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The influence of *adversity quotient* and learning independence on student math learning outcomes

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Abstract

Learning objectives become targets in the teaching and learning process so that learning activities can be directed and obtain learning outcomes in accordance with what is expected by students. However, in reality, based on observations made at SMK Negeri 4 Gorontalo, there are still many students experiencing problems in achieving learning objectives, this is reflected in the mathematics learning outcomes obtained. Mathematics Learning Outcomes (HBM) are student achievements that are addressed by changes in behavior after learning facts, logic, axioms, and so on that involve a reasoning process on a particular subject matter. Low HBM can be suspected to be caused by internal factors, including Adversity Quotient (AQ) and Learning Independence (KB). AQ is the intelligence of students in responding to problems obtained, while KB is an attitude in carrying out learning activities independently and actively. This study aims to determine and examine the influence given either partially or together and significant between AQ and KB on HBM of class X students of SMK Negeri 4 Gorontalo by using multiple linear regression analysis. The results showed that; AQ had a significant effect of 69.8%, KB had a significant effect of 20.7%, while Adversity Quotient and Learning Independence together had a significant effect of 77.9%.

Keywords: Adversity Quotient; Learning Independence; Math Learning Outcomes; Multiple Linear Regression.

1. Introduction

Mathematics needs to be given to students starting from elementary to secondary school, to equip students with the ability to think critically, creatively, logically, analytically, and systematically as well as the ability to work together. In achieving these competencies, of course, the mathematics learning process is needed because it has a goal to be a benchmark for achieving satisfactory student mathematics learning outcomes. Learning objectives become targets in the teaching and learning process at school so that learning activities can be directed and obtain results in accordance with what is expected both by students and by teachers.

Government support has been mobilized to assist in achieving learning objectives such as curriculum development, improving teacher competence, procuring learning media, educational facilities, improving school management and so on in the hope of making the mathematics learning process more meaningful. However, in reality there are still many students experiencing problems and difficulties in achieving the learning objectives of mathematics, this is reflected in the student learning outcomes obtained, the proof is based on KEMENDIKBUDRISTEK data, the achievement of the national exam in mathematics for vocational education units for the Gorontalo Province region is still lower than the achievements of other regions, especially in SMK Negeri 4 Gorontalo. Learning according to Winkel (2015) are changes in behavior in the form of attitudes that include cognitive, affective, and psychomotor aspects, while mathematics according to Soejadi (2009) is a science of numbers, calculations, logical reasoning, structures, rules, axioms, and so on

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that mathematics learning outcomes are outcomes so facts, logic, axioms, and so on that involve the reasoning process student achievements addressed by changes in behavior after learning on a particular subject matter.

Low math learning outcomes indicate a problem in learning mathematics, The problems or difficulties faced by students when learning takes place vary greatly. There are students who experience obstacles when facing a learning problem such as not understanding students in the material that has been explained by the teacher resulting in students having difficulty solving problems related to mathematics, but there are also students who are able to overcome every learning problem they face both from the way they process skills such as being able to analyze the problems obtained and solve them to changing learning styles.

The causal factor that can affect students' math learning outcomes when viewed from internal factors is *Adversity Quotient*. *Adversity Quotient* according to Shen (2014) is an attitude and ability to overcome difficulties in life and is a very important element for every human being or according to Amanah (2014) is intelligence that is able to turn obstacles into opportunities. So that *Adversity Quotient* is a student ability that can support fighting power and an unyielding attitude in facing difficulties that arise in the learning process. According to Sudarman (2018) *Adversity Quotient* is grouped in three types including; *Quitter* students who try to stay away from problems, *Camper* students who do not want to take too big a risk and feel satisfied with the conditions or circumstances they have achieved, *Climber* is a student who has goals and targets so that he has courage and discipline in facing problems.

