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The Effect of Student Attitudes on Mathematical Understanding Ability in Mathematical Logic in Hybrid Learning

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Abstract

Students' attitudes in mathematical logic courses can have an influence on their learning outcomes. The type of research used is quantitative research with quasi-experimental methods. The sample in this study were third semester students of the informatics engineering study program who took mathematical logic courses totaling 127 students. The results of the research obtained are that there is an effect of attitude on the learning outcomes of student mathematical logic. The results of the regression model obtained with the value of F=7.055 (p-value=0.009<0.05=α), which indicates that there is a significant effect of attitude on the learning outcomes in mathematical logic. The result of the correlation value R is 0.231 and the coefficient of determination (R^2) is 0.053 which shows that the effect of the independent variable (attitude) on the dependent variable (learning outcomes in mathematical logic) is 5.3%. This shows that there is a positive influence of student attitudes on student learning outcomes in mathematical logic.

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INTRODUCTION

After a long pandemic, many things have changed with activities and interactions in many fields. One of them is changes in the field of education. Education that is carried out after passing the pandemic is the implementation of hybrid learning. Learning that is carried out with face-to-face and online meetings is carried out alternately. One of the private campuses in Jakarta is still implementing hybrid learning. Students are asked to be able to attend lectures consistently both offline and online meetings.

Hybrid learning provides a new learning experience for students. This is in line with the opinion by Wegasari, Utomo, and Surachmi (2021) which states that "online learning has a positive impact on students, namely it can provide new experiences. Students are asked to be ready to carry out learning by attending class and carrying out online learning where students are required to be adaptive to technology such as the use of zoom, google meet, and other platforms that

support online learning (Sur et al., 2020). Some students have certainly shown positive and negative attitudes during the implementation of hybrid learning. Students' attitudes towards hybrid learning cannot be separated from how students respond to the learning experience they follow.

Attitude is one of the things that is part of the assessment in the learning process in the classroom. Through attitude, lecturers can see the effectiveness of learning in the classroom. Attitude is a reflection of students' interest or disinterest in the course they are taking. Therefore, attitude is an important part of achieving learning objectives in the classroom. The importance of student attitudes in this lecture process is to show the pleasure and seriousness possessed by students in taking mathematical logic courses in hybrid learning.

Basically, attitudes are more consistent than feelings and emotions, but attitudes can affect student activeness in lectures (Idris et al., 2021), but as a predisposition, attitudes cannot be seen or measured directly. Instead, attitudes are inferred from the way we respond to certain stimuli (Sarmah & Puri, 2014). The influence of attitude on students' activities in lectures may be positive or negative depending on the individual students (Mazana, Montero, & Casmir, 2018). Students' attitudes towards learning mathematics can be shown in the form of liking or disliking the course; the tendency of students to participate or not participate in mathematics learning activities; and beliefs about the usefulness or uselessness of mathematics (Kibrislioglu, 2015). Attitude is more about the way a person responds positively or negatively to an object, situation, concept or person. Attitude is a person's belief that reflects opinions and feelings and can be manifested in behavior (Joseph, 2013).

According to Karnia and Nurhasan (2023), attitude is a positive or negative reaction to an object. Furthermore Notoatmodjo (2010) stated that attitude is a collection of symptoms in responding to a stimulus so that it involves thoughts, feelings, attention and other psychological symptoms. The same thing is also stated by Arrosih, Marianti, and Rasidi (2022) that attitude is an internal symptom with an effective dimension in the form of a tendency to respond in a relatively fixed way to objects both positively and negatively. Then Rati, Martias, and Darman (2015) explained that attitude is a readiness to act in a certain way towards an object. Therefore, attitude is one of the factors that influence learning outcomes. According to Syah (2013) stated that attitude is one of the factors that influence the success of learning outcomes (Rati et al., 2015; Djaali, 2012). A positive attitude towards learning is a form of lecturer success in implementing learning in the classroom. This success is also expected to have a positive impact on student learning outcomes.

According to Rati et al. (2015), learning outcomes are cumulative of several aspects that have basically been done by students, both at school and outside school. Furthermore, according to Arrosih et al. (2022), learning outcomes are a process for determining the value of student learning through measuring learning outcomes. According to Dimyati and Mudjiono (2011), learning outcomes are a better level of mental development when compared to before learning. Learning outcomes are certain competencies both cognitive, affective and psychomotor that students achieve after participating in learning (Kunandar, 2014; Rusman, 2016; Sani, 2019; Susanto, 2013). Good learning outcomes are obtained from a series of learning process activities that students follow with a positive attitude.

Some studies that show that a positive attitude will result in good learning outcomes include Trisnawati, Sastrawan, and Buwono (2016) showing that there is an effect of learning attitudes on student learning outcomes by 5.9%. Then Arrosih et al. (2022) stated that there was a positive and significant influence between learning attitudes on student math learning outcomes. One of the positive attitudes seen when students are happy to take part in learning mathematical logic courses.

