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## The Relationship between Efficacy and Self-Regulation with Learning Outcomes in Elementary School Mathematics

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**ABSTRACT**

The problem in this research is the low mathematics learning outcomes of fourth grade elementary school students. The purpose of this study was to determine a positive and significant relationship between self-efficacy and students' mathematics learning outcomes, to determine a positive and significant relationship between self-regulation in learning and students' mathematics learning outcomes, to determine a positive and significant relationship between efficacy and self-regulation in learning with students' mathematics learning outcomes. This type of research after the fact correlation. The population is 221 students and the sample are 70 students using the technique probability sampling. Data collection techniques used observation, interviews, documentation studies and questionnaires while data analysis used correlation product moment and multiple correlation. The results showed that there was a positive and significant relationship between efficacy and self-regulation with students' mathematics learning outcomes, with a correlation coefficient of 0.7322 at the "Strong" level.

## 1. Introduction

Mathematics is a subject that has an important role in developing human thinking power, as well as underlies the development of modern technology. Mathematics is a branch of science that discusses the sciences of calculation. In addition, mathematics discusses the sciences that are related to logic, which can be accepted by common sense which is always based on logic accompanied by accurate facts. As for the branches that discuss about mathematics such as algebra, analysis, geometry, astronomy, astrology, and so on. (Stit & Nusantara, 2020)

Mathematics is often considered a difficult subject by students and students generally think of mathematics as a subject they do not like. Mathematics is difficult because mathematical concepts are arranged hierarchically, structured and systematically, starting from the simplest concepts to the most complex concepts (Hidayatulloh, 2016). Mathematics is also a subject that is difficult and frightening for students among other subjects so that students' interest in learning mathematics decreases, they just follow the learning process (Ningsih & Hayati, 2020). The level of mastery of mathematics in students themselves can be measured by learning outcomes which are usually in the form of numerical values.

Learning outcomes are changes that occur in students, both concerning cognitive, affective and psychomotor aspects as a result of learning activities. According to Silvester (2021) learning outcomes are achievements in the form of changes in student behavior that are obtained by students after participating in the learning process at school expressed by scores obtained from test results (Ningsih & Hayati, 2020). The measurement is done through observation and giving scores according to the indicators and learning objectives that are appropriate to certain learning materials. To achieve maximum learning outcomes, especially in mathematics, is not easy. This is because the learning process is influenced by many factors, both internal and external factors.

According to Rahayu 2018 the internal factor that influences learning outcomes is efficacy (Rahayu, 2018). Students who have self-efficacy can master situations, produce positive results, and succeed. (Ningsih & Hayati, 2020). Awareness regarding efficacy needs to be increased, especially in mathematics which is still considered difficult because mathematics is abstract. Students find it difficult to grasp and understand a concept or material, causing low confidence in students in solving a problem or problem. Students with high efficacy will tend to view difficult tasks as challenges to be mastered, in contrast to students with low efficacy tend to view difficult tasks as threats to be avoided.

In accordance with the description above, in general, efficacy is positively related to students' mathematics learning outcomes because students who have efficacy or self-confidence when learning mathematics material will get maximum

mathematics learning outcomes. This explanation is proven by research conducted by (Syehabudin et al., 2019) there is a positive relationship between self-efficacy and mathematics learning outcomes in the material equations and linear inequalities of the absolute value of one variable in class X SMA Darul Muttaqin (Syehabudin et al., 2019) This shows that the better the self-efficacy of students, the higher the learning outcomes of students.

In addition to the effectiveness of other internal factors that can affect student learning outcomes, namely self-regulation. According to (Wahyuni & Fransisca, 2019) self-regulation in learning is a learning process of students in activating their thoughts, feelings, and behavior systematically which is expected to achieve learning objectives. (Wahyuni & Fransisca, 2019) Self-regulation in learning becomes something that students need to pay attention to in the learning process. With good self-regulation in learning, the individual will realize that he has a sense of responsibility, and knows how to learn effectively for himself. Self-regulation is a process of self-control in learning that begins with compiling a series of learning activities in accordance with set goals (Purwaningsih & Herwin, 2020). After the goal is achieved, then proceed with evaluating the results to be repaired and improved in order to achieve optimal results in the future. In mathematics learning, self-regulation is needed because with self-regulation in learning, students will be better able to manage their study time and be more active when participating in learning, that way students will easily understand math material and can achieve maximum math learning results.

