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THE EFFECT OF HABITS OF MIND AND LEARNING ACTIVITIES ON LEARNING OUTCOMES OF HIGH SCHOOL STUDENTS

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ABSTRACT

This study aims to analyze the effect of habits of mind and learning activities on mathematics learning outcomes of class XI students of SMAN 11 Ambon on polynomial material. This associative causal research used purposive sampling technique involving 64 students from class XI MIA 1 and XI MIA 2. The research instrument consisted of 32 statements to measure habits of mind, 32 statements for learning activities, and 6 description questions for math learning outcomes. Data analysis used simple linear regression and multiple linear regression. The results showed: (1) there is a positive effect of habits of mind on mathematics learning outcomes with a determination contribution of 16.2% (p = 0.001) including the low category; (2) there is a positive effect of learning activities on mathematics learning outcomes with a determination contribution of 11.6% (p = 0.003) including the low category; and (3) habits of mind and learning activities simultaneously have a positive effect on mathematics learning outcomes with a determination contribution of 17.2% (p = 0.003) including the low category. This study recommends the development of learning strategies that systematically facilitate the formation of habits of mind and encourage optimal learning activities to improve students' mathematics learning outcomes, especially on polynomial materials that require good conceptual understanding and procedural skills.

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1. INTRODUCTION

Education is the main pillar in shaping quality and competitive human resources. Improving the quality of learning does not only focus on cognitive aspects, but also considers

the affective dimensions and habits of mind of students (Costa, 2008). In high school mathematics learning that demands higher order thinking, habits of mind become an important factor that needs to be considered (Cuoco et al.,1996).

Habits of mind are defined as intellectual behavioral tendencies that are carried out consistently when facing problems whose solutions are not yet known (Costa and Kallick 2000, 2007, 2009). In the context of mathematics, habits of mind are intellectual behavioral tendencies that encourage productivity and efficiency in mathematical problem solving (Maarif & Fitriani 2023). Several studies have proven a positive correlation between habits of mind and academic performance. Suryani & Habibi (2018) found that habits of mind contributed significantly to students' mathematical problem solving ability, while Handayani (2015) concluded that students with good habits of mind achieved better mathematics learning outcomes.

In addition to habits of mind, student learning activity is also a crucial aspect in learning. According to Fatra et al. (2022), learning activity is an important principle in teaching-learning interaction, including physical and mental activities that are directed to facilitate the process of acquiring knowledge and skills. Research by Firdausy et al., (2019) showed a high correlation between the level of learning activity and math learning outcomes, while Mawardin et al., (2023) concluded that active student participation has a positive effect on achieving optimal learning outcomes.

Polynomial material at the high school level requires good conceptual understanding and efficient procedural skills. The characteristics of the material that tend to be abstract and complex require good thinking habits and intensive learning activities. Observations in the field show that many students have difficulty in understanding the concept of polynomials, which is reflected in the daily test scores that are below 65. Based on the results of interviews with grade XI mathematics teachers and learning observations at SMAN 11 Ambon, it was identified that students' difficulties were closely related to unstructured mathematical thinking patterns and low intensity of independent practice, where 78% of students claimed to only study mathematics when going to the exam and 65% did not reflect on the mistakes made in solving polynomial problems.

The gap in previous research is that there are still limited studies that explicitly analyze the impact of the simultaneous interaction of learning activities and habits of mind on student learning outcomes, especially on the material of many terms. The majority of previous studies generally examine the individual effects of learning activities or habits of mind on learning outcomes, but the analysis using these two variables is still limited. In addition, the study of the amount of contribution of each of these factors to the learning outcomes of many terms material is also still minimal.

Based on the background and research gap, this study was conducted with the aim of analyzing: (1) the learning outcomes of students in grade XI of SMAN 11 Ambon, (2) the effect of habits of mind to learning outcomes of students in grade XI of SMAN 11 Ambon, and (3) the effect of learning activities to learning outcomes of students in grade XI of SMAN 11 Ambon, and (4) the effect of Habits of Mind and learning activities to learning outcomes of students in grade XI of SMAN 11 Ambon. The findings of this research are expected to contribute theoretically to the body of knowledge of mathematics education, especially related to the determinants of successful learning of polynomials material. Practically, the findings of this study are expected to be an empirical basis in developing learning strategies that facilitate the formation of good habits of mind and encourage optimal learning activities to improve student learning outcomes.

