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THE EFFECT OF MATHEMATICS PROBLEM-SOLVING ABILITY AND LEARNING INDEPENDENCE ON MATHEMATICS LEARNING ACHIEVEMENT IN ONLINE LEARNING

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Abstract
The COVID-19 pandemic has made face-to-face learning abolished and substituted by online learners, causing the value of mathematical learning performance to fall. It is possible that mathematical problem-solving skills and learning independence are variables that a ffect the reduction in learning achievement in mathematics. This study aimed to examine the effect of partial and simultaneous mathematical problem-solving ability and independent learning on mathematics learning achievement. This study was carried out at SMP N 1 Purwokerto, with the population was class IX SMP N 1 Purwokerto, the sample selected by cluster random sampling was class IX H SMP N 1 Purwokerto. A quantitative study using the ex-post-facto method was used in this study. Tests, surveys, and score documents were used to collect data. Validity and reliability assessments were completed on the tests and surveys. A precondition test, such as a normality test, multicollinearity test, heteroscedasticity test, and linearity test, was performed on the questionnaire test results. After that, a multiple linear regression model and test the hypothesis were formed using coefficients of determination, partial test, and simultaneous test methods. Y=49,280+0,107X1+0,378X2 was the linear regression model formed. According to the findings, mathematical problem-solving skills showed a significant effect on the learning achievement of 10.7%. Learning autonomy had a 37.8% positive effect on learning achievement. Simultaneously, the ability to solve mathematical problems and autonomous learning had a 70.7% significant effect on learning achievement.
Keywords: *Independent Learning, Mathematics Learning Achievement, Mathematical Problem Solving Ability, Online Learning,*

INTRODUCTION

The Covid-19 pandemic requires that face-to-face learning in schools be abolished. Students must learn at their respective homes or Study From Home, which is carried out online or online using various online platforms. All learning in schools is carried out online, including learning mathematics. Online learning affects student learning achievement. Learning achievement is the success of learning activity in the form of numbers or letters representing each child's success over a certain period (Tirtonegoro, 2011). Learning achievement may be influenced by mathematical problem-solving ability and independent learning. To understand well, it is necessary to know the definition of mathematical problem-solving ability and independent learning.

According to the National Professional Certification Agency BNSP, students' problem-solving abilities are strategic competencies shown by students when they can understand problems, can choose problem-solving strategies, and can solve mathematical models to solve problems. Afifah et al. (2019)states that problem-solving ability affects student learning achievement by 54.36%, so it is proven that mathematical problem-solving ability has a role in student learning achievement in mathematics. Meanwhile, to measure how far students' mathematical problem-solving abilities are needed indicators. The indicators of problem-solving ability, according to Polya, that will be used in this research are as follows: 1) understanding the problem (Understanding the problem), 2) developing

a strategy for solving a plan (Devising a plan), 3) solving problems appropriately with planning (Carrying out the plan), 4) check or re-evaluate (Looking back).

In addition to problem-solving skills, independent learning is very much needed in online learning. The teacher is only accompanied through the online platform, which means the teacher cannot guide directly. This is supported by the opinion of Kuo et al. (2014), who state that online learning is more student-centered so that it can foster student independence in learning. Research Uki & Ilham (2020) says that 72.59% of the influence given by the variable of learning independence on mathematics learning achievement. It is proven that learning independence has a role in students' learning achievement in mathematics. The indicators that will be used in this study refer to Sugandi (2013), who defines indicators of student learning independence: 1) learning initiatives; 2) diagnosis of learning needs; 3) set learning objectives; 4) view learning difficulties as challenges; 5) find and use relevant learning resources; 6) determine and implement learning strategies; 7) evaluate the learning process and results; 8) self-concept. Based on the explanation above, the problem formulations that can be made are 1) There is a positive influence of mathematical problem-solving ability on mathematics learning achievement in online learning; 2) There is a positive influence of learning independence on mathematics learning achievement in online learning; 3) There is a positive influence of mathematical problem-solving ability and learning independence on mathematics learning achievement in online learning.

METHOD

Research This research was conducted at SMP Negeri 1 Purwokerto in the even semester of the 2021/2022 academic year. The population in this study was class IX SMP Negeri 1 Purwokerto and the sample selected by cluster random sampling was class IX H SMP N 1 Purwokerto. The type of research used is quantitative research using the ex-post-facto method. Ex-post facto research is research with independent variables that had occurred before the study was conducted, the independent variables in this study did not receive special treatment. Still, it only revealed facts based on the measurement of symptoms that already existed in students. The effect of the independent variable on the dependent will naturally occur without researcher intervention (Sukardi, 2013).