Based on pre-research data conducted on November 15, 2021, the researchers obtained the results of interviews with educators who became homeroom teachers for fourth grade public elementary schools in the Cut Nyak Dien Cluster of East Metro District, there were several problems, namely that there were still students who did not have efficacy when participating in the learning process especially in mathematics. This can be seen when educators ask students to answer questions, students tend to be passive and do not want to answer questions from educators even though students are actually able to answer these questions. Students feel less confident about their ability to complete mathematical assignments. For example, some students do not complete on their own assignments. Students think that learning mathematics is difficult and complicated learning, students lack self-regulation when participating in learning such as not participating in the learning process and not being able to manage their study time in class.

The researcher obtained information on the results of learning mathematics in class IV students which were still low. Students are less confident about the results of the work they complete and lack self-motivation to achieve better learning outcomes. Several students scored below the Minimum Completeness Criteria (KKM). The odd mid-semester assessment shows that there are still many students in each school who have not reached the KKM that has been determined. This

relates to the factors previously described, namely that it is suspected that there is a relationship between efficacy and self-regulation in student learning so that it affects their learning outcomes, which are classified as still many that have not been completed.

Research related to efficacy and self-regulation has been carried out by Ningrum et al entitled "The Relationship Between Self-Regulation and Science Learning Outcomes of Students of SD Negeri 1 Padaherang." SD Negeri 1 Padaherang (Ningrum & Dkk, 2019). This shows that the higher the self-regulation of students in learning, the learning outcomes of students will increase. No previous research has linked self-efficacy and self-regulation, particularly in mathematics learning outcomes at the elementary school level.

Furthermore, research by Lely Suryani, Stefania Baptis Seto, Maria Goretty D. Bantas with the title "Relationship of Self-Efficacy and Learning Motivation to E-Learning Based Learning Outcomes in Students of the Mathematics Education Study Program at the University of Flores" is known that the increasing or improving Self-Efficacy and learning motivation will also increase the learning outcomes of the students themselves. (Suryani et al., 2020)

These relevant studies address efficacy and self-regulation, but there are differences. In previous research, the material content was more general and the level of education was higher, no one had discussed focusing on mathematics in elementary schools, therefore this study will discuss efficacy and self-regulation with learning outcomes focusing on mathematics in schools. base.

Based on the background that has been described, the researcher is interested in conducting research with the title "The Relationship between Efficacy and Self-Regulation with Elementary Mathematics Learning Outcomes". With the aim of: (1) knowing a positive and significant relationship between efficacy and learning outcomes in mathematics; (2) knowing the positive and significant relationship between self-regulation in learning and mathematics learning outcomes; (3) knowing the positive and significant relationship between efficacy and self-regulation in learning with mathematics learning outcomes.

## **2. Method**

This study uses a quantitative approach. The type of research used is after the fact correlational. The research was conducted at public elementary schools in the Cut Nyak Dien cluster, East Metro District, consisting of East Metro 1 Public Elementary School, East Metro 2 Public Elementary School, East Metro 8 Public Elementary School, East Metro 9 Public Elementary School, and East Metro 10 Public Elementary School. This research was conducted in the even semester of the 2021/2022 school year. The population of this study were fourth grade students in

the Cut Nyak Dien Cluster, East Metro District, totaling 221 students. This research uses techniques of *probability sampling* that is *proportionate stratified random sampling because the sampling* was carried out randomly by paying attention to the existing strata in the population, so that a sample of 70 students was obtained.

The data collection techniques in this study were as follows: (1) Observation, carried out to obtain data about the condition of the school or a description of the location of the research to be carried out in class IV of Public Elementary Schools in the Cut Nyak Dien Cluster, Metro Timur District; (2) Interviews, the researcher conducted interviews with homeroom teachers of class IV public elementary schools in the Cut Nyak Dien cluster, East Metro sub-district, with the aim of obtaining information about the data of state elementary school students in the Cut Nyak Dien cluster, East Metro district; (3) Documentation studies, used by researchers to obtain data on students' mathematics learning outcomes in the form of odd semester final exam scores for fourth graders of Public Elementary Schools in the Cut Nyak Dien Cluster of East Metro District for the 2021/2022 academic year as well as other data that supports research; (4) Questionnaires, Questionnaires are given to students to obtain information about efficacy and self-regulation in learning.

