The Effect of Prior Ability, Self-Regulation, Self-Efficacy, and Interest Towards Students' Mathematics Learning Achievement on Class IX SMP

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ABSTRACT

This study is ex-post facto research that aims to determine the effect of prior ability, self-regulation, self-efficacy, and interest toward students' mathematics learning achievement in grade 11 of Junior High School. The sample in this study was 65 students in grade 11 of Junior High School who were selected using a simple random sampling technique. Data collection was performed using tests and questionnaires. The data were analyzed using Descriptive and Inferential statistics. The descriptive analysis showed that (1) student learning achievement was in a low category, (2) prior ability was in a low category, (3) self-regulation was in the high category, (4) self-efficacy was in the high category, and (5) learning interest was in the high category. From the inferential analysis, it was obtained that (1) prior ability, self-regulation, self-efficacy, and interest in learning have a simultaneously effect on students' mathematics learning achievement, (2) prior ability has a positive effect on students' mathematics learning achievement, (3) self-regulation has a positive effect on students' mathematics learning achievement, (4) self-efficacy has a positive effect on students' mathematics learning achievement, (5) learning interest has a positive effect on students' mathematics learning achievement.

Keywords: Prior Ability, Self-Regulation, Self-Efficacy, Interest, Mathematics Learning Achievement.

1. INTRODUCTION

Learning is a process of providing knowledge, learning experiences, and getting life experiences for students. The success or failure of the learning process can be seen from the high and low student achievement. It is necessary to find out the factors that affect students' mathematics learning achievement. In general, the factors that affect student achievement are divided into two, namely internal factors and external factors. Factors that have a major influence are internal factors because the target of the learning process is the students themselves.

Prior ability is one of the internal factors that contribute to student achievement. Prior abilities are needed in the learning process because prior abilities can describe students' eagerness to follow the next material. Several studies have examined the relationship between prior knowledge and student achievement in mathematics. The results show that prior ability is positively related to students' mathematics learning achievement [1, 2, 3].

In addition, students also need good learning strategies, which are often referred to as self-regulation. Students who can take advantage of their self-regulation can combine academic learning skills and self-control in effective learning. Several studies have examined the relationship between self-regulation and student achievement in mathematics. The results show that self-regulation is positively related to students' mathematics learning achievement [4, 5, 6].

Another factor that also contributes to mathematics learning achievement is self-efficacy. Self-efficacy is the confidence of someone in their ability to cope with various situations that happened. Several studies have examined the relationship between self-efficacy and student achievement in mathematics. The results show that self-efficacy is positively related to students' mathematics learning achievement [7].

Another component that is no less important is the interest in learning. Students have different learning interests where some have a high interest while some have a low interest. If students are interested in a subject, then students feel happy and pay attention to that. Several studies have examined the connection between interest in learning and student achievement in mathematics. The results show that learning interest is positively related to students' mathematics learning achievement [8, 9, 10].

Based on the background above, the researcher is interested in a study focusing on four internal factors of the learning outcomes: prior ability, self-regulation, self-efficacy, and interest in learning. Therefore, the purpose of this study is to determine the effect of prior knowledge, self-regulation, self-efficacy, and student interest in learning mathematics on student achievement.

2. LITERATURE REVIEW

2.1. Mathematics Learning Achievement

Learning achievement is students' level of ability after participating in the teaching and learning process within a certain time in the form of changes in behavior, skills, and knowledge, which will then be measured, assessed, and realized in the form of numbers in report cards [11]. In the national education system, the formulation of educational goals, both curriculum and instructional goals, states that learning achievement consists of the cognitive domain [12].

2.2. Prior Ability

The prior ability of mathematics is the knowledge that students have previously that allows students to develop their mathematical knowledge at a higher level [14]. Prior abilities play an important role in connecting new information with existing knowledge. Students who have good prior abilities more easily understand the next concept. Thus, the prior ability

can affect student achievement, especially in the field of mathematics.

2.3. Self-Regulation

Self-regulation is the ability to plan, direct, and monitor behavior by involving physical, cognitive, emotional, and adaptive elements to achieve the goals desired by each individual. Zimmerman and Schunk [14] divide self-regulation in learning into three aspects: metacognition, motivation, and behavior. Related research was conducted by [5], who examined fourth-grade students' self-regulated learning and mathematics learning achievement. He shows that self-regulation has a positive effect on student achievement.

