efficacy in solving problems was presented in Table 1.

Table 1. Identification of Self-Efficacy in Solving Mathematical Problems

No.	Dimensions	Indicators
1	Magnitude Level	Knowing the level of difficulty of mathematical tasks. Having confidence that you could complete mathematical tasks. Being able to use all available information to complete mathematical tasks. Checking the work results. Having a plan when completing mathematical tasks. Being confident in planning and completing mathematical tasks.
2	Strength Level	Having commitment (diligent/ independent/ enthusiastic) to complete mathematical tasks. Having the ability to overcome or complete mathematical tasks. Having experience that could support in completing mathematical tasks.
3	Generality level	Knowing the mathematical ideas used in solving mathematical tasks. Believing in mathematical ideas used in solving mathematical tasks. Having confidence in their ability to complete mathematical tasks with similar or different contexts.

Dimensions of magnitude (levels): This component refers to the individual's confidence in their capacity to complete tasks or issues at the appropriate level, namely how challenging they perceive the assignment to be. A person's self-efficacy will be restricted to easy, medium, and difficult tasks according to their perceived capacity to satisfy the behavioral demands required at each level of problem, or tasks will be ordered according to a specific level of difficulty (Hourigan & Leavy, 2022; Williams & Williams, 2010).

Dimensions strength (strength): This dimension has to do with how stable one's heart is or how strong (or weak) one's convictions are about their capacity to carry out duties (Cecil & Pinkerton, 2000). When faced with challenges, people who have high levels of self-efficacy in their skills are often uncompromising and persistent in stepping up their efforts. On the other hand, those with low self-efficacy are more susceptible to being deterred from their goals by seemingly insignificant challenges (Dixon et al., 2020; Hourigan & Leavy, 2022). The magnitude dimension and the strength dimension are typically inversely correlated, meaning that the perceived confidence in one's ability to execute a task decreases as the work's difficulty increases.

Dimensions of generality (generalization): The generality dimension has to do with the scope of the work that was done. Some people have a limited belief in a specific activity and scenario, while others are spread throughout a broad collection of activities and settings when it comes to overcoming or completing problems or tasks (Bandura, 2000; Maurer & Pierce, 1998; Pajares & Graham, 1999). People can determine whether they have high self-efficacy in one or more professional fields.

Analyzing of Data

In the data analysis process, each participant was thoroughly observed based on their self-efficacy in solving problems. The triangulation process was employed to verify the data collected through interviews (Creswell, 2017). This process was also carried out to confirm the findings of the students' answers, who were coded S (SL and PL student) and R (researcher). In conclusion, the results of the self-efficacy in mathematics performance of two students in solving math problems were also summarized.

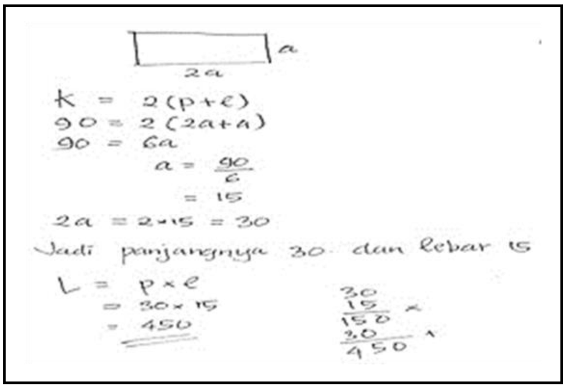
Additionally, the content, construct, and language aspects of the prototype test instrument and interview guide were validated. The conformance of the content to the student's educational level is one of its components. The clarity of test information and instructions is part of the construction component. Meanwhile, the language part entails using Indonesian properly, using communicative language, and using language that is easy to understand. The provided instrument was usable overall, although the two validators made several suggestions for improvement. Meanwhile, the validity and reliability of the instrument were tested on 34 students who were not prospective research subjects. The results of the validity and reliability analyses indicate that the instrument has met the validity of its items, and the reliability value is 0.872. Therefore, the test instrument is empirically valid and reliable. Thus, the instrument is suitable for use in research.

