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The Effect of Attitudes and Habits in Online Mathematics Learning on Cognitive Learning Outcomes of Senior High School Students

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Abstract: This study aims to determine the effect of attitudes and habits of learning mathematics through online learning on students' cognitive learning outcomes. This type of research is correlation research using ex post facto design. The research population was all class X IPA students at senior high school 7 Bengkulu City for the 2020/2021 academic year with 320 students. The research sample of 107 students from three classes was selected by a simple random sampling technique where the distribution of students' abilities in each category was not different. The study results show that attitudes toward learning mathematics in online learning have a direct positive effect on students' cognitive learning outcomes. The habit of learning mathematics in online learning has a direct and positive effect on students' cognitive learning outcomes. Suggestions from this study in improving student learning outcomes teachers need to develop student attitudes and learning habits

Keywords: mathematics attitudes, study habits, learning outcomes, online learning.

Abstrak: *Penelitian ini bertujuan untuk mengetahui pengaruh sikap dan kebiasaan belajar matematika melalui pembelajaran daring terhadap hasil belajar kognitif siswa. Jenis penelitian ini adalah penelitian korelasi dengan menggunakan desain ex post facto. Populasi penelitian adalah seluruh siswa kelas X IPA SMAN 7 Kota Bengkulu tahun ajaran 2020/2021 sebanyak 320 siswa. Sampel penelitian sebanyak 107 siswa dari tiga kelas dipilih dengan teknik simple random sampling dimana sebaran kemampuan siswa setiap kelas tidak berbeda. Hasil penelitian menunjukkan bahwa sikap terhadap pembelajaran matematika pada pembelajaran daring berpengaruh langsung positif terhadap hasil belajar kognitif siswa. Kebiasaan belajar matematika pada pembelajaran daring berpengaruh seacara langsung dan positif terhadap hasil belajar kognitif siswa. Saran dalam dari penelitian ini dalam meningkatkan hasil belajar siswa guru perlu menumbuhkembangkan sikap dan kebiasaan belajar siswa.*

Kata kunci: *sikap matematika, kebiasaan belajar, hasil belajar, pembelajaran daring.*

▪ INTRODUCTION

The pattern of learning as a result of the Covid-19 pandemic requires online learning. This causes those who make changes to the application of learning system policies (Bedjeber, 2020). The application of online learning can be done in delivering material or strengthening material. In online learning the need for interactive communication to connect teachers and students as well as the various resources needed in it (Bilfaqih, 2015). In an effort to improve the achievement of learning objectives teachers must be able to innovate (Susanto, Rusdi, & Susanta, 2021). In addition, students must be more independent and active in finding and obtaining various sources of relevant knowledge (Arvianto & Yosef, 2019).

Learning mathematics with online learning requires a special emphasis on conveying mathematical concepts. According to Sari et al. (2020), mathematics is a science that deals with abstract concepts and requires critical thinking in problem-

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solving. However, in practice, the achievement of student learning outcomes is still low. This is because students still have difficulty understanding mathematics. Learning difficulties are conditions in the learning process which are characterized by the presence of certain obstacles to achieving learning objectives (Haji, et al., 2018). This requires teachers to be more creative in classroom learning. Teachers in learning need to do innovative learning (Susanta et al., 2022)

Based on the researchers' review and the results of interviews with the mathematics teacher at Senior high school number 7 Bengkulu City, it was found that the teacher had difficulty giving mathematics lessons. In this online learning, students receive more teacher directions, students are not actively involved in discovering concepts or learning materials for themselves, students are less independent, and student participation is reduced, so students' opportunities to develop thinking skills are limited. It can be said that learning mathematics is still oriented toward teacher activities. To overcome this ineffectiveness, it needs to be changed to student-oriented learning (Haji, S., 2011). According to Lewy (2009), the focus of the characteristics of learning mathematics is on one-way communication, procedural skills, monotonous class settings, depending on textbooks, more dominant routine questions, and low-level questions or low-order thinking skills. Meanwhile, the ability to think at a high level of high-order thinking (HOT) consists of the ability to think logically, critically, systematically, analytically, creatively, productively, reasoning, connecting, communication, and problem-solving (Ahmad, 2014). High-level thinking is thinking at a higher level than just memorizing facts or saying something to someone exactly how it is said (Heong, et al., 2011).