The research instrument is a questionnaire. Measurement of the questionnaire is guided by the scale of *Likert* with four alternative answers without neutral answers to avoid doubtful answers and not having clear answers (Hertanto, 2017). The questionnaire was tried out before being used as a research data collection tool. The purpose of testing this instrument is to determine the validity and reliability of the instrument, so that the test is feasible to use for research and can collect data that is in accordance with what is being studied. Testing the validity of the test using the correlation formula *product moment*. Test the reliability of the test using the correlation formula *alpha cronbach*. The data analysis technique uses multiple linear regression analysis. The normality test data analysis requirements test is carried out using the formula *chi square* and for the linearity prerequisite test using the F-test. Hypothesis testing using multiple linear regression analysis by using the F-test with the decision rule if  $F_{count} > F_{table}$  then  $H_a$  is accepted whereas if  $F_{count} < F_{table}$ , then  $H_a$  is rejected. If  $H_a$  is accepted, it means that the proposed hypothesis can be accepted.

### 3. Result and Discussion

The results of the calculation of the normality test use the formula *chi square*, shows the results of learning mathematics (Y) obtained by data  $\chi^2_{count} = 9.776$  and  $\chi^2_{table} = 12,592$  up to  $\chi^2_{count} = 9.776 < \chi^2_{table} = 12.592$ , meaning that the Y variable data is normally distributed. The results of the calculation of the efficacy normality test ( $X_1$ ) obtained  $\chi^2_{count} = 5.841$  and  $\chi^2_{table} = 12,592$  up to  $\chi^2_{count} = 5.841 < \chi^2_{table} = 12.592$ , meaning variable X data<sub>1</sub> normally distributed. The results of the

calculation of the normality test of self-regulation in learning ( $X_2$ ) obtained  $\chi^2_{\text{count}} = 12.434$  and  $\chi^2_{\text{table}} = 12,592$  up to  $\chi^2_{\text{count}} = 12.434 < \chi^2_{\text{table}} = 12.592$ , meaning variable  $X_2$  normally distributed.

Efficacy linearity test results ( $X_1$ ) with mathematics learning outcomes (Y) using the F-Test formula obtained  $F_{\text{count}} = 0.43$  and  $F_{\text{table}} = 1.78$ . In accordance with the rule which states that  $F_{\text{count}} = 0,43 \leq F_{\text{table}} = 1.78$  this means the data is linear. The results of the self-regulation linearity test in learning ( $X_2$ ) with mathematics learning outcomes (Y) obtained  $F_{\text{count}} = -0.33$  and  $F_{\text{table}} = 1.79$ . In accordance with the rule which states that  $F_{\text{count}} = -0,33 \leq F_{\text{table}} = 1.79$  this means the data is linear.

Based on the calculation results of the first hypothesis test, the correlation coefficient between variables  $X_1$  and variable Y has a positive sign with the criteria of "strong enough" seen from the interpretation criteria of the correlation coefficient (r). These findings indicate that there is a positive and significant relationship between efficacy and the mathematics learning outcomes of fourth grade students of public elementary schools in the Cut Nyak Dien Cluster of Metro Timur District.

Efficacy is one of the important factors in an effort to obtain high learning outcomes. Students with high efficacy will be able to complete tasks given by educators because they have self-confidence that gives encouragement to try to complete tasks with their abilities. This is in accordance with the opinion expressed by (Pigay & Reba, 2021) that students with high efficacy make them like challenging tasks so as to generate high enthusiasm for learning to complete these tasks. On the other hand, students with low efficacy are easily discouraged, they assume that they are unable to complete the task. Meanwhile, according to (Chandra et al., 2019) the efficacy of students also has an impact on learning outcomes in class, namely students with high efficacy will enjoy a series of learning processes, but students with low efficacy levels will easily feel inferior so they don't enjoy the process. the learning carried out will have an impact on learning outcomes (Sunawan & Dkk, 2017). So it can be said that the higher the efficacy students have in learning, the more they will enjoy the learning process so that it can encourage students to achieve maximum learning outcomes.

