The Influence of Self-Regulation and Self-Esteem on Mathematics Learning Achievement of Elementary School Sixth-Grade Students

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Abstract: The research was conducted to know whether or not there is an influence between 1) self-regulation on the mathematics learning achievement of VI elementary school students, 2) self-esteem on the mathematics learning achievement of VI elementary school students, and 3) self-regulation and self-esteem on the mathematics learning achievement of VI Elementary School students. This research was conducted in 4 public elementary schools in Wedarijaksa District, Pati Regency, Central Java, with a sample of 82 students. Data analysis conducted in this study is descriptive statistics and hypothesis testing using multiple linear regression analysis. The results showed: 1) there was an influence between self-regulation and the mathematics learning achievement of VI Elementary School students, 2) there was an influence between self-esteem and the mathematics learning achievement of VI Elementary School students, and 3) Together there was an influence between self-esteem and self-esteem. Regulation and self-esteem on the mathematics learning achievement of VI Elementary School students. The coefficient of determination test shows that aspects of self-regulation and self-esteem in this study of 51.8% affect the mathematics learning achievement of VI Elementary School students.

Keywords: Self-regulation, self-esteem, and mathematics learning achievement

1.   Introduction

In the learning process it will be possible to measure the achievement of students' abilities, knowledge, and understanding of the learning materials that have been taught, which is called learning achievement (Rahardjo & Pertiwi, 2020). The success students get from the activities they have done or done in the academic field and within a certain period, which can be expressed as a score, is the definition of learning achievement (Moyano et al., 2020).

Education is closely related to the success of forming quality students and becoming the centre of teaching and learning activities. Factors that affect student achievement are external factors and internal factors. Arigiyati et al. (2023) suggested that internal factors, namely self-regulation, influence the success and success of students in achieving their achievements. The self-regulation process that is carried out is related to students' beliefs about themselves, namely regarding their abilities and skills in the student's learning process (Kurukkan, 2016).

Thoutenhoofd & Pirrie (2015) explains that self-regulation in the learning process is not a skill in the academic field, but students who manage their learning process independently through setting and achieving goals that refer to metacognition and active behaviour of students in independent learning. Arjanggi & Suprihatin (2010) suggests a significant correlation between self-regulation and academic achievement. Baranovskaya (2015) suggests three aspects of self-regulation in learning: metacognitive, motivational, and behavioural.

Factors that affect learning achievement are not only self-regulation, one of which is self-esteem. According to Agir (2019), self-esteem is one factor that influences student achievement, and self-esteem is important for students to improve their learning achievement. According to Blegur et al. (2021), self-esteem is defined as a form of response or evaluation/assessment of a person about himself against the views of others about himself in social interactions (Caqueo-Urízar et al., 2021). Lohan & King (2016) describe, self-esteem is self-acceptance, by oneself relating that we are worthy, valuable, capable, and useful.

Refnadi (2018) explains that students with high self-esteem can prevent them from doing negative things in achieving their learning achievements. High self-esteem by students can make them feel valuable, see themselves as

equal to others, respect themselves, and desire to always progress and develop. Mruk (2006) suggests that self-esteem requires personal belief and a sense of self-worth. It is integrated with self-confidence and self-esteem. And is the belief that a person is competent and worthy to live. The indicators of self-esteem in this study are power, significance, virtue, and competence (Ekowati, 2015).

From the theoretical basis described above, the framework created is for students with high self-regulation and self-esteem, so it is possible for them to achieve better and maximum learning achievements. Based on the thoughts described above, the framework in this study shown in Fig. 1 can be described.
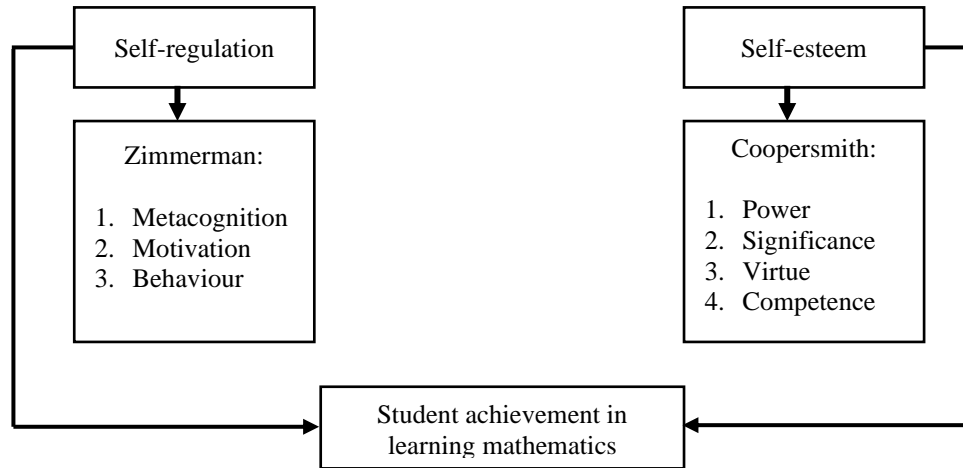