Not only that, another factor that is thought to contribute to the influence on student math learning outcomes is learning independence. According to Resmawan (2018) learning independence is an attitude of students who have the characteristics of taking learning initiatives, setting learning goals, monitoring, regulating, and controlling performance, seeing difficulties as challenges, finding and utilizing relevant learning resources, choosing and applying learning strategies, evaluating the process, and having a *self-concept.* Meanwhile, learning independence according to Diayi (2020) is a person's learning activities that are carried out actively to obtain certain knowledge and skills, which grow thanks to the knowledge or competence they have, so that students feel responsible for their learning process which is realized in the form of designing their learning activities, implementing, organizing and disciplining themselves and evaluating their learning process. So that learning independence is the behavior of students in realizing their will or desire in real terms by not depending on others, in this case, these students are able to do their own learning, can determine effective learning methods, are able to carry out learning tasks properly and are able to carry out learning activities independently.

Based on the problems that have been described, it can be seen that the importance of *adversity quotient* and learning independence in students is a factor that can affect the achievement of learning outcomes, especially in learning mathematics, therefore the purpose of this study is to determine the effect given either partially or jointly between Adversity Quotient and Learning Independence on Mathematics Learning Outcomes of class X students of SMK Negeri 4 Gorontalo.

2. Research methodology

This research is a quantitative study with a correlational survey approach. In this study there are three variables studied consisting of two independent variables; *Adversity Quotient*(X_1) and Learning Independence(X_2) and one dependent variable; Mathematics Learning Outcomes . (Y)

The research design model used is as follows:

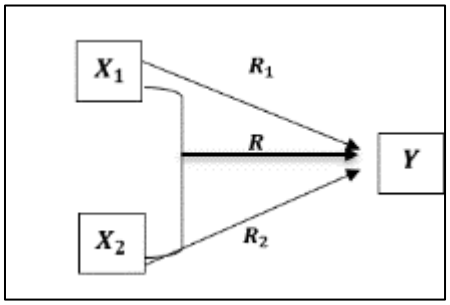

Figure 1 Correlational Survey Research Design

Data collection techniques were carried out by giving tests, questionnaires, and interviews. Tests were used to obtain data on math learning outcomes, while questionnaires were used to obtain data on *Adversity Quotient* and Learning Independence which were then measured based on a scale*Likert* . Interviews were conducted to support the data generated. The data analysis technique used was descriptive statistical analysis to obtain an overview of the characteristics of the distribution of the value of each score studied. Inferential statistical analysis was used to test the research hypothesis through classical assumption test analysis and multiple linear regression. The relationship and the amount of influence contribution both partially and jointly given by *Adversity Quotient* and Learning Independence to Mathematics Learning Outcomes can be obtained through the correlation coefficient and determination. The significance of the influence given can be obtained from the results of the T-Test and F-Test.

3. Research result

3.1. Descriptive Analysis

Based on the data obtained by involving 50 samples for Mathematics Learning Outcomes, 50% were categorized as low, 42% were moderate, and only 8% were high, for *Adversity Quotient*, 52% were categorized as *Quiters*, 40% *Campers*, and only 8% *Climbers*, for Learning Independence, 20% were categorized as high, 66% were moderate, and only 14% of students were categorized in Learning Independencelow . The details can be seen in Table 1 below:

Table 1 Distribution of Values by Variable

Variables	Value		
	Low	High	Mean
HBM	35	91	54
AQ	39	81	57
KB	43	93	65

3.2. Inferential Analysis

3.2.1. Data Normality

The normality test aims to test whether in the regression model, the dependent variable and the independent variable both have a normal distribution or not. A regression model is said to be good if it has a normal data distribution. The normality test is performed on the estimated regression residuals using *One-Sample Kolmogorov Smirnov*. The criteria used in decision making if the significance value is$> \alpha = 0{,}05$ whereα is the error confidence level, then the estimated regression residuals are said to be normal. Based on the test results of calculations using IBM SPSS *Statistics* 27 obtained as follows:

Table 2 Data normality

Estimated Residuals	Significance
Y top X_1	0.200
Y top X_2	0.200
Y topX_1 and X_2	0.200

Based on Table 2 and the decision-making criteria, it can be seen that all estimated regression residuals are normally distributed with a significance value of$> \alpha$. Testing the normality of the estimated regression residual data can also be seen from the histogram with the basis for decision making is said to be normally distributed if the data points are close to the regression line.

