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The measurement of self-efficacy students in mathematics lesson tenth students of senior high school

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Abstract. Self-efficacy can be defined as a person's assessment of abilities that the individual has in achieving something that has been targeted. The study aims to describe self-efficacy on students at mathematics lessons. The population in this study is the fifth annual public high school class in 2019/2020. The sample in this study is the 10th X Science class at the state high school of 5 Semarang using the simple random sampling technique. The instrument used in this study is a non-test instrument of self-efficacy of 20 statements and observations. The data analysis technique used in this study is a descriptive data analysis. The research shows that the average of the score on the overall scale of self-efficacy belongs to a positive category. The probability of self-efficacy in the study of mathematics consists of students with high self-efficacy by 16.67%, students with medium self-efficacy are 63.44%, and students with low self-efficacy are at 20%.

1. Introduction

Education is an effort to prepare a human through tutoring, teaching, and training activities that are expected to be useful for his or her future roles [1]. One of the fundamental sciences in various fields, as well as the practical value of everyday life, is mathematics. Thus, mathematics is learned by children from early childhood education [2]. Everyone is in touch with mathematics in resolving problems, such as those relating to the width of an area, distance, finances, and so on. Given the importance of mathematics, it would be common if mathematics become the compulsory subject in every grade of education. There are three distinct aspects to mathematics lesson: cognitive, affective and psychomotor. The three aspects are intertwined. The aspect of affective plays a similarly important role in supporting the student's success in life. The affective ability is absolutely related to psychological. Therefore, the psychological aspect of students in learning must be carefully considered. The psychological aspect is an aspect spurring a person's success in accomplishing a good task [3].

Yuliasari states that the reflections of the results of PISA (Program for International Student Assessment) and TIMSS (Treads in International Mathematics and Science Study) are Indonesia's lack of training in resolving problems with the same characteristics as the problems in PISA and TIMSS [4]. It indicates that mathematics education in Indonesia needs to be enhanced. Mathematics has always been regarded as a difficult subject for students. The student became frightened and worried of mathematics and that is resulted from a lack of confidence in his or her ability to complete the mathematical tasks.



One of the predators that influence student success in mastering the concept is self-efficacy. Students must have high efficacy in mastering a learning material because the success of a person depends on the beliefs held in the students [5]. According to Canfields & Watkins, individual success can be determined, among other things, by his view of his abilities. That view is repeated, sustained, difficult to change and grounded in individuals [6]. One type of view of his abilities that can affect individual success is self-efficacy [7]. Mathematics holds a prominent place in academic curriculum, and the academic success in these subjects is crucial in today's scientific and technological times, so self-efficacy is essential in mathematical problem solving [8].

Bandura describes Self-efficacy as "the ability of trust in organizing and executing the kinds of actions necessary to produce the accomplished achievements. Self-efficacy instituted a key component in Bandura's social cognitive theory. Building signifies the beliefs of a person, about his ability to successfully perform a task. It was found that Self-efficacy is a major determinant for individual development, their persistence using difficulties, and emotional thinking and reactions that they did [9]. Furthermore, Self-efficacy beliefs play an important role in achievement motivation, interconnect with self-regulating learning processes, and mediating academic achievement [10].

Collins declares that students with mathematical abilities and higher self-efficacy, they were faster at strategizing and solving problems, and chose to re-work problems that they had not solved, and did so more accurately than students with the same capabilities but disputable on his self-efficacy. The student who has high self-efficacy will continue to attempt to accomplish the task no matter how difficult the task might be. Students have a positive attitude of their own ability to be careful at work, be firm and positive, and be able to think clearly, focus, and not easily despair. So with that attitude, the students' mathematical skills are relatively good. Efficacy belief also influences the way someone acts, how much effort they made [11]. This diligence and effort of students can make a positive contribution to the mathematical learning that students accomplish at school. On the other hand, students with a low self-efficacy in doing certain tasks will tend to avoid tasks that are deemed difficult and unable to accomplish. Students with a low self-efficacy generally have no confidence in his ability to solve the problems. Students tend to be lax in the performance of a task, easy to despair and give up, which in time students take shortcuts by cheating on a friend's job. Those students also had a low self-awareness and self-motivation. So with those attitudes, the student's ability to solve mathematical problems is relatively low. High self-efficacy in mathematics would encourage the achievement of learning mathematics better than before [6]. Based on the statements above, it can be concluded that self-efficacy has a positive contribution and has a vital role to students' mathematical achievement.