Mathematical logic is one of the courses that must be followed by third semester students of the informatics engineering study program. Mathematical logic is one of the courses whose material is a lot of symbols, notations and proofs (premises). Therefore, students are asked to be able to prove premises with truth tables by using existing symbols and notations correctly. Therefore, it is necessary for students to have a positive attitude in participating in the course. These positive attitudes include enjoying participating in class learning, doing exercises and assignments, actively participating in class learning, providing ideas, ideas, opinions and even questions during the learning process in class.

Based on previous research conducted by Hartati (2015), it shows that the mathematics learning outcomes of students who have a positive attitude towards mathematics are higher than students who have a negative attitude towards mathematics. The difference in research conducted by researchers is in the research subject. The Hartati's research used a sample of vocational students while the sample in this study was second semester students. In addition, the purpose of the Hartati's research was to see the effect of learning styles and student attitudes on mathematics subjects while the purpose of this study was to see the effect of student attitudes on mathematical logic. Furthermore, the results of research conducted by Purnomo (2017) show that there is a significant effect of attitude on student math learning outcomes. The research subjects conducted by Purnomo were junior high school students while the sample in this study were second semester students. The purpose of Purnomo's research was to see the effect of students' attitudes and learning independence on math learning achievement while this study aims to see the effect of student attitudes on mathematical logic. Then the research conducted by Kibrislioglu (2015) shows that students' positive attitudes arise because of students' love for their teachers, not because of the nature of mathematics. The difference between Kibrislioglu's research and this study is in the research subject. The subject of Kibrislioglu's research was 6th grade elementary school students while the sample of this study was second semester students.

The importance of a positive attitude towards mathematical logic can impact students to learn better. Students who have a positive attitude towards mathematical logic tend to be more motivated to learn. Students have a greater interest in the material and are able to see its importance in everyday life. Then the positive attitude of students can help in overcoming obstacles and difficulties that arise during learning. Students do not give up easily when facing difficult tasks and try their best to achieve a good understanding. Students' positive attitude towards mathematical logic can make students participate more actively such as asking questions, answering questions, providing ideas or responses and discussing with friends in understanding material concepts better. Thus, it is necessary to see whether there is an influence of student attitudes on the learning

outcomes in mathematical logic and how much influence student attitudes have on the learning outcomes in mathematical logic. Based on the description above, the researcher is interested in seeing the effect of student attitudes on the learning outcomes in mathematical logic in hybrid learning.

RESEARCH METHODS

This research was conducted at one of the private universities in Jakarta. The research sample is Informatics Engineering students in even semester 2022-2023. Sampling in this study was carried out using Purposive sampling technique, which is a sampling technique based on certain considerations. The research was conducted for one semester from March 2023 to July 2023. This study uses a quantitative approach with the type of cause and effect research that aims to examine the effect of student attitudes (X) on mathematical logic learning outcomes (Y). The research instrument used a questionnaire containing 16 statement items about attitudes distributed to 127 students from four regular morning classes. This questionnaire was developed by Rezeki and Mutia (2020) with indicators (1) showing students' enjoyment in mathematical logic courses; (2) showing students' seriousness in following the mathematical logic course lecture process; (3) showing students' preference for lectures with cooperative learning models; (4) the role of lecturers in lectures. Data were obtained from the results of a questionnaire on the attitude of students learning mathematical logic and 5 items of mathematical logic questions in essay form. The validation of the attitude questionnaire used a Likert scale. The attitude questionnaire was distributed through the class wag in the form of a Google form link.

The analysis used is a simple linear regression analysis technique that aims to determine the effect of student attitudes on mathematical logic learning outcomes and to determine how much influence student attitudes have on mathematical logic learning outcomes.

RESULTS AND DISCUSSION

The descriptive statistical results of students' mathematical logic learning outcomes on student attitudes presented in Table 1.

Table 1. Descriptive statistics results

	N	Min	Max	Mean	Std. Deviation	Variance
Attitude	127	35.00	63.00	50.1575	6.21369	38.610
Learning Outcomes	127	0.00	100	90.2520	11.78105	138.793

In Table 1, it is shown that the minimum value difference between attitude and math logic learning outcomes is 35 while the maximum value difference is 37. Then the maximum and minimum value difference of attitude is 28 while the maximum and minimum value difference of math logic learning outcomes is 100. The difference in value between attitude and learning outcomes is quite large, namely 72. Furthermore, the difference in average value between attitude and math logic learning outcomes is 40.09. This shows that the average value of math logic learning outcomes is much higher than the average value of attitude. The

variance results show that the distribution of attitude data is smaller than the distribution of data on math logic learning outcomes. The same thing is also for the comparison between the average value and the standard deviation value, the value of learning mathematical logic is better because it has a smaller standard deviation value than the average value.

Table 2. Anova test results

	Sum of Squares	*df*	Mean Square	*F*	*p*-value
Regression	259.908	1	259.908	7.055	0.009
Residual	4604.942	125	36.840		
Total	4864.850	126			

Table 2 shows that the value of F=7.055 (p-value=0.009<0.05=α), so that the regression model can be used to predict the attitude variable or in other words there is an influence of the attitude variable on the variable learning outcomes in mathematical logic.