Research data collection techniques using primary data and secondary data. Primary data is a test instrument for the mathematical problem-solving ability variable, consisting of 3 limited description questions including four indicators of mathematical problem-solving ability. Then, a questionnaire for the learning independence variable was composed of 15 statements with five alternative answers (always, often, sometimes, rarely, never). The secondary data is the PAT score document for the mathematics learning achievement variable.

Validity test

Sugiyono (2015) reveals that an instrument that can measure what should be measured is valid. There are hypotheses to test the validity of the mathematical problem-solving ability test instrument and the learning independence questionnaire instrument:

H0: instrument item is not valid

Ha: instrument item is valid

The validity test in this study will be used SPSS with Pearson Correlation. The basis for decision-making uses the correlation value. If count table, then H0 is rejected, and Ha is accepted. The results of the validity test output will be displayed in tabular form.

Reliability Test

Reliability testing is related to the issue of whether an instrument is accurate and reliable and matches the criteria that have been set (Arifin, 2010). To test the validity of the mathematical problem-solving ability test instrument and the learning independence questionnaire instrument, the following hypotheses will be formulated:

H0: the instrument is not reliable

Ha: reliable instrument

This study's reliability test will use SPSS with Cronbach's alpha. The basis for decision making is the limitation in reliability testing: the Cronbach alpha coefficient > 0.70, then H0 is rejected, and Ha is accepted. The results of the reliability test output will be displayed in full.

For data analysis, techniques are used as follows.

Normality test

The normality test aims to detect the distribution of the data distribution of a variable from a population that is normally distributed or not (Sugiyono, 2015). The data of a variable that is feasible to use is usually distributed; when the distribution of the data is expected, the data can be said to represent the population. To perform the normality test, the following hypothesis will be formulated:

H0: data is usually distributed

Ha: data is not normally distributed.

The one-sample Kolmogorov-Smirnov test in the SPSS program can be used to calculate the normality test. The basis for decision-making in the normality test is the Asym value. Sig. > 0.05, which means H0 is accepted. The results of the normality test output will be displayed in complete form.

Multicollinearity Test

The multicollinearity test aims to test whether the regression model found a correlation between mathematical problem-solving ability (X1) and the variable of learning independence (X2). A good regression model is that there is no multicollinearity. To test multicollinearity, the following hypothesis will be formulated:

H0: data occurs multicollinearity

Ha: the data does not happen multicollinearity

The SPSS-assisted multicollinearity test was carried out by looking at the Tolerance value and its opposite, namely VIF. Tolerance value 0.10 or VIF value ten, then H0 is rejected, and H¬¬a is accepted.

Heteroscedasticity test

The heteroscedasticity test aims to test whether there is an inequality of variance from the residuals of one observation to another. Ghozali (2018) explains that a good regression model does not occur heteroscedasticity; in other words, homoscedasticity occurs. To test heteroscedasticity, the following hypothesis will be formulated:

H0: data appears heteroscedasticity

Ha: data does not happen heteroscedasticity

The heteroscedasticity test will be carried out with SPSS. The basis for making decisions on the output is a scatterplot with points spread above and below the number 0 on the Y-axis and do not form a specific pattern, then H0 is rejected, and Ha is accepted.

Linearity Test

(Sugiyono, 2015) revealed that the linearity test aims to test whether there is a linear relationship between each independent variable and the dependent variable. To test the Linearity of each independent variable on the dependent variable, the hypothesis will be formulated as follows:

H0: there is a linear relationship

Ha: there is no linear relationship

Test of Linearity with the help of SPSS can be used to test Linearity. For the Test of linearity method on the output results, if the value of Sig. On Linearity < 0.05 or the value of Sig. On Deviation from Linearity > 0.05, then H0 is accepted.

Multiple Regression Analysis

The purpose of multiple linear regression analysis is to determine whether there is an influence between two or more independent variables on the dependent variable. A multiple linear regression line equation with two predictors will be formed according to the output generated by SPSS. Furthermore, the multiple linear regression equation models will be interpreted as the meaning of the constant value, the value of the coefficient of X1, and the value of the coefficient of X2.