In improving students' cognitive learning outcomes, it is necessary to develop students' attitudes and habits of learning mathematics. Attitude towards mathematics needs to be a concern because it determines how students evaluate and responds to mathematics lessons. School environment, teachers' attitudes and beliefs, teaching styles and parents' attitudes as supporting factors for students' attitudes towards mathematics (Asante, 2012). Students' positive attitudes can be influenced by the method or approach used by the teacher during the learning process, the pleasant experience gained from teaching by the teacher will actually facilitate increasing students' positive attitudes towards mathematics (Ariawan, 2014). While study habits are one of the internal factors that influence learning outcomes. So good study habits will cultivate good learning outcomes as well. If learning has become a culture, then students will do it with pleasure and there is no coercion. Students who have good study habits such as always preparing books or study equipment, taking notes on each assignment, preparing for exams, maintaining health, and concentrating on studying will certainly be very likely to obtain optimal learning results.

Several related studies examine attitudes and study habits toward mathematics learning outcomes. Wahyuni (2016) examined the effect of attitudes on students' mathematics learning outcomes. The results show that there is a positive effect of attitudes on students' mathematics learning outcomes. In general, students having a positive attitude towards mathematics will have an impact on their grades and mathematics achievement (Mata, Monteiro, & Peixoto, 2012). There is a relationship between teachers' attitudes and students' performance in Mathematics (Mensah, Okyere, & Kuranchie, 2013).

Based on this, it is very important to apply good study habits and attitudes during online learning so that students get good results in the learning process. Improving study habits and attitudes toward mathematics lessons shown by students during this pandemic, will make it easier to achieve the expected learning objectives. Based on this background, researchers feel the need to examine attitudes and study habits in mathematics. So that it can be used as an illustration of the results of student achievement in learning that has been achieved. So, the researchers analyzed the effect of Adaptation of Attitudes and Habits of Studying Mathematics in Online Learning on Cognitive Learning Outcomes at Senior high school 7 Bengkulu City.

▪ METHOD

Participants

The population in this study were all students of class X IPA SMA Negeri 7 Bengkulu City, totaling 251 people from 7 classes. The research sample was selected by a simple random sampling technique where each student has the same opportunity to be selected from the class selection. The selected sample was 107 students from three classes, namely class X IPA 4 with 36 students, X IPA 5 with 36 students, and X IPA 6 with 35 students

Research Design and Procedures

This type of research is correlation research using ex post facto design. Correlational research was conducted to determine the level of relationship between two or more variables, without changing or adding, changing existing data (Arikunto, 2013). This study aims to examine the relationship between attitudes and study habits on mathematics learning outcomes. The research design involves independent variables, namely attitudes and learning habits towards learning mathematics, and the dependent variable, namely cognitive learning outcomes.

Instrument

Instruments for data collection in this study consisted of questionnaires and learning achievement tests. The questionnaire consists of two, namely an attitude questionnaire towards learning mathematics and study habits. The questionnaire is in the form of statements with four alternative answers, namely always (score 4), often (score 3), sometimes (score 2), and never (score 1). The attitude instrument consists of 24 question items with indicators: (1) receiving, (2) responding, (3) valuing, and (4) organization. The study habits instrument consists of 30 question items with indicators: (1) how to participate in learning activities, (2) independent study outside class hours, (3) studying textbooks, (4) facing exams. The cognitive test instrument consists of 8 questions with levels, (1) Remembering (C1), (2) Understanding (C2), (3) Applying (C3), (4) Analyzing (C4), (5) Evaluating (C5), and (6) Create (C6)

Data analysis

Data were analyzed using descriptive and financial statistics with a path analysis test. Statistics aims to describe the data of each variable descriptively, namely the mean, median, std deviation, variance, range, minimum, and a maximum of the data. Meanwhile, the path analysis test aims to test the research hypothesis, namely the influence of the dependent and independent variables. Before carrying out the test, a

prerequisite test is carried out with the estimated error normality test, linearity test, and multicollinearity test. The path analysis test uses the SPSS program by analyzing the significance of the test results.