Fig. 1 - Thinking framework chart.

From the theoretical basis described above, the framework created is as follows: Self-regulation is the ability of students to organize, compile, and determine their learning goals independently without depending on others to get maximum learning achievement. Students who have high self-regulation will facilitate their learning and be able to evaluate and organize learning activities effectively and efficiently. Conversely, if students have low self-regulation (self-regulated learning), they will need help accepting the subject matter so that their learning achievement is less than optimal.

The research was conducted to know whether there was or was not an influence between 1) self-regulation on the mathematics learning achievement of VI Elementary School students, 2) self-esteem on the mathematics learning achievement of VI Elementary School students, and 3) self-regulation and self-esteem on mathematics learning achievement Elementary School VI students.

2.   Literature Review

Mathematics is one of the most important educational subjects in today's world. The mathematical skill of a kid in elementary school not only effects their mathematical achievement in subsequent years, but it can also predict their future educational outcomes and job success (Cleary & Chen, 2009). Furthermore, while mathematical aptitude in primary school lays the groundwork for all other technological professions, math abilities have grown in importance in the digital era, when algorithmic language and artificial intelligence are used in everyday life (Niu et al., 2022). As a result, developing learners' mathematical abilities to adapt to this new method of communication is an important topic in today's world.

According to Güler et al. (2022), the following elements have a significant impact on children's learning outcomes. Teachers' pedagogical beliefs, clear and structured instruction, an emphasis on developing complex skills (such as deductive and critical thinking) alongside skill acquisition (Sukma & Priatna, 2021), and the classroom climate a teacher can provide to students are among these factors.

The school years are crucial for developing students. Young people deal with body changes, gain new skills, and form strong social interactions throughout this time (van der Kaap-Deeder et al., 2016). One of the biggest educational concerns is students' declining motivation, self-esteem, and achievement, particularly during the middle school transition. Many blame the decline on poor educational approaches, insensitivity to students' needs, and other factors (Topçu & Leana-Taşcılar, 2018). Student-centred, mastery-based orientations are frequently supported in elementary schools. Middle schools, on the other hand, are performance-focused, with increased expectations of academic accomplishment, teacher-centred education, and high-stakes testing (Cleary & Chen, 2009).

According to the social cognitive viewpoint, self-regulation mechanisms are classified into three types: personal, behavioral, and environmental. Personal strategies are the ways in which a learner manages information. This can entail taking notes, summarizing, creating chapter outlines, and monitoring oneself. The learner may also create goals and make plans to achieve them. Behavioural strategies are the acts or behaviors that the learner will engage in. For example, if

students determine that not paying attention in class is a problem affecting their learning, they may adopt a behavioral strategy such as being more attentive. Finally, environmental techniques include the student seeking assistance or making changes to his or her physical study environment (Komarraju & Dial, 2014). Self-esteem is an individual's assessment of how far he is valuable. If the student's self-esteem is high, the higher the student's learning achievement. Self-esteem or self-esteem that students have is high. It can make these students feel valuable, see themselves as equal to others, respect themselves, and desire to always progress and develop so that the student will feel that he is valuable and that their sense of self-confidence and self-esteem increases.

In accordance with educational conditions, mathematics teachers can employ strategies appropriate for the reconstruction of mathematical self-concepts and strengthening students' positive beliefs, which can result in increased self-concept of mathematics and increased motivation to learn mathematics, ultimately leading to improved mathematics academic achievement (Amri & Widada, 2019).