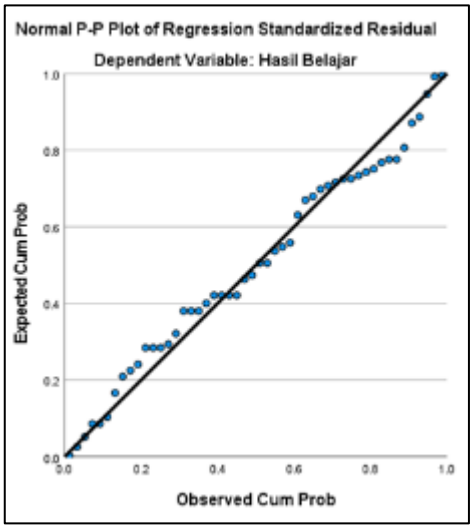

Figure 2 Normality of Residuals of HBM over AQ

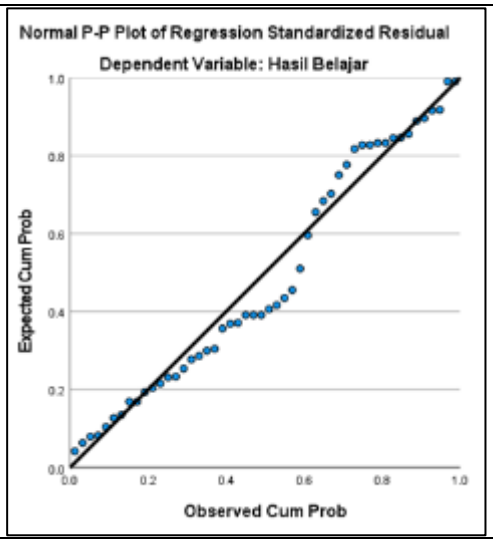

Figure 3 Normality of HBM Residuals over KB

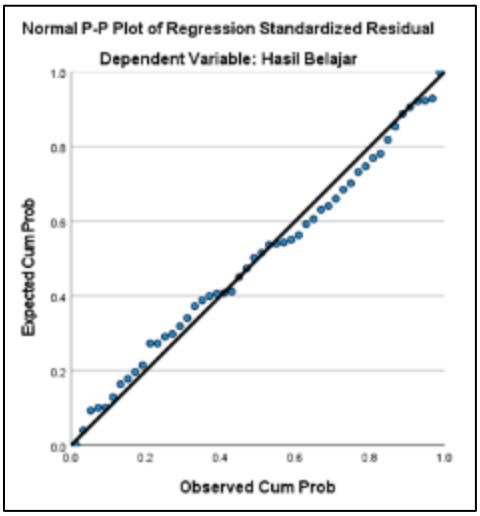

Figure 4 Normality of HBM Residuals on AQ and KB

3.2.2. Multicollinearity

MulticollinearityAdversity Quotient is done to test whether there is a relationship between the independent variables in this case and Learning Independence. If from the data obtained there is a relationship between the two independent variables, the standard error in the multiple linear regression model is large. A regression model is said to be good if there is no multicollinearity. Testing can be done by looking at the values *Tolerance* and *Variant Inflation Factor* (VIF) in the regression model. The criteria used in decision making are if VIF < 10 or *Tolerance*> 0.01 then there is no multicollinearity. With the help of the IBM SPSS application *Statistics* 27 using *Colinearity diagnostic* obtained as follows:

Table 3 Multicollinearity of AQ($\boldsymbol{X_1}$) and KB ($\boldsymbol{X_2}$)

Coefficients[a]			
Model		**Collinearity Statistics**	
		Tolerance	**VIF**
1	(Constant)		
	Adversity Quotient	0.957	1.045

	Learning Independence	0.957	1.045
a. Dependent Variable: HBM			

Based on Table 3, it can be seen that the VIF value < 10 or the *Tolerance* value> 0.01, according to the decision-making criteria, it can be concluded that there is no multicollinearity.

3.2.3. Heteroscedasticity

A regression model is said to be good if there is no heteroscedasticity. Heteroscedasticity is carried out to test whether there is an inequality of variance from residuals in one observation to another. Heteroscedasticity testing can be done by looking at the Graph *Scatterplot* at the *output of the* IBM SPSS Application*Statistics* 27 . The criteria used in decision making is if the data points on the graph spread out and do not show a certain pattern, it indicates that there is no heteroscedasticity.