Findings/Results

Of the 25 students who took the Mathematics Ability Test, seven students, including two boys and five girls, got a 75. Of the seven prospective participants who met these criteria, one male candidate and one female candidate with relatively the same ability were selected for both math ability and gender, respectively. The following were the results of interviews with two participants, namely male students (SL) and female students (PL), to find out more about students' self-efficacy in mathematics performance.

Male Student Self Efficacy (SL)

The outcomes of SL's problem-solving were evaluated and then confirmed again during the interview stage. SL's solution to the issue in Figure 2 was as follows.



Translation

K = 2 (p + l)
90 = 2 (2a + a)
90 = 6a
a = 15
2a = 2 × 15 = 30
So, the length is 30 and the width is 15
L= p × l
= 30 × 15
= 450

Figure 2. Mathematical Problem Solving Results by SL

Magnitude Level of SL

SL had knowledge related to the questions given. He also did not find it difficult to understand the information in the questions. In addition, SL had confidence in solving the given problem because he had already understood all the information and had an overview of the solution to the problem. SL knew all the information on the questions and believed the information she understood was correct. He checked the results that had been obtained by rereading the questions. SL also knew the material related to the problem by thinking about the solution used. It meant SL had an initial picture of the problem. It could be concluded that SL had a view of the difficulty level of math tasks. These findings were confirmed based on the results of interviews conducted by SL at the magnitude level.

Excerpts from interviews with SL at the level of magnitude were as followed

R	What did you think about this question? Was it easy, complex, or anything else?
SL	I thought it was easy, sir.
R	Well, okay. Why was this question easy?
SL	In my opinion, the information on this question was obvious. The language used was easy to understand for me. I had studied rectangles and still remembered the formulas so that I felt I could solve questions like this.
R	In this case, there was the term "*Barongko*." Did this term give you a clearer understanding of the question?
SL	I found it easier to understand this question because I could imagine the shape of the "*Barongko*" wrapping, a rectangle.
R	Was there something difficult with this question?
SL	I did not think it was too complicated. I could understand all the information.
R	Why did you feel this problem was not too difficult? Could you explain more about it?
SL	I felt that the information contained in this problem was clear, the language was easy to understand, I could understand the meaning of this question, and I already had an idea to solve this problem.
R	After doing this question, which problem did you find challenging?
SL	The one that I thought was quite difficult to solve was to make a mathematical model that fitted the problem in this question.
R	Maybe there were obstacles that you felt when solving this problem. Tried to tell me what you thought when you were going to solve this problem?
SL	The problem was when making a mathematical model that fitted the information in this problem. After I read this problem, what I thought was that to be able to solve this problem, one must first be able to make a mathematical model that fitted the information or problem, namely the width of a banana leaf was one-third of its length; then found the length and width of the *Barongko* wrapper whose the perimeter was 80.
R	If asked to do a question like this, could you solve it yourself? Were you sure you would succeed? Why?

SL	Of course, I could solve problems like this, sir. Because I already knew and could understand the information in this problem. This problem was related to rectangles, namely the perimeter and area, and had known the relationship between length and width and already knew the perimeter. I already had an idea for solving problems about the perimeter and area of a rectangle. So, I was sure that I could solve this problem well, sir.

Strength Level of SL

The interview data showed that SL had a high enthusiasm for solving new problems that arise. In addition, SL was committed to solving new problems that would be given. He could understand the information from the questions given to solve the problems given and thought about how to solve the problems given by reading the questions carefully, reviewing the questions, selecting information, taking pictures, and making mathematical models. It was also confirmed that SL had solved a problem similar to the one given. He gave a general description of the problems that had been solved and explained that he had previous experience solving mathematical problems. The following is an excerpt from an interview with SL on the strength level.