2. METHOD

The type of research used in this study is causal associative. Causal associative research itself is a type of research used to determine the relationship between two or more variables whose relationship is cause-and-effect. The data analysis technique uses simple linear regression and multiple linear regression. The simple linear regression stage is used to determine the effect of Habits of Mind on student math learning outcomes and to determine the effect of learning activities on student math learning outcomes. While the multiple linear regression stage is used to determine the effect of Habits of Mind and learning activities on student math learning outcomes. Before hypothesis testing is carried out, classical assumption testing is first carried out. Classical assumption testing includes residual normality test, Heteroskedastistas test, Multicolinerality test. For hypothesis testing using the T test and F test.

This study consists of independent variables denoted by X and dependent variables represented by Y. In this study, the independent variables include Habits Of Mind as X_1 and Learning Activity as X_2. The dependent variable includes math learning outcomes as Y. The relationship between the three variables can be illustrated as in Figure 1.

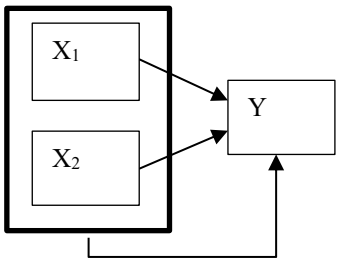

Figure 1. Research Design

The research sample is part of the population taken as a data source and can represent the entire population. This study took samples using purposive sampling technique. In the purposive sampling technique, the sample is based on the consideration of the researcher regarding who are the most suitable and relevant members of the population to be sampled, namely from 6 XI classes that have the highest learning outcomes. Based on this technique, the samples in this study were students of class XI MIA 1 and XI MIA 2 from 6 classes XI at SMAN 11 Ambon. The sample was determined as 64 students of class XI of SMAN 11 Ambon. The instruments used for Habits of mind and learning activities each consisted of 32 statements, while the mathematics learning outcomes data collection used a description of 6 test items.

3. RESULTS AND DISCUSSION

3.1. Results

3.1.1. Mathematics Learning Outcomes

The data that has been collected on Mathematics Learning Outcomes obtained 6 items of description questions, namely the highest score = 94; lowest score = 65; Mean = 80.31; median = 57.00; mode = 85; and Std. Deviation = 7.742.

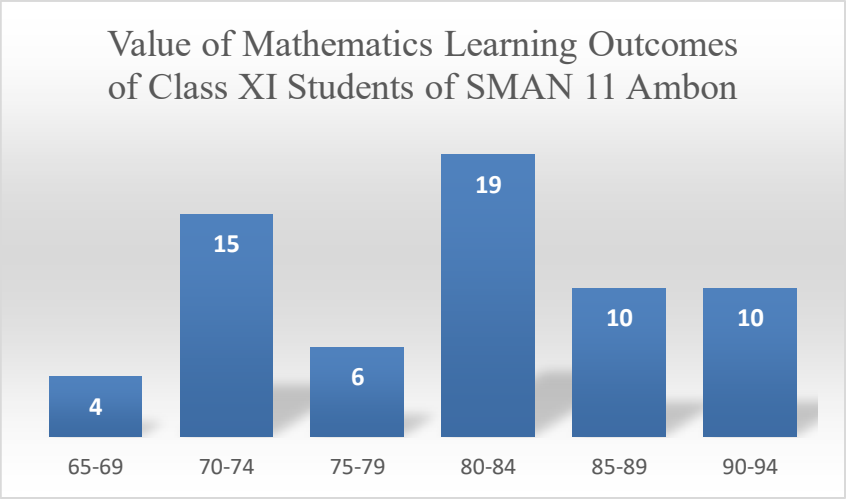

Figure 2. Value of Mathematics Learning Outcomes

3.1.2. Classic Assumption Test

a. Residual Normality Test

The normality test on the regression model is used to test whether the residual value resulting from regression is normally distributed or not. The residual normality test used is the One Sample Kolmogorov-Smirnov test.