3.   Methodology

This research method uses a quantitative approach, with hypothesis testing used as multiple linear analysis. The data collection technique in this study was a questionnaire to obtain self-regulation and self-esteem data, and data on students' learning achievement in mathematics was obtained from the Middle Semester Assessment scores of students in the 2021/2022 academic year for the even semester of mathematics.

This research was conducted in 4 public elementary schools in Wedarijaksa District, Pati Regency, Central Java as the population. Then, with a sample of 82 students with a simple random sampling technique. The following is a test conducted by researchers to analyze the data. The normality test was conducted to determine whether the data was obtained. Namely, self-regulation, self-esteem, and learning achievement data. The sample came from a normally distributed population, or the sample did not come from a normally distributed population (Gravetter & Wallnau, 2014). The homogeneity test is used to determine whether the population or research sample's variance is the same (Argyrous, 2011). Determine the multiple linear regression equation: according to Gravetter & Wallnau (2014), multiple linear regression analysis is carried out to determine the form of the linear correlation or relationship between the independent variables (self-regulation and self-esteem) and the dependent variable (mathematical learning achievement). The correlation coefficient significance test is used to determine whether or not there is an influence between the independent variable and the dependent variable separately, namely self-regulation (X1) on mathematics learning achievement (Y) and self-esteem (X2) on mathematics learning achievement (Y). This study's correlation coefficient significance test used a partial test (t-test). The significance test of the multiple correlation coefficient is used to determine whether or not there is an influence between the independent variables and the dependent variable together, namely self-regulation (X1) and self-esteem (X2) on mathematics learning achievement (Y). Test the significance of multiple correlation coefficients in this study using a simultaneous test (F test). The coefficient of determination serves to measure the amount of variance that occurs in the dependent variable (mathematical learning achievement), which has been influenced by independent variables (self-regulation and self-esteem).

4.   Results
4.1   Self-Regulatory Descriptive Statistics

The analysis results that researchers have carried out show the following Table 1. The data obtained is with a sample of 82; the average value is 84.87 with a median or median value of 88. The highest value obtained is 96 and the lowest is 56, while the standard deviation or standard deviation is 8.93.

Table 1 - Self-regulatory descriptive statistics.

Information	Self-regulation
Samples	82
Mean	84.87
Median	88
Max.	96
Min.	56
Standard deviation	8.93

4.2   Self-Esteem Descriptive Statistics

The analysis results that researchers have carried out show the following Table 2. The data obtained with a sample of 82 obtained an average value of 81.28 with a median of 80.5. The highest value obtained is 97 and the lowest is 63, while the standard deviation or standard deviation is 6.66.

Table 2 - Descriptive statistics of self-esteem.

Information	Self-esteem
Samples	82
Mean	81.28
Median	80.50
Max.	97
Min.	63
Standard deviation	6.66

4.3 Descriptive Statistics of Mathematics Learning Achievement

The analysis results that researchers have carried out show the following results. The data obtained is with a sample of 82; the average value is 81.54 with a median or median value of 80. The highest value obtained is 97 and the lowest value is 70, while the standard deviation or standard deviation is 7.07.

Table 3 - Descriptive statistics of mathematics learning achievement.

Information	Learning achievement
Samples	82
Mean	81.54
Median	80
Max.	97
Min.	70
Standard deviation	7.07

4.4 Normality Test

The analysis results that researchers have carried out show the following results. The calculation results show that the self-regulation normality test using SPSS results indicates that a significance value of 0.052 is obtained with a predetermined significance level of = 0.05. The significance value is greater than the predetermined significance level. So, $0.052 > 0.05$, the self-regulation data or samples come from a normally distributed population. The results of the self-esteem normality test using SPSS showed that a significance value of 0.234 was obtained. Then, the significance value is greater than the predetermined significance level. So, $0.234 > 0.05$, the self-esteem data or sample comes from a normally distributed population. The results of the normality test of students' mathematics learning achievement using SPSS showed that a significance value of 0.170 was obtained. So, $0.170 > 0.05$, the student's mathematics achievement data or the sample comes from a normally distributed population.

Table 4 - Normality test.