According to Bandura, there are 3 dimensions of self-efficacy those are 1) Magnitude or degrees of difficulty; A person with high degree of difficulty is optimistic in his or her success; 2) Strength or strength that shows the degree of one's steadiness in maintaining one's effort until he or she succeeds in spite of hardship; 3) Generality shows the magnitude and extent of the accomplishment of mission success [6]. As for the explanation of each of these aspects or dimensions as presented by Ika Maryati is as follows: 1) The degree of difficulty of duty (magnitude). This aspect implicates the selection of behaviors that the individual will try based on his or her understanding of the difficulty of duty. When tasks imposed on an individual are of varying degrees of difficulty, individual self-efficacy differences may be limited to simple, intermediate or high tasks. The individual will endeavor to perform tasks that are thought to be achievable and avoid situations and behaviors that are beyond his capabilities, 2) Generality. This aspect involves the scope of conduct that the individual believes in his or her abilities. Individual confidence in his abilities depends on an understanding of his abilities in an activity/situation, particular/limited or a series of larger and variation activities/situations, 3) strength of confidence (strength). This aspect relates to the power of one's confidence in his ability. Steady expectations in the individual encourage persistent efforts to achieve goals, even if they may not yet have sustaining experiences. On the other hand, weak and doubting expectations of self-ability will be easily shaken by unsustainable experiences.

Based on the interview with the mathematics teacher at the school, it obtained that the school has not yet conducted self-efficacy of students. All this time the teacher has only looked at the students from

the exam scores reflecting the students' mathematical performance. The purpose of this study is to provide an endless descriptive explanation of self-efficacy of students at school, especially at State Senior High School 5 of Semarang in mathematics lesson.

2. Methods

The study is a descriptive study aimed to know a self-efficacy student in mathematics lesson. This research is a descriptive study. The population in this study is all students in the tenth grade of senior high school 5 of Semarang academic year 2019/2020. The sampling technique used is a simple random sampling technique. The subject of this study is the tenth science grade with 30 students. The instrument used is a non-test of the Likert scale. Questionnaire is drawn up by the dimensions of self-efficacy by bandura as magnitude, generality and strength dimensions. The data analysis in this study was done by descriptive analysis, counting the average score of questionnaire, and counting percentage. To determine average by using the following formula:

$$average = \frac{total\ score}{the\ number\ of\ item} \tag{1}$$

Determine percentage by using the following formula:

$$percentage\ of\ score = \frac{average\ score}{ideal\ score} \times 100\% \tag{2}$$

3. Results and Discussion

The research subject consisting of 30 students was given a Questionnaire with a total of 20 statement items consisting of 10 positive statements and 10 negative statements. Statements 1 through 8 are magnitude-dimensional statements relating to the level of duty difficulties faced by students. The statements from the 9th through 14th are about generality dimensions that are perceived abilities demonstrated by students in a different context of assignments. Statements from 15th to 20th including a strength dimension which is a strong belief in students as their own abilities.

The scale of Likert Questionnaire installment presents the four choices: SS (strongly agree), S (agree), TS (disagree) and STS (strongly disagree). The choice N (neutral) was not used to invite students to sides. Each choice has a different score. On positive statements of SS = 4, S = 3, TS = 2 and STS = 1. In contrast to negative statements of SS = 1, S = 2, TS = 3 and STS = 4. The charge is guided by the researcher so that the students will truly understand the meaning of each statement listed on the questionnaire that the student selects precisely one of the four options available according to the circumstances in the student. As for the results of questionnaire working by the student are as follows.

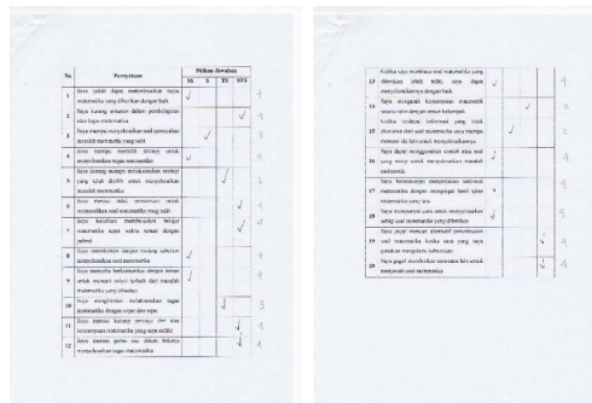


Figure 1. The Result of Students' Work.

After the questionnaire propagated the next step is calculating the average of the total and each self-efficacy dimension. Based on the distribution of the questionnaire gained the results of the self-efficacy presented at table 1.