▪ RESULT AND DISSCUSSION

Attitudes towards Learning Mathematics

Based on the analysis of data on students' attitudes toward learning mathematics with a score range of 24-96, it was found that the average student attitude score was 46.02 with a maximum score of 62 and a minimum score of 32 with a standard deviation of 7.281. From a score range of 24-96. Based on the average score of the research subjects in the moderate category (score range 39-53). The results of the analysis of students' attitudes toward mathematics showed that students who had low criteria (score <39) were 13 students (18.69%), moderate criteria (scores 39-53) were 20 students (63.55%), and students with criteria as many as 12 people (17.76%).

Study Habits

The results of the analysis of the responses of the research subjects to the study habits questionnaire which consisted of 21 statements showed that the average student score was 57.82 with a maximum score of 76 and a minimum of 42 from the score range of 30-120. This shows that in general students' study habits are still low in terms of the average student score. Analysis of the level of students' study habits was carried out by analyzing three categories, namely: high (score > 67), medium (score 48-67), and low (score <48). The results of the analysis showed that students in the low category were 19.63%, the medium category was 59.81%, and the high category was 20.56%. Based on these results, it can be concluded that the average student's learning habits are in the moderate category.

Cognitive Learning Outcomes

Data analysis of students' cognitive learning outcomes with a value range of 0-100 is summarized as the average learning outcome is 64.33 from a maximum score of 100 meaning that student mastery only reaches 60% of the material. While the analysis of students' cognitive ability categories showed that in the low category, there were 16 students (14.95%), in the medium category there were 73 students (68.22%), and in the high category there were 18 students (16.82%).

Prerequisite Analysis test results

Estimated Error Normality Test

Testing the normality of the data is done by the Liliefors test. The data normality test is used to determine whether the population data of the two variables are normally distributed or not by fulfilling the statistical hypothesis as follows: $H_o$is accepted if L_{count} is less than L_{tabel}, then the distribution is normal, and vice versa if L_{count} is greater than L_{table}, then the data is not normally distributed. The L_{count} used is $\frac{0{,}886}{\sqrt{n}} = \frac{0{,}886}{\sqrt{107}} = 0{,}085$ with $n > 30$ respondents. The results of the normality test analysis with estimated errors on the attitude variable (X_1), study habits variable (X_2), and the learning outcome variable (Y) are summarized in table 1.

Table 1. Estimation error normality test results

Regression Error	L_{count}	$L_{table\ (0,05;107)}$	Conclusion
(Y) on (X_1)	0.052		Normal Distribution
(Y) on (X_2)	0.076	0.86	Normal Distribution
(X_2) on (X_1)	0.054		Normal Distribution

Linearity Test

Linearity analysis based on the deviation from the linearity test by testing the test pair of cognitive learning outcomes variable on the attitude variable towards learning mathematics obtained a value of Sig = 0.575 with Cronbach α = 0.05 and F_{count} = 0.926 with F_{table} =1.629. Thus it can be concluded that the results of testing the hypothesis about the score of the test pair on the cognitive learning outcome variable on the attitude variable towards mathematics learning have linear Path Analysis of the test of deviation from linearity of the test pair for the cognitive learning outcome variable on the study habits variable obtained sig=0.076 with α=0.05 and F_{count} = 1.524 with F_{table} = 1.623. Thus it can be concluded that the results of testing the hypothesis about the score of the test pair on the cognitive learning outcome variable on the study habit variable have a linear pattern.

Multicollinearity Test

The multicollinearity test was carried out by looking at the tolerance value and Variance Inflation Factor (VIF) based on the results of the regression test. The results of the multicollinearity analysis show that the tolerance value for both variables is 0.993 and VIF is 1.007. based on this, the tolerance value < 0.10 and the VIF value > 10, it can be concluded that there is multicollinearity between the independent variables in the regression model.

Model and Hypothesis Testing

The model analyzed in the path analysis in this study is to look at the relationship of the dependent variable to the independent. The model analyzed is like the causal relationship on Figure 1.