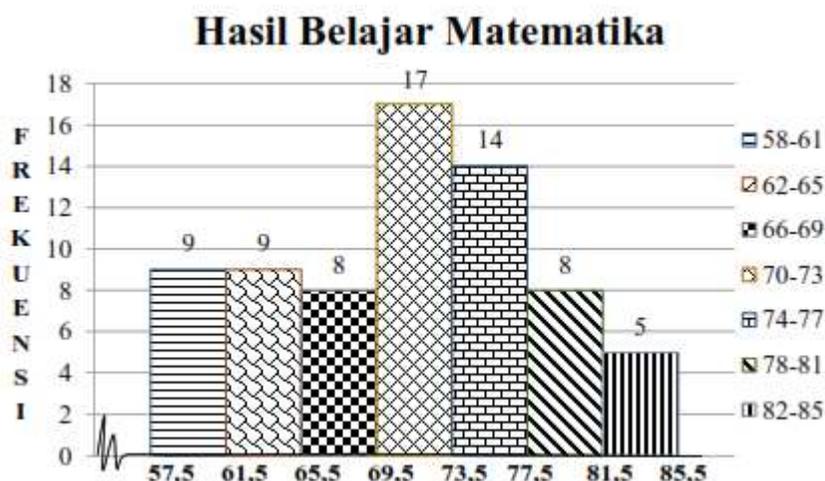
Based on the calculation results of the second hypothesis test, the correlation coefficient between variables  $X_2$  and variable Y has a positive sign with the criteria of "Strong" seen from the interpretation criteria of the correlation coefficient (r). These findings indicate that there is a positive and significant relationship between self-regulation in learning and the mathematics learning outcomes of fourth grade students of public elementary schools in the Cut Nyak Dien Cluster of Metro Timur

District. This is relevant to Sumantri's research (2016) which states that there is a positive and significant relationship between self-regulation in learning and student learning outcomes (Sumantri, 2016).

Self-regulation in learning is one of the important factors in an effort to obtain maximum learning outcomes. Self-regulation in learning is a very important ability for students to have when participating in the learning process, because students who apply self-regulation when learning have the ability to manage their own study time by involving cognitive abilities, motivation and active behavior so that they can achieve good learning outcomes. maximum. This is in accordance with the opinion expressed by Titik Kristiyani (2020: 13) that students who have self-regulation in learning are characterized by their activeness to participate in their own learning process cognitively, motivation, and behavior to control goals that have been made wrong one of which is achieving maximum learning outcomes (Kristiyani, 2016). It can be said that the higher the self-regulation in learning that students have, the higher the learning outcomes achieved.

Based on the calculation results of the third hypothesis test, the correlation coefficient between variables X1, X2 and variable Y has a positive sign with the criteria of "Strong" seen from the interpretation criteria of the correlation coefficient ( $r$ ). These findings indicate that there is a positive and significant relationship between efficacy and self-regulation in learning with the mathematics learning outcomes of fourth grade students of Public Elementary Schools in the Cut Nyak Dien Cluster, Metro Timur District. Kusaeri and Mulhamah's research states that there is a positive influence between self-regulation on students' mathematics learning achievement (Kusaeri & Mulhamah, 2016).

High efficacy and self-regulation in learning will affect the learning outcomes of students in class IV of public elementary schools in the Cut Nyak Dien Cluster, East Metro District. In carrying out the learning process students need the ability to be efficient and self-regulate in learning, because students who have these abilities will be able to effectively manage the learning process in various ways so as to achieve maximum learning outcomes.



Gambar 1. Mathematics Learning Outcomes

Students who have efficacy and self-regulation abilities in learning, they will be able to complete and cope with assignments well, besides that students will also be able to control their learning activities. Both are interrelated and affect student learning outcomes. The better the student's efficacy, the better the regulation. However, it is necessary to do something about the effect of efficacy and self-regulation on mathematics learning outcomes so that it can be seen how big the effect is. (Suryani et al., 2020) Likewise, self-regulation has a positive and significant influence on student learning outcomes. This shows that if students' self-regulation abilities increase, student learning outcomes will increase, and vice versa. (Friskilia & Winata, 2018)

#### 4. Conclusion and Suggestions

Based on the results of data analysis and discussion that has been carried out, the researchers conclude as follows: (1) There is a positive and significant relationship between efficacy and mathematics learning outcomes; (2) There is a positive and significant relationship between self-regulation in learning and learning outcomes in mathematics; (3) there is a positive and significant relationship between efficacy and self-regulation in learning with mathematics learning outcomes.

This research is still limited to the sample and research scope. It is known that there are several factors that influence mathematics learning outcomes, the authors suggest that further researchers can examine other factors such as intelligence, readiness to learn mathematics, interest, motivation and talent. In

addition, learning outcomes have been very much researched, the authors suggest that further researchers can research.

## 5. Author contributions

The authors consist of four people with the following contributions, Loliyana compiled the research concept and design, Jody Setya Hermawan collected data and presented tables, Ujang Efendi interpreted data and discussed it, Wiwin Winawati Hasanah checked data and edited and wrote an abstract in the body of the article.

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