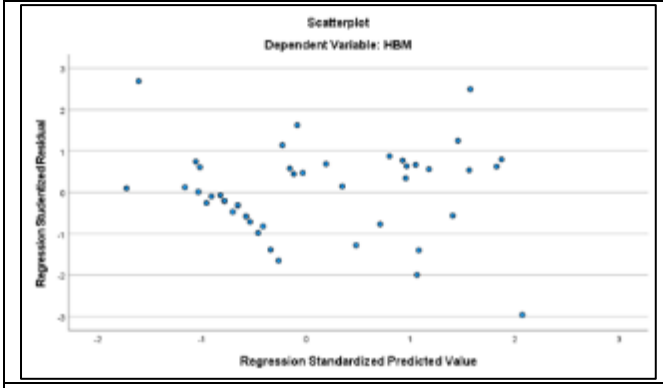

Figure 5 *Scatterplot of* HBM over AQ

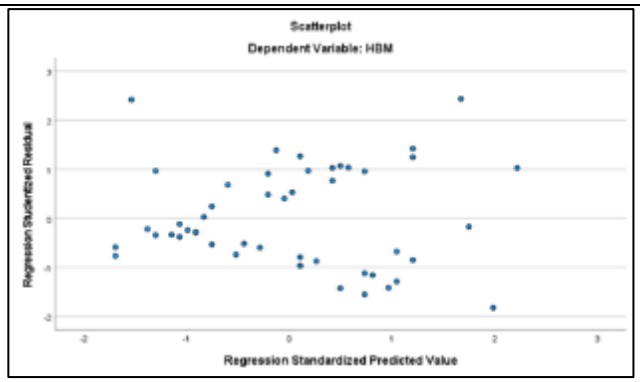

Figure 6 *Scatterplot of* HBM over KB

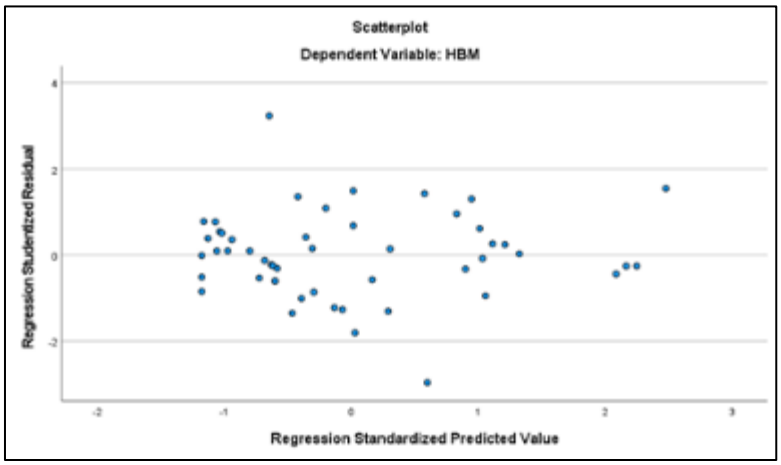

Figure 7 *Scatterplot of* HBM over AQ and KB

Based on Figures 5, 6, and 7, it can be seen that the data points on the graph do not form a certain pattern and spread, in accordance with the decision-making criteria, it can be concluded that heteroscedasticity does not occur.

3.3. Hypothesis Testing

3.3.1. Effect of AQ on HBM

The first research hypothesis is that there is a significant effect of *Adversity Quotient*(X_1) on Mathematics Learning Outcomes(Y) of SMK Negeri 4 Gorontalo students. Statistically, this research hypothesis can be formulated as follows.

$$H_0 : \rho_{YX_1} = 0$$

$$H_1 : \rho_{YX_1} > 0$$

The criterion used in decision making is if the coefficient of determination (*R-Square*) > 0 then *Adveristy Quotient* has an influence on Mathematics Learning Outcomes. Testing the significance of the linear regression model using the T-test with decision-making criteria if the significance value is then the regression model is significant. With the help of IBM SPSS $< \alpha = 0{,}05$*Statistics* 27 obtained :

