The Influence of Self-Efficacy on Mathematical Understanding Ability in Elementary School Students

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Abstract. The discovery of students who feel anxious, doubtful, and do not have confidence in learning mathematics has an impact on the low component of affection and also student achievement, the importance of Self-Efficacy is the trigger for this research. The purpose of this research is to determine the phenomenon of the influence and linkage of Self-Efficacy on the mathematical ability of elementary school students. This type of research is pre-experimental research with one-shot case study design. Data analysis using a mix of quantitative and qualitative analysis methods. Data retrieval techniques are taken with test techniques to measure mathematical understanding ability and non-test techniques such as filling out questionnaires and interviews. The results of this research were shown from inferential correlation and linear regression tests and concluded that: (1) self-efficacy has a significant relationship with students' mathematical understanding ability; (2) self-efficacy positively affects students' mathematical understanding ability; and (3) The findings show that students' self-efficacy is still low, as well as their learning outcomes, the trigger for low self-efficacy is thought to be due to the socio-cultural and economic background of students, aggravated by learning styles in schools that do not pay attention to the realm of student affection.

Keywords: Primary education, self-efficacy, mathematical understanding, learning obstacle.

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INTRODUCTION

Education is a necessity of mankind, without education, humans will not be able to develop. Based on the National Education System Law No. 20 of 2003 2003 (Khunaifi & Matlani, 2019) emphasizes education being able to provide quality human resources and provide benefits for humans and the state. Education is planning to change the behavior of students in order to be able to develop their potential, skills, intelligence, personality and noble character.

Education in Indonesia is inseparable from school, one of which is Mathematics, Mathematics is a useful science in the field of human life. The purpose of learning mathematics in the 2013 curriculum (Kemendikbud, 2013) is (1) improving intellectual abilities, (2) problem solving skills, (3) high learning outcomes, (4) Learning to communicate and (5) developing student character. Based on these points, it can be concluded that the study of mathematics is required not only to have intellectual abilities and obtain high learning outcomes, but also in the field of psychomorphism and affective or character traits. Furthermore, looking at the objectives of the mathematics curriculum listed in permendiknas Number 22 of 2006 (Sari, 2016), one of them stated "Having an attitude of respecting the usefulness of mathematics in life, ... as well as a tenacious and confident attitude in problem solving ...". Self-confidence in problem solving is known as self-efficacy, Bandura (Howard, 2015) explains an individual's belief in his ability to achieve goals, is an ability in the affective realm, furthermore, Bandura states that the ability of self-efficacy can determine how a person thinks, and behaves and motivates himself. A person who has high self-efficacy will feel confident in his ability to carry out a behavior successfully.

The importance of self-efficacy is represented in various student activities. How confident the student is in his ability to solve problems, activities or tasks to get good results. Self-efficacy also affects their perseverance in various activities. Perseverance and determination trigger actions to achieve goals despite obstacles or despair.

Self-efficacy abilities can also trigger student achievement and motivation. Students with good self-efficacy tend to face tasks with high desire, while students who have low self-efficacy tend to avoid many tasks, especially challenging tasks (Ghufron & Risanawati, 2017). From this

statement, it can be agreed that self-efficacy ability is very important and needed by students, having good self-efficacy ability is expected to be able to trigger high learning outcomes as well.

The importance of self-efficacy skills in fact does not receive good attention by educators, based on previous studies stated that many teachers are too focused on the Cognitive Realm and do not pay attention to psychological factors in students, thus implicating low self-efficacy skills (Auliya & Munasiah, 2016; Hanifah et al., 2020; In'am & Sutrisno, 2021; Lidiawati et al., 2021; Masitoh & Fitriyani, 2018; Mulyani et al., 2020; Ningsih & Hayati, 2020; Rahmi et al., 2020, 2017; Rakhmawati & Mustadi, 2019; Riskiningtyas & Wangid, 2019; Rorimpandey & Midun, 2021; Rusmansyah et al., 2021; Siregar & Prabawanto, 2021; Sopiyah, 2016; Yuliyani et al., 2017; Yuliyanto & Turmudi, 2020; Yuliyanto & Yulianto, 2021).