Excerpts from the interview with SL on the strength level were as followed

R	Did you understand the words in this question?
SL	Yes, I did.
R	Well. Could you tell me what did you understand from this question?
SL	A mother cut a banana leaf to wrap a *Barongko* cake, then the perimeter of the *Barongko* wrapper was known, then the length and width relationship was also known. In this question, we were asked to find the area of the *Barongko* wrapping that would be used, sir.
R	Was this question challenging for you? Why?
SL	Yes, I thought it was challenging, sir. I did not think this question could be done right away, sir. It was necessary to review the information first, understood it carefully, and thought about what needed to be done before finishing it.
R	You said about this, "you needed to think about what you did before you finished it."
SL	I thought what needed to be done was to read the question carefully, examining what information was in the question, selecting which information could be used to solve the problem., then continuing to take pictures to provide an image, model, or meaning of the information from the problem, trying to remember how to solve it, understanding how to solve it, and applying the solution.
R	Well. What material was this related to?
SL	It was related to materials about rectangle, perimeter, and area.
R	What was known and asked in this question?
SL	The perimeter was 90 cm, the width of the banana leaf was half of the length, and the width of the banana leaf was asked to wrap the "*Barongko*" cake.
R	Were you sure about the answer?
SL	(*When the interviewer asked a question, the subject was silent and seemed to see/read the question, then the subject answered*) Yes, sir, the information about the question was unambiguous, sir.
R	Had you ever got or solved a problem like this?
SL	If I solved this problem, sir, I had never done it, but if it was a bit similar, I had been, and I was able to solve it, sir.
R	Could you tell me, what the problem was like?
SL	What I remembered was the story. In that question, the perimeter was known, sir, furthermore, the relationship between length and width was also known, but the relationship was expressed in the form of a ratio of length and width. Then, what I remembered was being asked to find the length and width of the rectangle.

Generality Level of SL

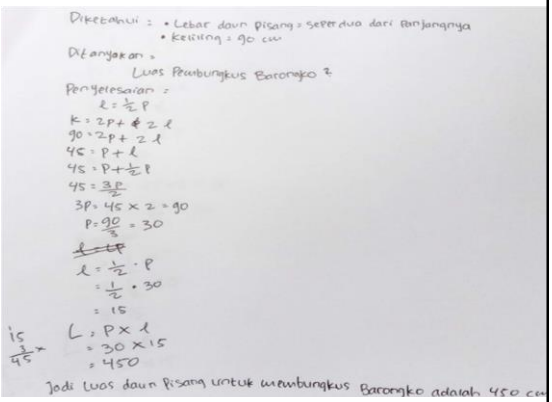
Based on written answers (Figure 2) and SL interview transcripts, the researchers obtained self-efficacy data at the generality level: Interview data showed that SL had an idea of all the information on the questions. He explained the materials used in problem-solving and the method used. SL could convince himself with the method used in problem-solving. He also knew the concepts used in solving problems, namely comparison, division, algebraic addition, and multiplication. In addition, SL had confidence in the ideas used in problem-solving. He also believed that the work done was right. SL checked the steps he took and followed the information about the questions, which made SL confident about the results of his work. Furthermore, SL believed in his ability to solve mathematical problems similar to the those given. SL reasoned that he already had experience in problem-solving, so SL was able to convince himself to solve other problems.

The following was a snippet of interview data by SL at the generality level, which was presented as followed