Table 4 T-test of AQ against HBM

R	*R-Square*	Significance
0,836	0.698	0.000

With the following regression model:

$$\boldsymbol{Y = -2,726 + 0,990X_1}$$

Based on Table 4 and the linear regression model with decision-making criteria, it can be seen that *Adversity Quotient* has a significant positive effect of 69.8% on Mathematics Learning Outcomes of Class X Students of SMK Negeri 4 Gorontalo. If *Adversity Quotient* is worth 1 then Math Learning Outcomes will increase by 0.990. This shows that the higher the *Adversity Quotient*, the higher the Mathematics Learning Outcomes obtained by a student.

3.4. Effect of birth control on HBM

The second research hypothesis is that there is a significant effect of Learning Independence (X_2) on Mathematics Learning Outcomes(Y) of SMK Negeri 4 Gorontalo students. Statistically, this research hypothesis can be formulated as follows.

$$H_0 : \rho_{YX_2} = 0$$

$$H_1 : \rho_{YX_2} > 0$$

The criterion used in decision making is if the coefficient of determination (*R-Square*) > 0 then Learning Independence has an influence on Mathematics Learning Outcomes. Testing the significance of the linear regression model using the T-test with decision-making criteria if the significance value is then the regression model is significant. With the help of IBM SPSS $< \alpha = 0{,}05$*Statistics* 27 obtained

Table 5 T-test of family planning against HBM

R	*R-Square*	Significance
0.456	0.207	0.001

With the following regression model:

$$\boldsymbol{Y = 23,631 + 0,463X_2}$$

Based on Table 5 and the linear regression model with decision-making criteria, it can be seen that Learning Independence has a significant positive effect of 20.7% on the Mathematics Learning Outcomes of Class X Students of SMK Negeri 4 Gorontalo. If Learning Independence is worth 1 then Math Learning Outcomes will increase by 0.463. This shows that the higher the Learning Independence, the higher the Mathematics Learning Outcomes of students.

3.5. Effect of AQ and KB on HBM

The third research hypothesis is that there is a effect significant together between *Adversity Quotient*(X_1) and Learning Independence (X_2) on Mathematics Learning Outcomes (Y) of SMK Negeri 4 Gorontalo students. Statistically, this research hypothesis can be formulated as follows.

$$H_0 : \rho_{YX_1X_2} = 0$$

$$H_1 : \rho_{YX_1X_2} > 0$$

The criterion used in decision making is if the coefficient of determination (*R Square*) > 0 then *Adversity Quotient* and Learning Independence have a joint influence on Mathematics Learning Outcomes. Testing the significance of multiple linear regression models using the F-test with decision-making criteria if the significance value is then the regression model is significant. With the help of IBM SPSS $< \alpha = 0{,}05$*Statistics* 27 obtained

Table 6 F-test of KB against HBM

R	R Square	Significance
0.883	0.779	0.000

With the following regression model:

$$\boldsymbol{Y = -17,735 + 0,917X_1 + 0,297X_2}$$

Based on Table 6 and the linear regression model with decision-making criteria, it can be seen that *Adversity Quotient* and Learning Independence have a significant positive effect of 77.9% on Mathematics Learning Outcomes of Class X Students of SMK Negeri 4 Gorontalo. If *Adversity Quotient* and Learning Independence are each worth 1 then Math Learning Outcomes will increase by 1.214. This shows that the higher the *adversity quotient* and learning independence possessed by students, the higher the achievement of student learning outcomes.