Table 3. Regression coefficient

	Unstandardized Coefficients		Standardized Coefficients	*t*	*p*-value
	B	Std. Error	Beta		
(Constant)	68.271	8.338		8.188	0.000
Attitude	0.438	0.165	0.231	2.656	0.009
R	0.231				
R^2	0.053				
Adjusted R^2	0.046				

Table 3 shows that the simple regression coefficient value of math logic learning outcomes is 0.438 while the constant value is 68.271. This can be formulated in the following equation, $\hat{Y}$=68.271+0,438X. This equation can be interpreted that every one unit increase in the attitude variable will also be followed by an increase in the student math logic learning outcomes variable by 0.438. The higher the student's attitude, the higher the student's mathematical logic learning outcomes.

Furthermore, the correlation value R is 0.231 and the coefficient of determination (R^2) of 0.053, which indicates that the effect of the independent variable (attitude) on the dependent variable (mathematical logic) is 5.3%. The results of the above calculations show that there is a positive influence of student attitudes on student mathematical logic learning outcomes. Students who have a high attitude tend to show interest and effort to participate in the learning process of mathematical logic. Conversely, students who have a low attitude will tend to show less interest and less participation in the learning process of mathematical logic. This is in line with the opinion Hartati (2015) which states that if students have a positive attitude towards the course, these students will categorize the course as an interesting and useful course to study, such as enjoying doing assignments, responding well to problems and challenges given by lecturers and so on and vice versa.

Based on the research results, the coefficient of determination is 5.3%. This shows that the learning outcomes of student mathematical logic are influenced by student attitudes. Students' environmental factors are one of the reasons for this. When given a task, each group tries to complete the task in a timely manner. However, the factor of homogeneous group members is one of the things that influences the process of group discussion activities. Groups consisting of students with moderate abilities will show a positive attitude in completing the task. Each student helps each other to complete the task. Conversely, groups consisting of low-ability students will show negative attitudes such as laziness to try to solve problems, pessimistic about being able to complete the task and hope that friends can complete the task.

Student Attitudes Positively Impact Math Understanding

Based on the results of the analysis test, it can be shown that there is a positive effect of student attitudes on student learning outcomes in mathematical logic courses. Students who have a positive attitude tend to have good learning outcomes in mathematical logic courses. This can be seen from the results of the coefficient of determination (R^2) which shows that the magnitude of the influence of student attitudes on learning outcomes in mathematical logic courses is 5.3%. In other words, 5.3% of student learning outcomes are influenced by the attitude of the students themselves and the rest is influenced by other factors. Among other factors that affect student learning outcomes in mathematical logic courses is the division of groups homogeneously. Homogeneous group division based on the value of the prerequisite courses in the previous semester. Groups consisting of students whose prerequisite scores are low will show negative attitudes such as being less active in lectures, less motivated in lectures, late in submitting assignments and less serious in attending lectures. Meanwhile, groups consisting of students whose prerequisite scores are high will show positive attitudes such as being happy to attend lectures, active in group discussions, on time in submitting assignments and having high curiosity about mathematical logic courses. It is also explained by Hartati (2015) that if students have a positive attitude towards the course, these students will categorize the course as an interesting and useful course to learn, such as happy to do assignments, respond well to problems and challenges given by lecturers and so on. Conversely, students who have a negative attitude towards the course will categorize the course as an uninteresting and less useful course to learn, such as being forced to do assignments, lazy to do problems and so on.

Although the percentage is small, it still has a positive influence on student learning outcomes. The same thing was also obtained from the results of research conducted by Trisnawati et al. (2016) which showed that there was an effect of learning attitudes on student learning outcomes of 5.9%. According to Purnomo (2017) states that students who have a positive attitude will show a sense of pleasure and a greater desire to get to know and know more about mathematical concepts. In line with the opinion by Hartati (2015) which also states that students will take sustainable actions if they feel happy doing something, such as studying, attending lectures and so on. Based on this opinion, it can be concluded that a positive attitude is very important for every student in attending lectures in order to obtain good learning outcomes.

Based on the results of the anova test, the value of F=7.055 (p-value=0.009 <0.05=α), this shows that student attitudes have a significant influence on learning outcomes in mathematical logic courses. This is shown during class lectures that some students are active in answering questions and questions given by the lecturer. During group discussions, it was seen that some students participated in providing ideas and ideas in solving exercise problems. In addition, some students also have the initiative to present the results of their group discussions in front of the class. This is in line with the opinion by Purnomo (2017) which states that the positive attitude of students in the course can have a good influence on learning outcomes. Furthermore, according to Aisah (2023) states that the attitude of students who play an active role during lectures can provide good learning outcomes. Conversely, the attitude of students who do not play an active role during lectures can provide poor learning outcomes. The opinions of the two experts are corroborated by the results of research conducted by Arrosih et al. (2022) showing that there is a positive and significant influence between learning attitudes on student math learning outcomes.

CONCLUSION

The results showed that there was an effect of attitude on the learning outcomes of student mathematical logic. It is interpreted that the higher the student's attitude, the higher the student's mathematical logic learning outcomes. The effect of attitude on students' mathematical logic learning outcomes is 5.3% and the rest is influenced by other factors.

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