The low ability of self-efficacy also has an impact on obstacles or learning difficulties of students as revealed in the research of Triswanto and Laksmiwati (2020) which found low self-efficacy in line with students who have learning difficulties, Triswanto and Laksmiwati also stated that self-efficacy has a close relationship with difficulties learning mathematics, therefore confidence and self-ability are needed by students who have learning difficulties.

The results of interviews with several elementary school teachers in West Java throughout 2022 stated that there are still teachers who do not pay attention to the psychological and mental state of students in mathematics learning, thus triggering fear, anxiety, and despair when learning mathematics takes place and also has implications for low self-efficacy ability, especially with these circumstances, so students' orientation to mathematics learning is only limited to counting, In fact, one of the functions of mathematics is complex problem solving, which is the ability to solve problems with the analysis of human thinking logic.

Related to this background description, there are several results of previous relevant research on self-efficacy and student mathematics learning outcomes. Research conducted by Aan Yuliyanto, et al. (2020) on the relationship between self-efficacy ability and mathematics learning outcomes through the Concrete-Pictorial-Abstract (CPA) approach in elementary schools, states that there is no relationship or correlation between self-efficacy and student learning outcomes, meaning that students who have high self-efficacy cannot be ascertained that learning outcomes are high and vice versa. Furthermore, Yuliyanto and Yulianto's research (2021) on the influence of self-efficacy ability on the interpersonal intelligence of elementary school students, states that there is no significant relationship between students' mathematical self-efficacy and the interpersonal intelligence of elementary school students. Furthermore, mathematical self-efficacy has a very limited influence on students' interpersonal intelligence. Thus, an increase or decrease in mathematical self-efficacy cannot be guaranteed to also occur in the interpersonal intelligence of primary school students. Furthermore, research by Mulyani, et al. (2020) on the relationship between mathematical self-efficacy ability and elementary school student motivation, the results of the research stated that there is a positive relationship between mathematical self-efficacy and student learning motivation and there is a significant relationship between mathematical self-efficacy and student motivation. Furthermore, research from Rakhmawati and Mustadi (2019) on the potential and urgency of self-efficacy is seen from the point of view of the ability and interest of elementary school students. The results of the research stated that: (1) students in the fifth grade of elementary school have begun to show self-efficacy; (2) students are able to value themselves; (3) self-efficacy can develop into a potential character. Furthermore, research from Yuliyani, et al. (2017) on the role of self-efficacy and positive thinking ability towards mathematical problem solving ability. The results of this research include: (1) There is an influence between self-efficacy on solving mathematical problems. (2) There is an influence between positive thinking and solving mathematical problems. (3) There is an influence between self-efficacy and positive thinking. (4) There is an indirect influence of self-efficacy on problem-solving ability through positive thinking.

Based on the analysis of previous relevant research, a research gap was found where in previous studies there has not been found a reason why and how self-efficacy can be low? Why is self-efficacy related or not related to student learning outcomes or other mathematical abilities.

The purpose of this research is to look at the phenomenon of self-efficacy that exists in students, whether there is a relationship and influence between self-efficacy and students'

mathematical understanding ability, as well as answer why, how and where the source of self-efficacy arises.

METHOD

This type of research is pre-experiment research with a one-shot case study design. Data analysis using a mix of quantitative and qualitative analysis methods. Data from description tests and questionnaires will be quantitatively analyzed by correlation and regression methods, while observation and interview data will be supporting materials and analyzed qualitatively descriptively.

Table 1. One-Shot Case Study Design

Class	Treatment	Post-test
Experiment	X	O

Source: Gall et al., 2014

Population and Sample

The population and samples of the research were taken in a purposive way. The population in this research was all grade V elementary school students in the city of Bandung, Indonesia, while the sample in this research was 37 students and 4 grade V teachers of public elementary schools in one of the schools located in Coblong district, Bandung City, West Java, Indonesia. The research implementation runs for one month, namely in September 2022 and is an odd semester of the 2022/2023 academic year.