4. Discussion

4.1. Effect of AQ on HBM

The existence of *adversity quotient* implies that students will find it difficult to give up in facing every challenge in life or in other words students always keep fighting even though they have to go through various problem problems. Students who have a high are more likely to have a strong level of control over the math problems faced. For students who have a *adversity quotient* high tend to place guilt and see themselves as the cause of difficulties in learning mathematics. Guilt can help students to learn by tending to reflect on themselves, learn to adjust their behavior, and make self-improvement. As well as being responsible for the good or bad results of every action that is their responsibility and not blaming others and solving their own problems. In addition, students with *adversity quotient* high attribute difficulties only to that situation, not considering difficulties can penetrate all other aspects of life. And the difficulties faced will soon pass.*adversity quotient*

Students who have low tend to think that difficulties that arise will continue to occur, so they continue to be overshadowed by obstacles that often arise. Every difficulty, the cause is also considered as something that will continue to reappear in the future. Students are expected to be able to get out of these thoughts so that they are able to face difficulties and consider the cause as just a common thing that happens and immediately take action to solve it. Thus students are able to survive in achieving the desired math learning outcomes. Students are expected to be able to position difficulties as a tool for self-improvement, not as a major obstacle in life that causes student learning outcomes to drop, *adversity quotient* therefore, by fostering and increasing students' AQ, it is the same as trying to help students to achieve successful HBM.

4.2. Effect of family planning on HBM

Student learning independence is all learning activities carried out by students of their own will with confidence in their abilities, which are carried out to master a competency. The meaning of high learning independence is characterized by a strong initiative, being able to overcome problems and take responsibility, having self-confidence, not depending on others, having a desire to progress which has an impact on the more skills and knowledge developed, and more often solving mathematical problems learned independently.

If a student has the independence to learn, the student will make every effort to achieve the goals learning he has set, organize study time in such a way, study hard, try to complete assignments on time. Likewise, students who have high learning independence will be reflected in the amount of desire to learn, believe in their abilities, are responsible for their learning activities and have confidence in their abilities. For this reason, teachers need to encourage the emergence of student learning so that students can achieve maximum learning outcomes in mathematics. independence

4.3. Effect of AQ and KB on HBM

Mathematics learning outcomes can be improved by taking learning seriously, doing a lot of assignments or doing practice problems as additional practice at home, discussing with peers or asking friends related to tasks or lessons that are not understood, and actively participating in learning activities in the classroom. The learning experience gained, the results can be contributed to classmates through discussion, so that the mathematics learning outcomes that will be achieved can increase. One of the factors that affect math learning outcomes is learning independence. The existence of learning independence by students, resulting in students who engage in independent learning will be more confident, responsible, and self-starting. despite the difficulty of trying, students never plagiarize the work of their classmates. Discovering new competencies is the goal of independent learning, including knowledge and problem-solving skills.

In addition to learning independence, learning outcomes are also influenced by *adversity quotient*, *adversity quotient* is a person's ability to deal with difficulties by changing his way of thinking in dealing with problems that come his way so that he can achieve the desired success. Basically everyone has a desire to achieve success. students who have high AQ in learning, especially in math lessons, then students will continue to make more efforts because students who have high AQ will have high learning motivation as well. This is what will lead students to achieve better and satisfactory learning outcomes. Student motivation in learning greatly influences the learning process, because these students already understand that the problems that exist must be faced instead of avoided, so that obstacles in working on problems can easily be overcome and resolved properly. This is the role of AQ in students, namely when students can turn obstacles in learning into opportunities. As a problem-facing intelligence, AQ has 4 main dimensions, namely *Control, Origin/Ownership, Reach, and Endurance.* These four dimensions are then very instrumental in shaping individual AQ in dealing with difficult situations, including when the individual is in the learning process.

5. Conclusions

There is a significant positive effect of *Adversity Quotient* on Mathematics Learning Outcomes of students of SMK Negeri 4 Gorontalo with the amount of influence contribution of 69.8%. This means that the higher the *Adversity Quotient of* students, the higher the Mathematics Learning Outcomes obtained.

There is a significant positive effect of Learning Independence on Mathematics Learning Outcomes of students of SMK Negeri 4 Gorontalo with the amount of influence contribution of 20.7%. This means that the higher the student's Learning Independence, the higher the Mathematics Learning Outcomes obtained.

There is a significant positive interaction effect between *Adversity Quotient* and Learning Independence on Mathematics Learning Outcomes of students of SMK Negeri 4 Gorontalo with the amount of influence contribution of 77.9%. This means that the higher the *Adversity Quotient* and Learning Independence of students, the higher the students' Mathematics Learning Outcomes obtained.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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