R	Could you explain what was meant by "width of a banana leaf" was half of its length"?
SL	The width of the banana leaf was half of the length. That was, if the length was two, then the width was one. If the length was four, then the width was two. If the length was 2*a*, the width was *a*. Thus, a rectangle had a length-to-width ratio of 2*a* to *a*.
R	Were you sure that your understanding was correct? Why?
SL	Yes, I was. Therefore, according to the information from the problem, the width of the banana leaf was half of the length. It could be made a comparison of the length and width of the length of the banana leaf to the width of the banana leaf to be 2*a* to *a.*
R	Well. What was used to solve this problem?
SL	The formulas used were perimeter, area, multiplication, and addition.
R	Were you sure that the method or idea you were planning would work? Why?
SL	Yes, I was sure it would work. The perimeter was known to be 90, and the relationship between length and width was known, namely 2*a* to *a;* already able to get the width; keep looking for the length again, if we got the length and width, we found that the area using the area formula.
R	Were you sure that the results of the work (steps) that you had done were correct? Why?
SL	Sure. It was because I had checked the steps I did earlier. Everything was correct and was following the information from the question.
R	Were you sure that all the procedures you used were correct? Why?
SL	Yes, sir. Because I felt that all the information I understood was already used, namely the perimeter of the *Barongko* wrapper was 90. The width of the banana leaf was half the length, which I stated in a ratio of 2 to 1 in length, so I made a comparison model for the length be *2a* and the width *a*. I was sure the formula that I used was correct. The formula for the perimeter was twice the sum of the length and width. In contrast, the formula for the area of the *Barongko* wrapper was length times the width, and I was also sure that the results of the calculations I did were correct and had checked the results of my work, sir.
R	After working on this problem, what concept or trait did you use?
SL	I used comparison, division of both sides, the addition of algebraic forms, and multiplication.
R	If you were given a question similar to this one, would you be able to solve it? Why?
SL	Certain. Because I could solve this problem. I had already known the formula for the area and perimeter of a rectangle. I also had some experience in solving this kind of problem.

Female Student Self-Efficacy (PL)

The results of problem-solving carried out by PL were shown in Figure 3 below.



Translation

Given: Banana leaf width = half of its length
Perimeter = 90 cm
Asked: The area of the "Barongko" cake wrapper
Solution:
L = ½p , K= 2p + 2l, So, 90 = 2p + 2l, 45 = p+l, 45 = p + ½p, 45 = 3p/2, 3p= 45×2=90
P= 90/3 = 30
Then, l = ½ × p = ½ × 30 = 15
So, L = p × l, L = 30 × 15 = 450 cm^2
So, the area of the banana leaf to wrap "Barongko" is 450 cm^2

Figure 3. Mathematical Problem Solving Results by PL

Magnitude Level of PL

PL knew the level of difficulty of a given mathematical task. In addition, PL had confidence in solving the given problem because she already understood all the information and had an overview of the solution to the problem. Moreover, PL could use all the information to complete a mathematical task (See Figure 3). She did not check the work results because she was sure that the results obtained were correct. PL also had a plan for completing a given mathematical task. On the other hand, PL found it challenging to change the form of mathematical models, but PL could overcome the difficulties experienced when completing mathematical tasks.

The following was an excerpt of an interview by PL at the magnitude level

R	What did you think about this question? Was it easy, moderate, difficult, or anything else?
PL	I thought it was moderate.
R	Why did you say it was moderate? What was the reason?
PL	In my opinion, the problem was moderate because of the area of the banana leaf to be used. We must first find the length and breadth. However, in this case, we still had to find the length and width values. It would be easier because if the length and width were known, it would be easy to find the area.
R	Well. Before completing or working on this problem, what did you think you need to do to answer this question?
PL	I thought I needed to read, paid attention closely to every information contained in the question; selected and marked the information that would be used or needed in problem-solving in this question; tried to interpret any information that would be used in solving problems; tried to remember, understood how to solve it, then did it.
R	Were you sure the way and the activities you were going to do could succeed in getting the result or answer?
PL	I was sure, sir. Because I thought all the information in question was under the plan that would be carried out in problem-solving.
R	Were you sure you could solve problems like this?
PL	Yes, I was, sir.
R	Why?
PL	Because such a question used the formula for the perimeter and area of a rectangle that I already knew how to solve, so I felt confident that I could solve them well.
R	After doing this problem, was there a problem, or was there a part that you found difficult in this problem?
PL	There was no one difficult, sir, but there was a bit more complicated, sir.
R	Which part was it?
PL	Hmmm... I thought it was about changing or making the mathematical form.
R	Why did you find it a bit difficult to change the mathematical form?
PL	Because, in part, the width of a banana leaf was half of its length, I needed much time to pay attention to understand, interpreted the language, and if you did not understand it and could not make mathematical