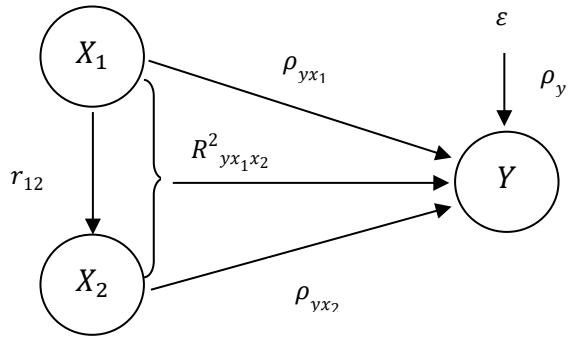

Figure 1. Path diagram of causal relationship

The structural equation for path diagram path analysis: $\hat{Y} = a + b_1X_1 + b_1X_2 + \varepsilon_1$

X_1	:	Attitudes Towards Learning Mathematics
X_2	:	Study Habits
Y	:	Cognitive Learning Outcomes
ρ_{yx_1}	:	The path coefficient of the attitude variable (X_1) towards learning mathematics through online learning towards cognitive learning outcomes (Y).
ρ_{yx_2}	:	The path coefficient of the variable habit of learning mathematics (X_2) through online learning on cognitive learning outcomes (Y).
$\rho_{x_2x_1}$	:	The path coefficient of the attitude variable (X_1) towards learning mathematics through online learning towards mathematics learning habits (X_2).
$R^2{}_{yx_1x_2}$	:	The path coefficient of the attitude variable (X_1) towards learning mathematics through online learning towards cognitive learning outcomes (Y) through learning habits of mathematics (X_2).
ρ_y	:	The variable path coefficient ε on cognitive learning outcomes (Y).
ε	:	Error or residue

Simultaneous Influence Test Results

The results of the F test on the regression test to test the effect of the model simultaneously are summarized in table 2.

Table 2. Estimation error normality test results

Model	Sum of Square	df	Mean Square	F	Sig
Regression	3398.1880	2	1699.094	6.147	0.003
Residual	28746.121	104	276.405		
Total	32144.309	106			

Based on the calculation results of table 2 attitudes toward learning mathematics and study habits towards cognitive learning outcomes (Y) obtained an F_{count} value of 6.147 with a probability value of sig. = 0.003, because the value of sig. ≤ 0.05, the decision is Ho is rejected and Ha is accepted, meaning that attitudes towards learning mathematics (X1) and study habits (X2) through online learning have a simultaneous and significant effect on cognitive learning outcomes (Y). Therefore, individual testing can be carried out.

Hypothesis Testing Results

The results of the partial effect test using the t-test on linear regression are summarized in the Table 3.

Table 3. Estimation error normality test results

Model	Unstandardized B	Coefisien Std.Error	Standardized Coefisients Beta	t	Sig
(Constant)	17.266	13.605		1.269	0.207
learning attitude	0.477	0.223	0.200	2.114	0.034
Study Habits	0.434	0.168	0.240	2.583	0.011

The Effect of Attitudes on Online Learning Mathematics toward Cognitive Learning Outcomes

The first hypothesis tested is as follows

H_0: Attitudes towards learning mathematics through online learning have no significant effect on cognitive learning outcomes.

H_1: Attitudes towards learning mathematics through online learning have a significant effect on cognitive learning outcomes.

Based on the results of the analysis in Table 3, information was obtained that the learning attitude row obtained a t-value of 2.114 and a significance of 0.034. This means that the significance value of the test results is less than alpha (0.05) which causes hypothesis 1 to be accepted and the null hypothesis to be rejected. So it can be concluded that attitudes toward learning mathematics through online learning have no significant effect on cognitive learning outcomes.

The results of the analysis of hypothesis testing show that attitudes toward learning mathematics have a positive direct effect on cognitive learning outcomes. That is, attitudes towards mathematics lessons have a positive direct influence on the cognitive learning outcomes of students at senior high school number 7 Bengkulu City. These findings indicate that the higher the attitudes towards mathematics lessons possessed by students, the higher the cognitive learning outcomes of students. Attitudes are formed as a result of several learning experiences. Attitude reflects an emotional reaction, belief in something or behavior towards an object as a result of a feeling reaction that has been internalized in students. According to Zan & Martino (2007), attitudes toward mathematics are positive or negative emotional feelings and beliefs in mathematics. The importance of linking cognitive assignments in facilitating students' positive relationships with mathematics (Ni et al., 2018). Student success in mathematics depends on attitudes toward mathematics (Farooq & Shah, 2008). Students realize the benefits of learning mathematics they are studying and feel that learning mathematics is important for them. This means that students are happy with mathematics and have a positive tendency in choosing and determining how to learn mathematics.