Table 1. Residual Normality Test

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		64
Normal Parameters[a,b]	Mean	0E-7
	Std. Deviation	7.04283527
Most Extreme Differences	Absolute	.056
	Positive	.055
	Negative	-.056
Kolmogorov-Smirnov Z		.449
Asymp. Sig. (2-tailed)		.988
a. Test distribution is Normal.		
b. Calculated from data.		

Based on Table 1 shows that the Asymp Sig value is 0.988>0.005, it can be concluded that the residual value of X_1, X_2, and Y data has a normal distribution.

b. Heteroskedasticity Test

Heteroscedasticity indicates that the variance of the variables is not the same for all observations. The test to detect the occurrence of Heteroskedastistas symptoms uses the Giejser test.

Table 2. Heteroskedasticity Test

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.504	4.912		1.324	.190
	X_1	.000	.078	.000	-.003	.998
	X_2	-.010	.062	-.028	-.164	.871
a. Dependent Variable: ABS_RES						

Based on Table 2. shows that the Sig value of X_1 is 0.998>0.05 and the Sig value of X_2 is 0.871>0.05. Thus it can be concluded that there are no symptoms of heteroscedasticity.

c. Multicollinearity test

Multicollinearity test is used to see whether the independent variables contained in the regression model have a perfect or near perfect linear relationship.

Table 3. Multicollinearity test

Coefficients[a]			
Model		Collinearity Statistics	
		Tolerance	VIF
1	X_1	.568	1.760
	X_2	.568	1.760
a. Dependent Variable: Y			

Based on Table 3. Shows that the tolerance value of the two independent variables is 0.568>0.10 and the VIF value of the two independent variables is 1.760 <10, so it can be concluded that there is no multicollinearity.

Based on the results of the classical assumption test that has been carried out, it shows that theresiduals are normally distributed and there are no symptoms of Heteroscedasticity and Multicollinearity symptoms so that they can proceed to simple linear regression tests and multiple linear regression tests.

3.1.3. The Effect of Habits Of Mind and Mathematics Learning Outcomes

The results of simple linear regression calculations of math learning outcomes (Y) with Habits Of Mind (X_1) can be seen in table 1. Based on the results of simple linear regression calculations carried out, then in column B obtained a constant a equal to 28.552 and b equal to 0.338 simple linear regression equation, namely: $\hat{Y} = 28.552 + 0.338\ X_1$. The relationship model between Habits Of Mind (X_1) and the math learning outcomes variable (Y) with the regression equation $\hat{Y} = 28.552 + 0.338\ X_1$. Based on the regression equation, it can be seen that the effect of Habits Of Mind and Grade XI mathematics learning outcomes at SMAN 11 Ambon is positive, this is shown in the regression coefficient or b value in the regression equation which shows a positive number of 0.338 which means that every increase in Habits Of Mind 1 unit will be followed by an increase in math learning outcomes by 0.338 units. Vice versa, if Habits Of Mind decreases by 1 unit then math learning outcomes tend to decrease by 0.338 units. The coefficient value a (intercept) is 28.552 which means that if there is no Habits Of Mind (X = 0) it is estimated that the math learning outcomes are 28.552 units.

Table 4. Value R Square Y over X_1

Model Summary		
R	R Square	Adjusted R Square
.403[a]	.162	.149
a. Predictors: (Constant), HOM		

Table 5. Regression Y over X_1 (Simplifield)

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
Model		B	Std. Error	Beta		
1	(Constant)	28,552	7,772		3,674	.001
	X_1	.338	.098	.403	3,466	.001
a. Dependent Variabel: Y						

In table 4, explains the value of Correlation (R) is 0.403. From this output, the coefficient of determination (R-square) of 0.162. which implies that the effect of the independent variable (Habits of Mind) on the dependent variable (Mathematics learning outcomes) is 16,2%.