	forms. You could not solve it, and you would not get the result.
R	After completing your work, did you review the results of your work?
PL	No, sir, I did not check again the work I had done earlier because I was sure that what I had done was correct.
R	Well. Were you sure that you had used all the information in this problem in problem-solving? Why?
PL	Sure. The problem was that the width was half of the length, then the perimeter was 90, the *Barongko* cake wrapper was rectangular, so the formula used was related to rectangles.

Strength Level of PL

At this level, PL is committed to completing the given mathematical task. It was indicated by the PL's understanding of the information in the problem. In addition, the PL explained the information understood in the questions in a language that was easy to understand and made me feel confident that the information was correct. It showed that PL had the readiness to complete the given mathematical task. In addition, the PL explained previous experiences related to questions similar to the given task. Therefore, it was concluded that PL had the experience that could support her in completing mathematical tasks.

The following was an excerpt from the interview by PL at the Strength level

R	Did you understand the words in this question?
PL	Yes, I understood.
R	Could you tell me, what did you understand from this question?
PL	A mother cut a banana leaf to make a *Barongko* cake wrapper, a rectangular *Barongko* wrapper. The width of the banana leaf was half of the length. The perimeter was 90 cm, then they were asked to find the area of the banana leaf that would be used to wrap the Barongko.
R	Had you ever studied this material before? What material was it related to?
PL	Ever, related to rectangular material.
R	What did you think was known and asked in this question?
PL	What was known, the width of a banana leaf was half of its length; The perimeter of a banana leaf was 90 cm. The question was the area of the banana leaf used to wrap the Barongkao cake.
R	Were you sure what you understood was correct? Why?
PL	Certain. Because the problem stated that the width of a banana leaf was half the length, for example, the length was four. The width was half the length. Then, the width was half times four was two; so, for example, the length was *p*, the width must be twice *p*, but the perimeter must be 90 cm.
R	If you came across a problem liked this, could you solve it yourself?
PL	I felt like I could finish it myself, but maybe it would take me a while to finish it.
R	How did you solve your problem?
PL	I read it repeatedly, understood by trying to imagine the shape of the *Barongko* wrapper whose width was half the length, and I tried to work and work on it until I got the answer.
R	Could you tell me, what did you imagine?
PL	I imagined if the *Barongko* wrapper had the same shape as a rectangle, the width was half of the length. If the length was four, the width was half of four or two, then if six the width was half of six was two, and vice versa if the length was *p*, the width was half of *p* was twice *p* so that the mathematical form I made was *el* equal to twice *p.*
R	After working on this problem, maybe, did you remember or had you ever solved a problem like this?
PL	Never, sir, but I had solved a problem similar to this one.
R	Could you give me an idea of what it was like?
PL	I forgot the problem, but if it was similar, sir, looked for the area and found the length and width first, and then you could find the area.

Generality Level of PL

The PL stated that the mathematical tasks solved were related to the perimeter formula and the area formula. It showed that PL knew the mathematical ideas used in solving mathematical tasks. He also believed that the idea he used was correct. It was based on the PL explanation that the purpose of this problem was to find the perimeter, area, and operations used (addition, division, multiplication, and subtraction). In addition, PL felt confident in their ability to solve problems based on the difficulty encountered in mathematical tasks similar to those given. She could explain the description of questions that were similar to the given task. It showed that PL had confidence in its ability to complete mathematical tasks in similar or different contexts. Therefore, it was concluded that the PL met the level of generality.