Data Collection Techniques

Data collection techniques with test and non-test techniques. The test technique is to measure students' mathematical understanding ability and the level of student self-efficacy while the non-test technique is in the form of learning observations and interviews with teachers.

Mathematical Self-Efficacy Indicators

The questionnaire in this research is a measuring tool for mathematical self-efficacy ability and is given to students after the mathematics learning process. There are three indicators of mathematical self-efficacy ability based on Bandura (Alam, 2018) contained in the questionnaire, these indicators are:

- Level, belief in carrying out or solving problems/tasks according to the level of difficulty.
- Strenght, the stability or strong belief of students in doing assignments/questions or math exams and the stability of heart in mathematics subjects.
- Generality, students' beliefs about the breadth of the task area or subject matter of mathematics.

Mathematical Understanding Ability Indicators

Mathematical understanding ability using test measuring instruments in the form of description questions. The indicators of mathematical understanding ability according to Killpatrick et al., (National Research Council, 2001) are described through the following table:

Table 2. Mathematical Understanding Ability Indicators

No.	Indicator	Aspect
1	The ability to restate a concept that has been learned.	Instrumental understanding
2	Ability to apply concepts algorithmically.	Instrumental understanding
3	Presenting concepts in a wide variety of forms of mathematical representation.	Instrumental understanding
4	The ability to relate various concepts in mathematics and outside of mathematics.	Relational understanding

Source: National Research Council, 2001, p. 116

Interview Instruments

Interviews are supporting data on phenomena that occur in students, are expected to answer factors that affect the achievement of students' self-efficacy and mathematical understanding ability, interviews in this research are carried out in a structured manner by preparing and determining what to ask, while the resource persons in this interview are teachers. These interview question items are as follows:

- Have you ever heard of and found out what a student's self-efficacy ability is?
- In your view, how important is the student's self-efficacy ability?
- During the teaching process, do your students demonstrate self-efficacy skills?
- During math learning, do you perform verbal persuasion such as advice, advice and guidance to your students?
- During mathematics learning, do you pay attention to the psychological, mental, emotional and physical state of the students?
- In your view, does socio-cultural background affect self-efficacy ability in your students?
- In your view, in addition to what has been mentioned above, are there other factors that affect self-efficacy ability in your students?
- What strategies/approaches are you used to in Mathematics learning?

Data Validity

In this research, quantitative data obtained from the results of the self-efficacy questionnaire and the mathematical understanding ability essay test were carried out by judgement experts which were then tested for validity and reliability before being submitted to the sample, while the interview instrument was only conducted judgement expert.

RESULTS

Overview of Self-Efficacy and Mathematical Understanding Ability

Self-efficacy (SE) and mathematical understanding (MU) data from 37 samples can be described as follows:

Table 3 Descriptive Statistics of Self-Efficacy (SE) and Mathematical Understanding (MU)

Group	N	Mean	Min	Max	Std. Deviation
SE	37	54	27	79	11.55
MU	37	51	26	85	15.75

Based on Table 3, it is known that the average SE is 54 while MU is 51, then the minimum score on SE is 27 while MU is 26. The maximum score on SE is 79 and MU is 85, from which it can be concluded that the data of the two variables do not differ much, while the standard deviation value which indicates lower than the average value means that the distribution of data is adjacent to the average value. The distribution of students' self-efficacy and mathematical understanding achievement scores can also be seen in Table 4 below:

Table 4 Distribution of Self-Efficacy and Mathematical Understanding Achievement Scores Based on Predicates

Criteria	Interval	Predicate	SE Score	MU Score
Very good	88 - 100	A	0 Student	0 Student
Good	75 - 87	B	3 Students	2 Students
Passable	62 - 74	C	5 Students	7 Students
Poor	49-61	D	20 Students	9 Students
Very poor	<49	E	7 Students	17 Students

Based on Table 4, it is known that none of the students received the Excellent (A) predicate on either the SE or MU scores. Then the students who obtained the predicates Good (B) and Passable (C) on the SE score were 8 students while the MU score was 9. Then the students who obtained the predicates Poor (D) and Very poor (E) on the SE score were 27 students while in the MU score there were 26 students. From these results, it can be concluded that the average

self-efficacy score and student learning outcomes are still low. To find out the average score of each self-efficacy indicator, it can be illustrated as follows:

Table 5 Mean Score on the Self-Efficacy Indicator

Self-efficacy Indicator	Mean	Criteria
Level, belief in carrying out or solving problems/tasks according to the level of difficulty.	51	Poor (D)
Strenght, the stability or strong belief of students in doing assignments/questions or math exams and the stability of heart in mathematics subjects.	52	Poor (D)
Generality, students' beliefs about the breadth of the task area or subject matter of mathematics.	59	Poor (D)

Looking at Table 5, it is known that the average score of each indicator is not much different and all of them get a predicate of Poor (D) or it can be said that each indicator of self-efficacy is still low.

The Influence of Self-Efficacy on Mathematical Understanding Ability

At this point, the researcher tries to answer the research question as follows:

- Is there a significant correlation between self-efficacy (x) and mathematical understanding ability (y)?
- Does self-efficacy (x) have a positive influence on mathematical understanding ability (y)?

To answer this question, correlation and regression tests were carried out with the help of SPSS software. The test results are as follows:

Table 6 Correlation and Regression Test Results

R	R Square	Constant (a)	Coeff. R (b)	Sig.
0,582	34%	7.74	0.794	0.000

From the output in Table 6, an R-count is 0.582 with $\alpha = 0.01$ then df = 35 and the one-tailed test, obtained an R-critical is 0.386. Because R-count (0.582) > R-critical (0.386), then H0 is rejected and H1 is accepted. This means that there is a significant correlation between self-efficacy (x) and mathematical understanding ability (y). From the SPSS output (Table 6), a coefficient of determination (R Square) of 34% is also obtained, which implies that the influence of the self-efficacy variable (x) on the mathematical understanding ability variable (y) is 34%.

From the output of SPSS (Table 6), it is known that the constant value (a) is 7.74, while the value of the regression coefficient (b) is 0.794, so the regression equation can be written:

$Y = a + bx$
$Y = 7.74 + 0.794x$

The equation can be translated:

- The constant of 7.74 means that the consistent value of the variable Y (mathematical understanding) is 7.74.
- The regression coefficient X of 0.794 states that every addition of 1 self-efficacy value (X), then the mathematical understanding value (Y) increases by 0.794.
- The regression coefficient is positive, so it can be said that the direction of influence of the variable X on Y is positive.
- From the output in Table 6, it is also known that the significance value of 0.000 < 0.01, it can be concluded that the self-efficacy variable (x) has a significant and positive influence on the mathematical understanding variable (y).

Factors Influencing Self-Efficacy

Factors that influence self-efficacy can be illustrated through the results of interviews with teachers, from the interviews the following points are found:

Table 7 Factors Influencing Self-Efficacy from a Teacher's Perspective

Teachers-sourced factors	Students-sourced factors
• Teachers are not very familiar with the term self-efficacy. • The strategies and approaches used by teachers only refer to the 2013 curriculum which uses a scientific approach. • Teachers pay little attention to the psychological, mental, emotional and physical state of students.	• In the mathematics learning process, sometimes students show self-efficacy ability, meaning that the intensity of occurrence is quite low. In addition, from the overall students, only a few students are able to show self-efficacy abilities, this can be seen from student activities that show confidence when answering questions, confidence to perform in front of the class, and confidence to compete with classmates. • The average student comes from a lower-middle economy with a parental occupational background as an entrepreneur. • Low motivation and enthusiasm for learning of students. • There is a sense of anxiety and fear of learning Mathematics. • There is the possibility of learning styles, culture and habits of students at home and their environment which also influence self-efficacy.

It needs to be underlined that what is described above is subjective because it is based on the perspective, opinion and observation of the teacher in the learning process.