Table 1. The Results of a Self-Efficacy Calculation

Dimension	No of Statement	Average
Magnitude	1 to 8	3.03
Strength	9 to 14	3.06
Generality	15 to 20	3.02
The Overall Average		3.03

It seems that the overall rate of 3.03 is more than the median score on a scale of 4 so it summarizes that self-efficacy students in mathematics lesson is positive. The calculations are also made in each dimension to know the reruns. According to table 1, it is said that in the magnitude dimension the average measurement 3.03 was positive. In a strength dimension gained by 3.06 that means positive for more than 3. Last to generality dimensions retrieved the wreckage at 3.02 which means positive.

Table 2. The Category of Grouping Self-Efficacy

Criteria	Category
$x_i > (\bar{x} + s)$	High Self-Efficacy
$(\bar{x} - s) \leq x_i < (\bar{x} + s)$	Medium Self-Efficacy
$x_i < (\bar{x} - s)$	Low Self-Efficacy

Note:

s : standard deviation

\bar{x} : the average of overall students scores

x_i : the total scores of students to-i, where $i = 1,2,3, \dots, n$

Table 3. Categorization of Level Self-Efficacy Tenth Grade Student

Category	Score	Frequency (f)	Percentage
High Self-Efficacy	$x_i > 69$	5	17
Medium Self-Efficacy	$52 \leq x_i < 69$	19	63
Low Self-Efficacy	$x_i < 52$	6	20
Total		30	100

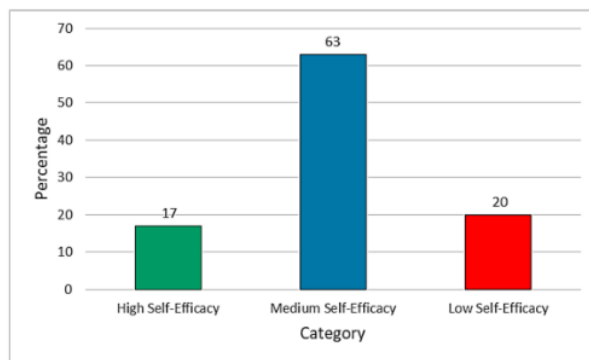


Figure 2. Graph Categorization Self-Efficacy Tenth Grade Student

Interpretations Self-efficacy beyond the positive and negative criteria can also be presented in high, medium, and low ones. According to Arikunto [12] it is to determine the student's position by dividing the classes of low, medium, high groups by using the standard deviation. How to determine those limits is presented in table 2.

Based on the acquisition of data that has been obtained by using self-efficacy questionnaire, analyzing the data with descriptive technique and percentage, the result is presented in table 3 and picture 1.

Based on each dimension on self-efficacy, after measuring, the average dimension is 3.03. It seems that magnitude dimensions are at a medium and positive level. This illustrates that when a student is given a task of varying degrees of difficulty, the student will strive to perform the tasks he or she considers to be able and the student avoids the tasks beyond his or her abilities. Students were quite optimistic about the task. Next on generality dimensions, the average dimension of generality is 3.06. It appears that students are at a medium and positive level. That means that the student is fairly certain of his abilities to take place within certain domains or apply to various activities involving making past experiences his way to success, finding new situations, and new challenges. The last dimension is strength. The average dimension strength is 3.02; therefore it is at medium and positive level. It means that the student is strong and steady in holding on to his or her effort until he or she successfully completes a mathematical assignment in spite of difficulties or lack of encouraging experiences in doing the task.

As a result of observations, the students with the high self-efficacy category have better grades of studying mathematics than those with medium or low self-efficacy, and the students with the medium self-efficacy are better than those with low self-efficacy. This harmonizes with research carried out by Asakereh & Nouroddin [13] that a significant relationship was observed between self-efficacy and academic achievement. The height of self-efficacy would be associated with the height of academic achievement. However, the lack of self-efficacy can result in a lack of academic achievement. Students with high conviction will be able to determine their motivations for excellence [14].

Self-efficacy plays an important role in achieving motivation, interacts with learning, and academic attainment. Someone who has a high Self-efficacy would have great confidence and effort at solving a problem. Nor the opposite, someone who has a low self-efficacy is likely to be unsure and prone to solving the problem. Research indicates that there was a difference in the students' ability to solve a mathematical problem reviewed by self-efficacy (high, medium, low) [10].

4. Conclusion

Based on the results, the conclusion is that self-efficacy of students on the overall study of mathematics is at a medium and positive level. As well as the three dimensions of self-efficacy are magnitude, generality and strength that each are at a moderate and positive level. There are 5 students (17%) having high self-efficacy, 9 students (63%) possessing medium self-efficacy, and 6 students (20%) who have low self-efficacy. Overall, the students in tenth science grade of the state of high school 5 Semarang have medium self-efficacy.

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