The following was an excerpt of an interview by PL at the Generality level

R	Okay. What did you use to solve this problem?
PL	I used the formula for the perimeter and area, sir.
R	Was it enough with the formula for the perimeter and area?
PL	Mmmm. I thought I also needed operations, such as addition, division, multiplication, and subtraction.
R	Were the materials, concepts, or ideas you mentioned above appropriate to this problem?
PL	I thought it was appropriate, sir. Because the perimeter was known, the area was used because we wanted to find the area, and we used operations to find the length, width, and area, sir.
R	Were you sure or not? What did you do was suitable to the problem?
PL	Yes, sir, because the problem was finding the length and width values to find the area. If we did not get the length and width values that matched the information, it was impossible to get the area.
R	Were you sure that the steps you had taken or were running are correct?
PL	Yes, sir.
R	Well. After you worked on this problem, what concept or trait did you use?
PL	I used division of both sides, equalizing the denominator, addition of algebraic forms, the addition of fractions, and multiplication of integers.
R	Was there anything else?
PL	(*The subject paid attention, looked at the worksheet, and gave a response, a moment later*) I thought multiplication of fractions by integers and multiplication of integers by numbers.
R	Suppose you were given a question similar to this question. Were you sure you could solve it? Why?
PL	Sure, I could. Because I had worked on a problem like this and I had solved it correctly, sir.
R	What if the problem was different?
PL	If it was easy or not too difficult, I was sure you could, sir. Nevertheless, if it was difficult, maybe I could finish it well.
R	If so, how did you distinguish between easy questions, not too tricky or moderate, and challenging questions?
PL	In my opinion, I would say easy questions were easy. If the language was easy for me to understand, I could understand, I could interpret, I did not confuse, and I already knew how to solve, and it was easier to calculate.
R	Okay. Would you please tell or give an overview of the problems related to rectangles that you had solved?
PL	I usually found the perimeter and area of a rectangle with known length and width; once the perimeter was known and one of the lengths was known, and the area will be sought; there was also a question in the form of a story, the length and width had not been known, but an explanation of the length and width had been mentioned in the problem, sometimes the perimeter and area were known.

Discussion

A number of variables, including gender and self-efficacy, have an impact on mathematical performance (Huang, 2013). Students can be different in how they process and complete the mathematical tasks they face. This statement is supported by Arcavi (2003), Gorgorió and Planas (2001), who show that people have different ways of searching for and processing information, as well as seeing and interpreting it. As a result of these differences, there are differences in learning achievement between men and women (Geary et al., 2019; Parker et al., 2018; Rodríguez et al., 2020).

This study aims to identify students' self-efficacy in solving math problems. The results of the data analysis and findings are described as follows. Individuals behave in certain situations depending on the reciprocity between the environment and cognitive conditions, especially cognitive factors related to their belief that they can or cannot perform satisfactory actions. Self-belief or hope of having the ability to perform the expected action or self-assessment, whether it can perform good or bad actions, can or cannot do as required, is better known as "self-efficacy" (Stankov et al., 2012).

In general, in this paper, the fundamental difference in solving math problems, male students' self-efficacy (Bugis ethnicity), and female students' self-efficacy (Bugis ethnicity), is found in their ability to think abstractly. Subjects with male students (ethnic Bugis) indeed seem to be superior in thinking to female students (ethnic Bugis). Self-efficacy, especially self-confidence, seems to give rise to its impetus to keep trying all kinds of ways until they find the correct answer. When they face challenges, they quickly shift their mindset and decide on alternative approaches to providing the best solution. They look persistent and never give up while solving problems. However, they admit that the expanded abstract question is the most difficult compared to the previous problem. However, it is not an obstacle for them to keep trying. This finding, supported by Zimmerman (2000), demonstrates that the level of difficulty of the tasks faced by individuals affects the individual's assessment of their abilities. It is also recognized by Kıran & Sungur (2012), Ramdass and Zimmerman (2008), and Usher (2009), that the more complex a task is faced by an individual, the lower the individual will assess his ability. Conversely, if the individual faces a straightforward task, the better he assesses his ability.