2.4. Self-Efficacy

According to [7], self-efficacy is a person's belief in overcoming various situations in life. Self-efficacy is related to the abilities that a person's beliefs possess, that is, what they can do no matter how great the abilities they possess. This is consistent with the study conducted by Slameto [17], which concluded that it has a positive and significant impact on student self-efficacy and performance.

2.5. Learning Interest

Interest is one of the key factors for success in school, work, play, or other activities. Interest in learning is a desire or need resulting from students' participation and learning experience created by a sense of security in the teaching and learning process so that they have full control over learning outcomes and teachers can create conditions for students always to want to learn [8].

3. RESEARCH METHOD

This study is ex-post facto research that aims to determine the effect of prior ability, self-regulation, self-efficacy, and interest toward students' mathematics learning achievement in grade 11 of Junior High School. This research was conducted in grade 9 of Junior High School. The number of selected samples was 65 students. The variables in this study consisted of independent and dependent variables. The independent variables were prior ability, self-regulation, self-efficacy, and interest in learning, while the dependent variable was students' mathematics learning achievement.

Data were collected using the mathematics learning achievement test, prior ability test, self-regulation questionnaire, self-efficacy questionnaire, and learning interest questionnaire. Furthermore, the instruments were validated by two expert validators. The data analysis used were descriptive statistical analysis and inferential statistical analysis. Descriptive statistical analysis was used to describe each research variable. Inferential statistical analysis was used to test the research hypotheses. However, before testing the hypothesis, prerequisite tests consisting of multicollinearity and heteroscedasticity were performed.

4. RESULTS AND DISCUSSION
4.1. Result

4.1.1. Descriptive Analysis

4.1.1.1. Mathematics Learning Achievement

Data about the mathematics learning achievement of students are given in the following table.

Table 4.1 Distribution of student learning achievement statistics

Statistics	Statistics Value
Number of Samples	65
Mean	25.0
Median	26.7
Modus	26.7
Standard Deviation	10.1
Variance Coefficient	40%
Minimum	6.7
Maximum	53.3
Range	46.6
Skewness	0.1

Based on table 4.1, the average score of students' mathematics learning achievement was 25.0 from the maximum score of 100. These results indicate that the student's score is still relatively low. This statement is in line with the acquisition of the highest score, which only reached 53.3. It means that students still cannot work on the questions appropriately given.

Data about the frequency distribution of student learning achievement scores are given in the following table.

Table 4.2 Frequency distribution of student learning achievement scores

Interval	Category	Frequency	Percentage (%)
0 ≤ score < 20	Very Low	16	25
20 ≤ score < 40	Low	41	63
40 ≤ score < 60	Medium	8	12
60 ≤ score < 80	High	0	0
80 ≤ score < 100	Very High	0	0
Total		65	100

Based on Table 4.4, students' prior abilities were still unsatisfactory. There was no student reached scores in the high category. In addition, the number of students whose very low, low and medium prior ability were 5, 35, and 25, respectively. Based on the categorization of the acquisition scores, it can be concluded that the students' prior ability test results were in a low category since most students with a percentage of 54% or 35 of 65 students had a low prior ability.

4.1.1.2. Prior Ability

Description of the distribution of students' prior ability is given in the following table.

Table 4.3 Distribution of Student Prior Ability Statistics

Statistics	Statistics Value
Number of Samples	65
Mean	32.2
Median	30
Modus	30
Standard Deviation	12.2
Variance Coefficient	38%
Minimum	10
Maximum	50

Based on table 4.3, it was found that the average score of students' prior ability was 32.2 out of a maximum score of 100. These results indicated that the students' prior ability scores were still relatively low. In addition, the highest and the lowest scores achieved by students were 50 and 10, respectively.