In table 5, obtained arithmetic = 3.466 at the significance level α = 0.05 for the two-sided test then obtained df or dk (degrees of freedom) 64 - 2 = 62 so that the t table = 1.998. It turns out that the calculation of the value of t count> t table or 3.466> 1.998 and shows the probability of significance p-value = 0.001/2 = 0.0005 <0.05 then H_0 is rejected and H_1 is accepted. Thus, "Habits Of Mind is positively related to the learning outcomes mathematics of grade XI".

3.1.4. The Effect of Learning Activities and Mathematics Learning Outcomes

The results of the simple regression calculations carried out, then in column B a constant of 30.030 is obtained and b forms a simple linear regression equation of 0.225, namely: $\hat{Y} = 30.030 + 0.225X_2$. The relationship model between students' mathematical disposition and mathematics learning outcomes with the regression equation $\hat{Y} = 30.030 + 0.225X_2$. The regression equation shows that the relationship between students' learning activities and mathematics learning outcomes of grade X_1 students of SMAN 11 Ambon is positive, this is shown in the regression coefficient or b value in the regression equation which shows a positive number 0.225. This implies that every increase in learning activity of 1 unit will be followed by an increase in math learning outcomes by 0.225 units. Vice versa, if student learning activity decreases by 1 unit then math learning outcomes will be more likely to decrease by 0.225 units. The coefficient value a (intercept) is 30.030 which means that if there is no student learning activity (X = 0) it is estimated that the math learning outcomes are 30.030 units.

Table 6. Value R Square Y over X_2

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.340[a]	.116	.102	7.338

a. Predictors: (Constant), Learning Activity

Table 7. Regression Y over X_2 (Simplifield)

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
Model		B	Std. Error	Beta		
1	(Constant)	35,030	7,176		4,882	.000
	X_2	.225	.079	.340	2,850	.006

a. Dependent Variabel: Y

In table 6, explains the value of Correlation (R) is 0.340. From this output, the coefficient of determination (R-square) of 0.116. which implies that the effect of the independent variable (Learning Activity) on the dependent variable (Mathematics learning outcomes) is 11.6%.

In table 7, obtained arithmetic = 2.850 at the significance level α = 0.05 for the two-sided test then obtained df or dk (degrees of freedom) 64 - 2 = 62 so that the table t = 1.998. It turns out that the calculation of the value of t count> t table or 2.850> 1.998 and shows the probability of significance p-value = 0.006/2 = 0.003 <0.05 then H_0 is rejected and H_1 is

accepted. Thus, "Student learning activities are positively related to the learning outcomes of grade XI mathematics".

3.1.5. The Effect of Habits Of Mind and Learning Activities and Mathematics Learning Outcomes

The regression results of Habits of Mind (X_1) and Learning Activity (X_2) with the math learning outcomes variable (Y) can be seen in table 3. Based on the calculation results, in column B, a constant a = 26.429, regression coefficient b1 = 0.265 and b2 = 0.088 are obtained. Thus, the multiple linear regression equation is $\hat{Y} = 26.429 + 0.265X_1 + 0.088X_2$. Based on the calculation of the multiple regression equation, it can be seen that the relationship between Habits of Mind and math learning outcomes is shown in the regression coefficient or b1 in the regression equation which shows a positive 0.265 which means that every increase in student self-concept of 1 unit will be followed by an increase in math learning outcomes by 0.265 units. Vice versa, if the self-concept decreases by 1 unit, the math learning outcomes will decrease by 0.265 units.