One-sample Kolmogorov-Smirnov test				
		Self-regulation	Self-esteem	Mathematics learning achievement
N		82	82	82
Normal parameters[a,b]	Mean	84.87	81.28	81.54
	Standard deviation	8.932	6.658	7.070
Most extreme differences	Absolute	149	.114	.123
	Positive	.106	.114	.123
	Negative	-.149	-.107	-.097
Kolmogorov-Smirnov Z		1.353	1.036	1.110
Asymp. Sig. (2-tailed)		.052	.234	.170
a. Test distribution is Normal.				
b. Calculated from data				

4.5 Self-Regulation Homogeneity Test on Mathematics Learning Achievement

The analysis results that researchers have carried out show the following results. Obtained a significance value of 0.708 with a predetermined significance level of = 0.05; the significance value is greater than the predetermined significance

level. So, 0.708 > 0.05, the data from the self-regulation sample on students' mathematics learning achievement is homogeneous or has the same variance.

Table 5 - Self-regulation homogeneity test on mathematics learning achievement.

Test of homogeneity of variances			
Mathematics learning achievement			
Levene statistic	df1	df2	Sig.
739	12	59	.708

4.6 Self-Esteem Homogeneity Test on Mathematics Learning Achievement

The analysis results that researchers have carried out show the following results. If a significance value of 0.149 is, then the significance value is greater than the predetermined significance level. So, 0.149 > 0.05, the data from the self-esteem sample on students' mathematics learning achievement is homogeneous or has the same variance.

Table 6 - Self-esteem homogeneity test on mathematics learning achievement.

Test of homogeneity of variances			
Mathematics learning achievement			
Levene statistic	df1	df2	Sig.
1.504	12	58	.149

4.7 Multiple Linear Regression Equation

The analysis results that researchers have carried out show the following results. Analysis with SPSS obtained b0 of 33.512, b1 of 0.175, and b2 of 0.212. This equation estimates students' mathematics learning achievement or the dependent variable influenced by independent variables or self-regulation and self-esteem is $\bar{Y}= 33.152 + 0,175X1 + 0.408X2$. If self-regulation as X1 increases or increases by one unit, then Y or mathematics learning achievement will also increase by 0.175 and assume that the value of X2 remains constant. While self-esteem as X2 increases or increases by one unit, Y or mathematics learning, achievement will also increase by 0.408 and assume that the value of X1 is constant or constant. If together X1 and X2, namely self-regulation and self-esteem, increase by one unit, student learning achievement will also increase with the influence of the dependent variable, self-regulation and self-esteem or X1 and X2.

Table 7 - Multiple linear regression equations.

Coefficients[a]					
Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. error	Beta		
1 (Constant)	33.512	8.950		3.745	.000
Self-regulation	.175	.084	.221	2.086	.040
Self-esteem	.408	.113	.384	3.618	.001

4.8 Correlation Coefficient Significance Test

The analysis results that researchers have carried out show the following results. The first is the t-test on self-regulation of students' mathematics learning achievement; it can be concluded that the significance value of SPSS is 0.040 with a predetermined significance level of $\alpha = 0.05$, and then the significance value is smaller than the predetermined significance level. So that 0,40 < 0,05. In the calculated T-test of 2.086 and the value in the T table with a critical area Ta; n-3 = T0.05; 82-3 = T0.05;79 obtained 1.66437, so T count > T table is 2.086 > 1.66437. So, there is an influence between self-regulation on students' mathematics learning achievement. Second, the t-test on self-esteem on students' mathematics learning achievement, it can be concluded that the significance value of SPSS is 0.001 with a predetermined significance level of $\alpha = 0.05$; second, the t-test on self-esteem on students' mathematics learning achievement, it can be concluded that the significance value of SPSS is 0.001 with a predetermined significance level of.

Table 8 - Correlation coefficient significance test.

Coefficients[a]				
Model	Unstandardized coefficients	Standardized coefficients	t	Sig.