Table 4.4 Frequency distribution of student prior ability scores

Interval	Category	Frequency	Percentage (%)
0 ≤ score < 20	Very Low	5	8

20 ≤ score < 40	Low	35	54
40 ≤ score < 60	Medium	25	38
60 ≤ score < 80	High	0	0
80 ≤ score < 100	Very High	0	0
Total		65	65

Based on Table 4.4, students' prior abilities were still unsatisfactory. There was no student reached scores in the high category. In addition, the number of students whose very low, low and medium prior ability were 5, 35, and 25, respectively. Based on the categorization of the acquisition scores, it can be concluded that the students' prior ability test results were in a low category since most students with a percentage of 54% or 35 of 65 students had a low prior ability.

4.1.1.3. Self-Regulation

Table 4.5 Distribution of student self-regulation statistics

Statistics	Statistics Value
Number of Samples	65
Mean	60.1
Median	60
Modus	58
Standard Deviation	6.7
Variance Coefficient	11%
Minimum	44
Maximum	74

Based on table 4.5, the average self-regulation score of students was 60.1 out of a maximal score of 100. In addition, the minimal and maximal scores of students' regulation scores were 44 and 74, respectively. Moreover, there was no student had scored in the very low and low categories. Therefore, it can be said that the self-regulation of students was quite sufficient.

Table 4.6 frequency distribution of student self-regulation

Interval	Category	Frequency	Percentage (%)
20 ≤ score < 32	Very Low	0	0
32 ≤ score < 44	Low	0	0
44 ≤ score < 56	Medium	14	21
56 ≤ score < 68	High	42	65
68 ≤ score < 80	Very High	9	14

Total		65	100

Table 4.6 showed that most students with 42 of 65 or 65% reached scores in the high category. It was because no student got scores in the very low and low categories. The students' scores were only in three categories, namely moderate, high, and very high. Therefore, it can be concluded that the students' self-regulations were satisfied.

4.1.1.4. Self-Efficacy

Table 4.7 Distribution of student self-efficacy statistics

Statistics	Statistics Value
Number of Samples	65
Mean	74
Median	74
Modus	74
Standard Deviation	7
Variance Coefficient	9%
Minimum	55
Maximum	94

Based on table 4.7, the average self-efficacy score of students was 74 out of an ideal score of 100. The highest and the lowest students' self-efficacy scores were 55 and 94, respectively. In addition, the mode of the students' self-efficacy scores was 70. Therefore, it can be concluded that students' self-efficacy was in a good category.

Table 4.8 Frequency distribution of self-efficacy scores

Interval	Category	Frequency	Percentage (%)
25 ≤ score < 40	Very Low	5	8
40 ≤ score < 55	Low	35	54
55 ≤ score < 70	Medium	25	38
70 ≤ score < 85	High	0	0
85 ≤ score < 100	Very High	0	0
Total		56	100

Table 4.8 showed that the results of the students' self-efficacy scores were satisfactory. It was because no student got scores in the low category. The students' scores were only in three categories, namely moderate, high, and very high. In addition, most students with a percentage of 72% reached scores in

the high category. Therefore, it can be concluded that students' self-efficacy was high.

4.1.1.5. Learning Interest

Table 4.9 Distribution of student learning interest statistics

Statistics	Statistics Value
Number of Samples	65
Mean	70,7
Median	72
Modus	73
Standard Deviation	9
Variance Coefficient	13%
Minimum	50
Maximum	86

Based on table 4.9, the average score of students' interests in learning was 70 from the maximum score of 100. In addition, the highest and the lowest scores of students' interest were 50 and 86, respectively. Moreover, the mode of the scores was 73.

Table 4.10 Frequency distribution of student learning interest scores

Interval	Category	Frequency	Percentage (%)
25 ≤ score < 40	Very Low	0	0
40 ≤ score < 55	Low	4	6
55 ≤ score < 70	Medium	22	34
70 ≤ score < 85	High	36	55
85 ≤ score < 100	Very High	3	5
Total		56	100

Based on Table 4.10, the results of the students' interest in learning scores are satisfactory. It was because none of the students got scores in the very low category. The acquisition scores of students were in four categories, namely low, medium, high, and very high. In addition, most students with a percentage of 55% or 36 of 65 students reached scores in a high category. Therefore, it can be concluded that the learning interests of students were high.