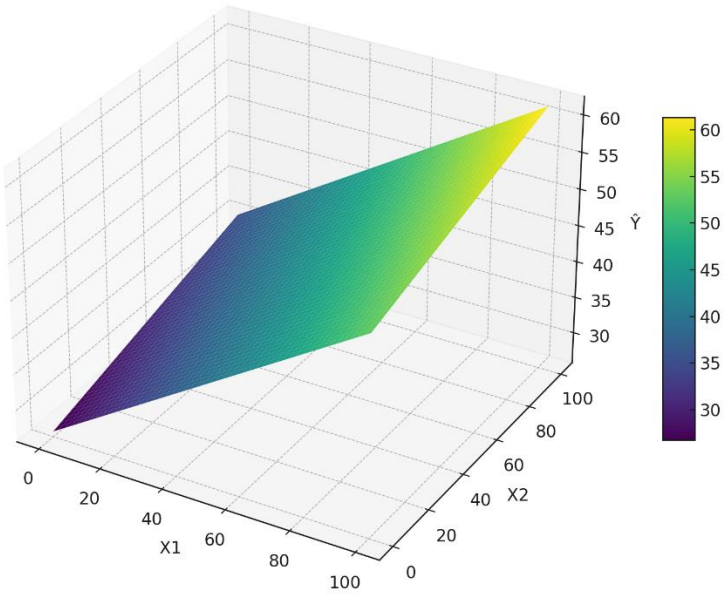

Figure 3. Surface plot of the regression equation $\hat{Y} = 26.429 + 0.265X_1 + 0.088X_2$

Based on the regression equation of learning activities on math learning outcomes, a direct (positive) relationship is seen. This is shown in the regression coefficient or value 0 in the regression equation which shows a positive number of 0.088 which means that every increase in student learning activity of 1 unit will be followed by an increase in math learning outcomes by 0.088 units. Vice versa, if learning activity decreases by 1 unit then math learning outcomes will decrease by 0.088 units. And the coefficient value a (intercept) is equal to 26.429 which means if there is no Habits of Mind and learning activities, the estimated learning outcomes of mathematics students are equal to 26.429 units.

Based on the analysis results as presented in Table 3, the statistical price for the coefficient of the Habits of Mind variable (X_1) is arithmetic = 2.042 and p-value = 0.046/2 = 0.026 <0.05 or H_0 is rejected, which means that self-concept is positively related to math learning outcomes. Furthermore, the statistical price of the coefficient of the learning activity variable (X_2) is t count = 0.861 and p-value = 0.003/2 = 0.0015> 0.05 or H_0 is rejected, meaningful learning activities are positively related to math learning outcomes.

Table 8. Regression Y over X_1 and X_2

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
Model		B	Std. Error	Beta		
1	(Constant)	26,429	8,169		3,235	.002
	X_1	.265	.130		2,042	.046
	X_2	.088	.102		.861	.393
a. Dependent Variabel: Y						

Table 9. R Square Y over X_1 and X_2

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.415[a]	.172	.145	7.157
a. Predictors: (Constant), HOM, Learning Activity				

Table 10. Significance Test of X_1 and X_2 on Y

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	650.854	2	325.427	6,353	.003[b]
	Residual	3124.896	61	51.228		
	Total	3775.750	63			

a. Dependent Variable : Learning Outcome

b. Predictors: (Constant), HOM, Learning Activity

Based on Table 9. shows the magnitude of the multiple correlation R value, which is the correlation between two independent variables on the dependent variable. The R value obtained is 0.415, which means that the correlation between the Habits of Mind and Learning Activity variables on the Mathematics Learning Outcomes variable is 0.415. The R Square value, which shows the coefficient of determination, obtained a coefficient of determination coefficient of 0.172, which means that the influence of Habits of Mind and Learning activities on the Mathematics Learning Outcomes variable is 17.2%, while the remaining 82.8% is influenced by other variables that are not included in it.

Meanwhile, the results of the analysis presented in table 10, obtained the price of F statistics, namely F count = 6.353 and p-value = 0.003 <0.05 or this average H_0 is rejected. This means that there is a linear relationship between Habits of Mind variables and learning activities with math learning outcomes. It also means that there is a relationship between Habits of Mind and learning activities simultaneously to the mathematics learning outcomes of Class XI students of SMAN 11 Ambon.