		B	Std. error	Beta		
1	(Constant)	33.512	8.950		3.745	.000
	Self-regulation	.175	.084	.221	2.086	.040
	Self-esteem	.408	.113	.384	3.618	.001

4.9 Double Correlation Coefficient Significance Test

The analysis results that researchers have carried out show the following results. The results of the analysis of the significance of the multiple correlation coefficient test (F/simultaneous test) above, the first is the F test on self-regulation and self-esteem on students' mathematics learning achievement, it can be concluded that the significance value of SPSS is 0.000 with a predetermined significance level of $\alpha = 0.05$. The significance value is smaller than the predetermined significance level, so $0,000 < 0.05$. In the calculated F test of 14.488, thee value in the F table with the critical area is Fa; k; n-k-1 = F0.05; 3; 78 obtained 2.72, F count > F table that is $14.488 > 2.72$. So, it can be concluded that self-regulation and self-esteem have a joint influence on students' mathematics learning achievement.

Table 9 - Significance test of multiple correlation coefficient.

ANOVA						
Model		Sum of Squares	df	Mean square	F	Sig.
1	Regression	1086.418	2	543.209	14.488	.000[b]
	Residual	2961.972	79	37.493		
	Total	4048.390	81			

4.10 Coefficient of Determination

The analysis results that researchers have carried out show the following results. The analysis results obtained the value of the coefficient of determination (R2) of 0.268. The variance of mathematics learning achievement is Y, which is influenced by self-regulation as X1 and self-esteem as X2 of 0.518. The figure shows that the percentage given is 51.8%, which means the self-regulation variable as X1 and self-esteem as X2 can affect this research by 51.8% with a high level of relationship or correlation category.

Table 10 - Coefficient of determination.

Model Summary				
Model	R	R square	Adjusted R square	Std. error
1	.518[a]	.268	.250	6.123
a.Predictors: (constant), self-regulation, self-esteem				

5. Discussion

Based on the analysis that has been carried out to test the significance of the correlation coefficient to determine the relationship between self-regulation and mathematics learning achievement of grade VI Elementary School students, is there an influence or not? After the analysis or t-test, the results of the t-test show that T count > T table, which is 2.086 > 1.66437. So, it can be concluded that there is an influence between self-regulation and mathematics learning achievement of grade VI elementary school students. Based on the analysis that has been carried out to test the significance of the correlation coefficient to determine the relationship between self-esteem and mathematics learning achievement of sixth-grade elementary school students, is there an influence or not? After the analysis or t-test, the t-test results show that T count > T table is 3.618 > 1.66437. So, it can be concluded that there is an influence between self-esteem and mathematics learning achievement of grade VI elementary school students.

The analysis uses the simultaneous test or F test aimed at knowing the relationship between self-regulation and self-esteem on the mathematics learning achievement of sixth-grade elementary school students, whether or not there is an influence between these variables. The results of the F test show that F count > F table, which is 14.488 > 2.72. It can be concluded that together, there is an influence between self-regulation and self-esteem on the mathematics learning achievement of six sixth-grade elementary school students.

In this study, the aspects of self-regulation and self-esteem used by researchers could explain 51.8% after calculating the coefficient of determination. It shows that the independent variables or independent variables, namely self-regulation and self-esteem, can influence or explain according to the research aspects/factors by, 51.8% of the dependent variable or dependent variable, namely mathematics learning achievement. In comparison, 48.2% explained other factors outside this study.

Mathematics education fosters elementary level of orientation and ability, including mathematical beliefs; mathematical creativity through problem solving; social empowerment through mathematics contributes to critical citizenship; and a broader appreciation of mathematics, its nature, and its main ideas (Ernest, 2015). As a result, students

must be prepared with self-confidence and rational mathematical reasoning. Students can acquire this capacity when confronted with mathematical issues, discovering possible solutions, and analyzing and justifying their reasoning for the results (Fang et al., 2016), leading students to become confident critical thinkers. Another study discovered that mathematical talents have a direct and indirect effect on mathematical performance (via mathematical self-efficacy).

6.   Conclusion

Based on the results of the study, there are several suggestions given by the researcher, namely as follows: 1) for teachers, the results of this study can expand knowledge and create material for consideration to improve self-regulation and self-esteem students so that students can achieve maximum learning achievement, and 2) for future readers or researchers, so that this research can be used as a reference and further researchers can explore the same research by paying attention to other aspects or factors that can affect student achievement.

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Conflict of Interest

The authors declare no conflicts of interest.

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