DISCUSSION

Based on the research findings, the ability of mathematical self-efficacy has a significant relationship to students' mathematical understanding abilities. This means that if student self-efficacy is poor then mathematical understanding is possible to poor, and vice versa, if student self-efficacy is high, then mathematical understanding will possible to be high. The findings also show that self-efficacy has a positive influence on students' mathematical understanding abilities. This is in line with the statements of Ghufron and Risanawati (2017), Yuliyani, et al. (2017), Ningsih and Hayati (2020) that self-efficacy is closely related and influence student achievement, results, and learning motivation. However, this statement contradicts the research of Yuliyanto, et al (2020) which states that self-efficacy has no relation to learning outcomes, the cause of this can be assumed to be due to sources and factors that influence the ability of diverse self-efficacy. Bandura, Howard and Noble (Alam, 2018) state that there are four sources that influence a person's self-efficacy ability, namely:

1. Mastery experience: an individual's previous experience or success in solving a problem, activity, or task. Previous experience can affect a person's self-efficacy because of the individual's personal experience of real success and failure.
2. Vicarious experience: individuals who see others succeed in the same activity and have comparable abilities can increase their self-efficacy. Conversely, seeing someone fail triggers lower that individual's level of self-efficacy.
3. Verbal persuasion: self-efficacy of a person can be increased by guidance, mentoring and advice. In other words, a person's suggestion can influence his level of self-efficacy. With this, a person can increase their confidence in their abilities so that they are expected to help achieve their desired goals. Individuals who are verbally convinced trigger more effort to achieve success.
4. Psysiological state: physiological state concerning the physical such as pain and fatigue. The emotional state concerns mood and stress. Physiological states and emotions that suppress can influence the level of confidence in the face of activity. Feeling depressed, anxious, sick, tired, or other negative things can lower a person's level of self-efficacy. Conversely, when a person is at their best, it positively contributes to the development of self-efficacy.

Looking at the results of the self-efficacy questionnaire (Table 4) it was also found that there was one student who achieved self-efficacy with good criteria but had poor mathematical understanding abilities, there were also two students who achieved mathematical understanding abilities with sufficient criteria but with self-efficacy abilities is poor, from this it can be concluded that these students are less able to know their own abilities and prove one's various sources of self-efficacy according to Bandura's statement.

Looking at the low self-efficacy and mathematical understanding achievement scores of students, after analyzing and identifying the causes or factors that affect these results, it is assumed that they can be answered in the results of interviews with teachers, there are several influencing factors either sourced from the teacher, students or their environment (Table 7), such as: (1) Teachers are not very familiar with the term self-efficacy causing this ability to be ignored and considered unimportant; (2) The strategies and approaches used by teachers only referring to the 2013 curriculum cause monotonous learning systems and lack of self-efficacy skills; and (3) Teachers also pay less attention to the affective realm of students which also affects the psychological, mental, emotional and physical condition of students and causes low motivation and enthusiasm for student learning. From these findings in line with the research of Ricardo and Meilani (2017) and the research of Mulyani, et al. (2020) stated that there is a positive relationship between mathematical self-efficacy and student learning motivation and there is a significant relationship between mathematical self-efficacy and student motivation. In line with research from Rakhmawati and Mustadi (2019) states that self-efficacy can develop into a potential character. In line with research from Yuliyani, et al. (2017) stated that there is an influence between self-efficacy and positive thinking on solving mathematical problems.

CONCLUSION

Based on the findings in this research, it can be concluded that self-efficacy ability has a significant correlation with students' mathematical understanding ability. It is proven that students' self-efficacy is still low, as well as their mathematical understanding ability. The findings also show that self-efficacy positively influence students' mathematical understanding ability.

The low achievement of self-efficacy and mathematical understanding ability of students is influenced by several factors, including factors sourced from teachers who do not know the importance of self-efficacy skills, learning strategies and approaches that tend to be monotonous and do not pay attention to the realm of student affection. Factors that originate from students include the economic, social and cultural conditions of parents of students who come from the lower middle class, so that with environmental conditions these students cause low enthusiasm and motivation for student learning and also have implications for students' self-efficacy.

Students with good self-efficacy abilities are not only shown by a high self-efficacy achievement score, but also with high learning outcomes that are represented from mathematical understanding abilities, if the student has high self-efficacy but low learning outcomes or vice versa, it can be stated that the student's ability to assess their self-efficacy is in the bad category.

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