3.2. Discussion

The results showed that habits of mind affect mathematics learning outcomes, where the higher the habits of mind of students, the higher the mathematics learning outcomes obtained by students. This indicates that the development of habits of mind, such as perseverance, flexible thinking, and metacognition in students, plays an important role in improving their ability to solve complex mathematical problems and understand mathematical concepts in depth. This finding is in line with the research of Hutajulu et al. (2019) which showed a significant relationship between habits of mind and students'

mathematical problem solving ability, research by Hidayat (2024) which confirmed the positive correlation between habits of mind and mathematics learning achievement, and Wirantasa (2017) study which proved that mathematical habits of mind positively affect mathematics learning outcomes. So, in this study there is a strong relationship between Habits of Mind and math learning outcomes.

The findings of this study indicate that there is also a positive relationship between student learning activities and mathematics learning outcomes, because learning activities affect mathematical learning outcomes, where high learning activities will make students proactive in their learning activities independently from others. Conversely, if students' learning activities are low, students will not be proactive in their learning activities and will tend to learn when they get orders only. These results indicate that factors that influence students' learning activities such as intrinsic motivation, conducive learning environment, and interactive learning methods play an important role in shaping their learning independence and ultimately improving their mathematics learning outcomes. This finding is in line with Handayani et al., (2019) study which found a significant correlation between self-learning activities and improved student mathematics achievement, Sutrisno and Yusri (2021) study which confirmed that engagement in self-learning activities can improve student mathematics achievement. Jayadiningrat et al., (2019) which confirmed that students' active involvement in learning has a positive impact on understanding mathematical concepts, as well as Ariandi (2016) research which proved that students with high levels of activeness tend to have better mathematical problem solving skills than passive students. So, in this study there is a strong relationship between student learning activities and math learning outcomes.

The research findings show that habits of mind and learning activities simultaneously and partially have a significant relationship with students' mathematics learning outcomes on the material of polynomials. This positive relationship indicates that developing habits of mind such as perseverance, flexible thinking, and metacognition, as well as increasing learning activities that involve active participation of students in learning are important determinants in improving mathematics learning outcomes. This finding strengthens the research of (Hidayat, 2024; Suryani et al., 2023; Suryani & Habibi, 2023) which shows that the combination of habits of mind and high learning activities can improve students' mathematical representation skills, and is in line with the study of Moma & Ramadhani (2024) which found that the integration of positive habits of mind with an active learning approach contributed significantly to improving mathematics learning outcomes.

Furthermore, the results of this study support the findings of Umar & Usman (2021) who confirmed that learning that facilitates the development of habits of mind while encouraging learning activities can improve students' higher-order thinking skills in mathematics. also found a significant contribution of habits of mind to mathematical problem-solving ability, while Sofyan & Ratumanan (2018) and Pamoras et al., (2021) confirmed the effect of learning activities on better understanding of mathematical concepts. Thus, learning strategies that combine the development of habits of mind and learning activities need to be implemented systematically to optimize students' mathematics learning outcomes, especially in complex materials such as many terms.

4. CONCLUSION

Based on the research findings, the following conclusions can be drawn:

a. There is a positive effect of Habits of Mind (X_1) and mathematics learning outcomes (Y) in class XI SMAN 11 Ambon with a determination contribution of 16.2% ($p = 0.001$). This contribution falls into the low category as 83.8% of learning outcomes are influenced

by other variables not examined in this study, such as problem-solving ability, retention capacity, and self-regulated learning.

b. There is a positive effect of learning activities (X_2) and mathematics learning outcomes (Y) with a determination contribution of 11.6% (p = 0.003). This relatively low contribution suggests that while learning activities positively affect outcomes, their influence is limited compared to other potential factors.
c. Habits of Mind (X_1) and Learning Activities (X_2) simultaneously have a positive relationship with mathematics learning outcomes (Y) with a determination contribution of 17.2% (p = 0.003). This combined influence remains in the low category, indicating that 82.8% of the variance in mathematics learning outcomes is determined by other factors such as problem-solving abilities, self-discipline, retention capacity, and prior mathematical knowledge.

These findings indicate that while Habits of Mind and learning activities contribute positively to mathematics learning outcomes, educational stakeholders should also consider other significant factors when developing strategies to improve students' mathematics achievement.

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