Additionally, these outcomes show that both students of Bugis ethnicity are capable of handling mathematical problems successfully. It is supported by Akib (2016), that Bugis ethnic students show a significant level of mathematical performance when faced with math problems associated with culture. The researcher did not, however, compare math ability among the Bugis ethnic group with that of the Makassar, Toraja, and Mandar ethnic groups in this study. As the dominant ethnic group in South Sulawesi, it examines the self-efficacy of Bugis ethnic pupils in math performance. The findings demonstrate that most students perform better than minority students, particularly when it comes to problem-solving. It is relevant to Edman and Brazil (2009), Syed et al. (2011), that majority students perform better academically than minority students.

Initially, both male and female students may identify various concepts in the problem and establish links between these concepts in the form of patterns while answering questions. They employ procedural skills, certain arithmetic procedures, and trial-and-error methods to identify patterns. This method is used repeatedly until they are certain that the pattern they discover is sufficient to ensure the reality of the relationship they are looking for. They realize that a mathematical model can represent the connection between the notions mentioned in the problem as a symbol. Thus, it may be argued that both participants have confidence in intending to complete mathematical problems and have done so. This finding is supported by previous studies (Lee & Hannafin, 2016), that a person's confidence in their capacity to make a determination is an ability related to the emotive aspects used in learning mathematics and necessitates that mathematics instruction be more student-centered. Giving students the chance to show off their aptitude for seeking, selecting, and discovering information in relation to learning, for instance, might boost their level of comfort while solving mathematical problems.

Encouragement from within them (male and female students) shows that they view difficulties as challenges, not as obstacles. In achieving a goal, self-efficacy influences one's work ethic and persistence. It is supported by Skaalvik et al. (2015), demonstrate the link between high self-efficacy and motivation and success in math learning. Changes in attitudes, conduct, cognition, and problem-solving actions are some of the ways that the influences that arise might be observed. This finding supports the claim made by Gist and Mitchell (1992), that students with similar abilities may behave differently depending on their level of self-efficacy since self-efficacy influences choices, objectives, problem-solving, and persistence in the effort. Further discussion is given regarding factors relating to student self-efficacy at the magnitude, strength, and generality levels.

With regard to the first aspect, the degree of the student's confidence dictates how challenging the math problems they have used are. Male students consider the problem to be easy (easy difficulty level), while female students consider it to be moderate (moderate difficulty level). In this case, male students excel in the aspect of magnitude compared to female students. Male students, on the other hand, are more confident and active than female students, though their confidence levels differ slightly in magnitude.

The second aspect is the strength of the student's degree of dedication and preparedness to work on math problems. The dedication and preparation of male students are equal to that of female students. That is, male and female students can adequately identify all the information and the purpose of the questions given. However, in the experience aspect that supports solving math problems, male students are superior to female students. In this aspect, male students are better able to explain the description of previous experiences related to similar questions compared to female students.

The final aspect of self-efficacy is generality in knowledge and belief in concepts when it comes to solving mathematical problems. Students of both genders are equally self-effective. It is based on the findings of interviews and the responses of the two participants, showing that they can defend their reasoning for approaches taken to solve mathematical problems. However, when it comes to the ability to relate to previous experience, male students outperform female students. Male students are more confident in being able to solve different problems than female students. Consequently, there is a small difference between male and female students in terms of generality, but male students perform better.

The findings of this study suggest that male students are superior in three areas, namely magnitude, strength, and generality, with a number of indicators from each aspect. The first aspect (magnitude) consists of six indicators, namely the level of difficulty of a mathematical task; confidence in completing a mathematical task; using all information to complete a mathematical task; checking work results; planning for completing a mathematical task; and confidence in planning for completing a mathematical task. The second aspect (strength) consists of three indicators, namely commitment (diligent/independent/enthusiastic) to completing a mathematical task; readiness to overcome/complete a mathematical task; and experience that can support completing a mathematical task. In the third aspect, generality has three indicators, namely: knowing the mathematical ideas used in completing mathematical tasks; believing in mathematical ideas used in completing mathematical tasks, and believing in their ability to complete mathematical tasks in similar or different contexts. This finding is supported by Hackett and Betz (1989), Hyde et al. (1990), that women's confidence is lower in their ability to learn mathematics and their belief that mathematics is not helpful to them, and also recognized by Badger (1981), that boys are better than girls at math performance. However, it contrasts with Bandura (2000), which states that women have higher efficacy in managing their roles than men. It happens because male students tend to reason compared to girls. After all, women are more alike in using their feelings.