Attitudes toward mathematics lessons can be seen from the way students react to mathematics lessons so that students will appear who have a positive or negative attitude towards mathematics lessons. The implication is that students who have a positive attitude towards mathematics will be enthusiastic about learning mathematics because they think that mathematics is a useful subject, while students who have a negative attitude towards mathematics will find mathematics an uninteresting and unhelpful subject. So, the attitude shown by students in learning mathematics, whether positive or negative, will have an impact on student learning outcomes. For example in statements with indicators of receiving or receiving, namely awareness and desire to receive stimuli, control and select symptoms or stimuli that come from outside. Students have the willingness to pay attention to an activity such as when the teacher greets or asks questions, students pay attention to the material being taught properly during learning, and show awareness of the importance of learning and being disciplined and independent.

The findings in this study are relevant to previous research conducted by Rusgianto's research (2006) also show that attitudes towards mathematics have a

positive relationship with mathematics learning outcomes even though other independent variables are controlled. This shows that attitudes toward mathematics are consistently directly related to mathematics learning outcomes. According to Haji and Abdullah (2019) building a positive attitude towards mathematics will be able to improve mathematics learning outcomes. Attitudes towards mathematics lessons can be seen from the way students react to mathematics lessons, so that students will appear who have a positive or negative attitude towards mathematics lessons. The implication is that students who show a positive attitude towards mathematics will be enthusiastic in learning mathematics, while students who show a negative attitude towards mathematics will perceive mathematics as an unattractive and unbeneficial subject. So, the attitude shown by students in learning mathematics, whether positive or negative, will have an impact on student learning outcomes.

The Effect of Online Learning Habits toward Cognitive Learning Outcomes

Based on the calculation results in the sig column. in Table 3 the study habits variable obtained a sig. of 0.011. Because the sig. 0.011 value is smaller than the probability value $\alpha = 0.05$, then Ho is rejected and Ha is accepted, meaning that the path analysis coefficient is significant. So, the habit of learning mathematics through online learning has a significant effect on cognitive learning outcomes.

The results of testing the hypothesis show that study habits also have a positive direct effect on cognitive learning outcomes. This means that students study habits have a positive direct influence on the cognitive learning outcomes of students at senior high school number 7 Bengkulu City. These findings indicate that the higher the study habits possessed by students, the higher the level of cognitive learning outcomes of students. Learning is not an immediate good process, so the formation of good study habits needs to be developed. Learning will be more useful if it is patterned in the actions of individuals who are learning. According to Astuti (2018), good learning methods are needed to form study habits in students. These learning methods are carried out repeatedly, over time which will then form a habit of learning to achieve the desired results. For example, in statements with indicators of math learning habits, namely how to participate in learning activities. How to take part in learning activities is divided into several sections such as studying first before online learning begins, preparing learning equipment such as math books, listening and paying close attention, and is full of concentration.

The findings above are relevant to previous research conducted by Agustyaningrum & Suryantini (2016) indicating that there is a significant relationship between study habits and students' mathematics learning outcomes which are included in the strong relationship category. By familiarizing themselves and disciplining themselves in learning, students will get used to carrying out learning activities in their daily lives. Habits that are carried out are very important in influencing the learning process that occurs. So that by getting used to studying regularly, the expected learning outcomes can be achieved optimally. Therefore, it is clear that study habits are needed in students' cognitive learning outcomes.

▪ CONCLUSION

Based on the results and discussion of the research, it can be concluded as attitudes towards learning mathematics in online learning have a direct positive effect on cognitive learning outcomes. The habit of learning mathematics in online learning has a direct positive effect on cognitive learning outcomes. Attitudes towards learning mathematics in online learning have an indirect effect on attitudes towards cognitive learning outcomes through the habit of learning mathematics. This research has implications for how teachers must provide motivation during learning because students' attitudes towards learning are different, especially in online learning. This research has limitations that can be further developed on a wider subject.

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