4.1.2. Descriptive Analysis

4.1.2.1. Classical Assumption Test

Table 4.11 Multicollinearity Test Results

Variable	Tolerance Value	VIF Value
Prior Ability (x_1)	0.878	1.140
Self-Regulation (x_2)	0.715	1.398
Self-Efficacy (x_3)	0.705	1.418
Learning Interest (x_4)	0.692	1.445

Based on Table 4.11, with the tolerance value greater than 0.1, the VIF value for each variable is less than 10. Therefore, it can be concluded that there was no multicollinearity among variables.

Table 4.12 Heteroscedasticity test results

Variable	Sig. Value
Prior Ability	0.931
Self-Regulation	0.464
Self-Efficacy	0.424
Learning Interest	0.258

Based on table 4.12, with a significant value $\alpha = 5\%$, it was found that the sig value was greater than alpha for all independent variables. This implied that there was no independent variable that was statistically significant affecting the dependent variable. Therefore, it can be concluded that the regression model did not contain heteroscedasticity.

4.1.2.2. Hypothesis Test

Table 4.13 Hypothesis Test 1

Model	Df	Mean Square	Sig	F	Adjusted R Square
Regression	4	763.749	0.000	13.026	0.429
Residual	60	58.63			

Prior ability, self-regulation, self-efficacy, and interest in learning affect students' mathematics learning achievement. The calculated F value (13.026) was greater than the F table (2.523), and the obtained significant value was less than 0.05, implying H0 was rejected.

Table 4.14. Results of a hypothesis test for variables 2, 3, 4 and 5

Model	Unstandardized Coefficient		Std. Coeff. B	T	Sig.
	B	Std. Error			
(Constant)	-46,887	11,299		-4,149	0,000
Prior Ability	0,219	0,084	0,263	2,605	0,012
Self-Regulation	0,342	0,170	0,225	2,015	0,048
Self-Efficacy	0,349	0,164	0,240	2,134	0,037
Learning Interest	0,262	0,125	0,238	2,095	0,040

Based on Table 4.14, the value of sig obtained was 0.012. Since this value was less than 0.05, H0 was rejected. Therefore, it can be said that students' prior ability had a significant positive effect on students' learning achievement.

Hypothesis Test 3

Based on the results of hypothesis testing in table 4.14, the value of sig obtained was 0.048. Since this value was less than 0.05, H0 was rejected. Thus, it can be said that students' self-regulation had a significant positive effect on learning achievement.

Hypothesis Test 4

Based on the results of hypothesis testing in table 4.14, the value of sig obtained was 0.037. Since this value was less than 0.05, H0 was rejected. Thus, it can be said that the learning independence of students had a significant positive effect on their learning achievement.

Hypothesis Test 5

Based on the results of hypothesis testing in table 14, the value of sig obtained was 0.040. Since this value was less than 0.05, H0 was rejected. Thus, it can be said that students' learning interests had a significant positive effect on students' learning achievement.

4.2. Discussion

Based on the results of previous data analysis, it is known that the average score of students' mathematics learning achievement was 25.0 from the ideal score of 100. This indicated that students' mathematics learning achievement still required attention. In addition, the maximum score obtained was 53.3, implying that students' mathematics learning achievement was still unsatisfactory and needed to be improved.

Furthermore, several students with a percentage of 38%, had a lack of readiness based on the prior ability test results. There were still students who did not understand the materials or topic they were studying. Therefore, the student's readiness and mastery of the topic should be considered more by teachers since they were prerequisites for the next topic.

Meanwhile, the average self-regulation score obtained by students was 60.1 out of an ideal score of 80. In addition, most students with a percentage of 65% got scores in a high category. Therefore, it can be concluded that students' self-regulation was high. Other aspects, namely students' self-efficacy was said to be satisfactory since the average score was 74 out of an ideal score of 100, and most students with a percentage of 72% reached scores in the high category. Moreover, students' interest in learning was good since 55% of all students achieved scores in a high category and the average score was 70.7.

5. CONCLUSION

Based on the results and discussion above, several conclusions are derived as follow: (1) Prior ability has a positive effect on students' mathematics learning achievement, (2) Self-regulation has a positive effect on students' mathematics learning achievement, (3) Self-efficacy has a positive effect on students' mathematics learning achievement, (3) Interest in learning has a positive effect on students' mathematics learning achievement, and (4) Prior ability, self-regulation, self-efficacy and interest in learning have an effect on the mathematics learning achievement of class IX students.

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