The affective state (psychological component) of students, which includes their interest in and motivation for learning, is another factor that significantly influences learning. The most crucial thing is to instill in students a strong sense of confidence. The results of this study indicate that students can overcome the difficulties they face with high confidence. Students view every difficulty they encounter as an interesting challenge that must be faced, not as an obstacle that is simply ignored. By increasing self-efficacy in students, students do not easily give up when faced with difficulties and become intelligent individuals in determining appropriate strategies to solve the problems they encounter. It is relevant to Skaalvik et al. (2015), having high levels of self-efficacy might boost motivation and academic success.

Conclusion

Students' self-efficacy has a crucial role in learning mathematics, especially anxiety and belief, namely to control stress that occurs in students and have an impact on math performance. Researchers not only examine aspects of self-efficacy, but also integrate self-efficacy, culture, and gender as factors that support students' mathematical performance. The results of the analysis and discussion show that there are differences in the self-efficacy of male students (ethnic Bugis) and female students (ethnic Bugis) in mathematics performance. The differences exist in the three aspects of self-efficacy, namely magnitude, strength, and generality, including (1) the aspect of magnitude, male students of Bugis ethnicity outperform female students of Bugis ethnicity at the level of confidence. Both subjects are full of concentration to interpret the information repetitively in reading the given problem; plan by thinking hard in making an effort to apply previous experience and knowledge. In addition, both subjects try and have confidence in carrying out problem-solving and feel confident about the results obtained by re-examining the results of answers based on previous experience; (2) the aspect of strength, the self-efficacy of male students of Bugis ethnicity and female students of Bugis ethnicity tend to have slight differences. In this aspect, male students are better able to explain the description of previous experiences related to similar or different questions than female students; and (3) the generality aspect, this aspect also shows that the difference in self-efficacy between male and female Bugis students has a slight tendency. However, in this aspect, male students are more able to convince themselves in solving different problems compare to female students.

According to self-efficacy theory, these results confirm that high confidence and self-confidence are important predictors of self-efficacy. Closer analysis shows that previous experience in self-efficacy theory in mathematics learning is not so important. It may indicate that feedback on performance during coursework may be less clear in these subjects, where this aspect has a less prominent role. Confirmation of one's ability to complete a task is perhaps more difficult to obtain, or alternatively. Difficulty using previous experience, a person can lead to a smaller tendency in his performance. The effect on self-efficacy will be less clear in this case.

Recommendations

Further research in this area should concentrate on three aspects and be cross-cultural. We need to investigate whether there are differences in student self-efficacy in certain cultures at the junior secondary level. Finally, it may be interesting to examine the extent to which cultural differences in self-efficacy exist in the subtopics of the subjects investigated for this study. Additional research should be able to examine ways to boost students' three aspects of self-efficacy, namely magnitude, strength, and generality, particularly when they display confusion when doing mathematical tasks provided by the teacher.

Limitations

Like all research, this study has limitations. The limitations in this study are that the selection of subjects related to the Bugis ethnicity does not use instruments; the task of solving mathematical problems focuses on the material of algebra and rectangles; and the selection of subjects does not consider the economic, social, and educational background of parents and students' environment. Limitations on ethnicity explored in this study are devoted to the ethnic Bugis Bone.

Authorship Contribution Statement

Alam: Design, analysis, and conceptualization. Budiarto: Reviewing, translating and citing Mendeley. Siswono: Supervision and proofreading.

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