Hypothesis testing

Coefficient of Determination

The coefficient of determination, called R2, aims to measure the percentage of the influence of the independent variables (X1 and X2) on the dependent variable (Y). The size of the coefficient obtained shows how capable the independent variable's variation is used in explaining the dependent variable's interpretation. Finding the coefficient of determination using SPSS is done by looking at column R2 (Adjusted R Square), the numbers that show how big the contribution of the influence of mathematical problem-solving ability and independent learning on mathematics learning achievement.

Partial Test (t-Test)

The t-test aims to determine the partial significance of the role between the independent variables on the dependent variable. To perform the t-test, the following hypotheses will be formulated:

H0: there is no significant effect partially

Ha: there is a somewhat significant effect

The t-test was carried out with the help of SPSS based on decision making, the value of count > table, or the value of Sig. <0.05, which means H0 is rejected and Ha is accepted.

Simultaneous Test (F Test)

F test aims to determine the significance of the role simultaneously between the independent variables on the dependent variable. To perform the F test, the following hypotheses are needed:

H0: there is no significant effect simultaneously

Ha: there is a significant simultaneous effect

The F test was carried out with the help of SPSS based on decision making, the value of Fount > F table or the value of Sig. <0.05, which means H0 is rejected and Ha is accepted.

RESULTS AND DISCUSSION

T Test Results

Table 1

T Test Results

Coefficients[a]

Model		t
1	(Constant)	10,877
	Mathematics Problem-Solving Ability	2,478
	Learning Independent	5,503

a. Dependent Variable: Learning Achievement

Based on table 1, it is known that the count value for the mathematical problem-solving ability variable is 2.478, and the count value for the learning independence variable is 5.503, which means both count values > table. The Sig value for the variable of mathematical problem-solving ability is 0.019 < 0.05. It is concluded that H0 is rejected, so the value of Sig. is in the area Ha. In other words,

the mathematical problem-solving ability has a significant effect on learning achievement. In line with the statement of Nanang (2012), problem-solving is a fundamental and essential ability in mathematics. Research Malina et al. (2021) reinforced that students' mathematical problem-solving abilities affect student achievement by 66%. Students with good mathematical problem-solving skills will find it easier to process and solve the math problems they face.

The results of the t-test hypothesis test showed that the value was 0.000 <0.05. This means that H0 is rejected, so the value of Sig. is in the area Ha. In other words, the learning independence variable significantly affects the learning achievement variable. In line with the statement, Asmar & Delyana (2020) say that student learning independence is an effort made by students to be able to carry out learning activities independently based on their motivation to master certain materials that can increase the value of learning achievement, Relevant also to research Uki & Ilham (2020)) which states that there is 72.59% of the influence given by the independent learning variable on mathematics learning achievement. Students who have independence in learning will be beneficial for learning, especially when learning online.

F Test Results

Table 2

F Test Results

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	663,659	2	331,830	38,459	,000[b]
	Residual	250,216	29	8,628		
	Total	913,875	31			

a. Dependent Variable: Learning Achievement

b. Predictors: (Constant), Learning Independent, Mathematics Probel-Solving Ability

Based on table 2, the F count value is 35.378 while the t table value is 3.32, which means that the F count > F table. Value of Sig. is 0.000 < 0.05. This means that H0 is rejected and Ha is accepted. In other words, the variables of mathematical problem-solving ability and independent learning simultaneously or together significantly affect the learning achievement variable. The magnitude of the influence of mathematical problem-solving ability and learning independence on mathematics learning achievement is explained by the coefficient of determination. The output results show the Adjusted R Square value of 0.707. This shows that 70.7% of learning achievement variables can be influenced by the mathematical problem-solving ability and learning independence variable. While the rest (100% - 70.7% = 31.1%) is influenced by other variables outside the model.

CONCLUSION

Based on the results of research and data analysis, and interpretation of test results, it can be concluded that mathematical problem-solving ability has a significant effect on learning achievement in mathematics, and learning independence has a significant impact on learning achievement in mathematics based on the interpretation of the t-test that t count 5.503 > t table 2,045, and solving ability Mathematical problems and learning independence have a significant effect on learning achievement in mathematics based on the interpretation of the F test that F count 38.459 > F table 3.32. The percentage of the influence of mathematical problem-solving ability and learning independence on mathematics learning achievement is 70.7%.

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