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Research Article

The correlation of numerical ability with learning outcomes in mathematics economics of management students of the Universitas Sumatera Barat

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ABSTRACT

This study is motivated by the fact that not all students can do math calculations well. This can be seen when students carry out exercises on matrix material and the application of linear functions in economics that require numerical skills, namely the addition and subtraction of integers. There are still many students who are confused in doing the exercise, especially with quite large numbers such as tens and hundreds. At the time of doing the distribution of many students who hesitate in doing it. Likewise with multiplication, there are even some students who have not memorized multiplication from 1 to 10. From this the researcher concludes that not all students have good numerical skills, so that students in working on math problems tend to experience difficulties and cause students' low economic mathematics learning outcomes. The average student learning outcomes are still below the minimum standard, in this case it can be seen from the midterm exam scores in mathematics economics management students at the Faculty of Economics, Universitas Sumatera Barat. So, one of the factors that influence students' learning outcomes in economics mathematics is numerical ability. This type of research is ex post facto correlational research, namely research that is intended to determine whether there is a relationship between two or several variables. The population in this study were all management students at the Faculty of Economics, Universitas Sumatera Barat, who took four classes of economics mathematics, consisting of 128 students. The instruments used in this study were numerical ability tests and learning achievement tests. The analysis used in this research is linear correlation analysis. The results showed that there was a significant relationship between numerical ability and the learning outcomes of economic mathematics students at the Faculty of Economics, Universitas Sumatera Barat, which was indicated by $t_{count}=5.215 > t_{table}=1.68$. This is also seen from the value of the correlation coefficient $r_{xy}= 0.641$, the correlation coefficient when seen in the table of the level of closeness of the relationship between X and Y variables, then the level of closeness of the relationship is in the medium relationship category because it is in the range of $0.40 \leq r_{xy} < 0.70$. So, it can be concluded that there is a significant relationship between numerical ability and the results of learning economics mathematics from students of management at the Faculty of Economics, Universitas Sumatera Barat.

Keywords: Numerical ability; Mathematics economics; Learning outcomes; Teaching and learning

1. INTRODUCTION

Education is a universal activity in human life. Education is essentially a human effort to improve human resources so that they can develop their potential so that they are able to deal with the changes that occur. As in the National Education System Law (UUSPN) No. 20 of 2003 Chapter 1 Article 1 states that: Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have spiritual strength, religion, self-control, personality, intelligence, noble character, and the skills needed by themselves, society, nation and state. Ministry of National Education, National Education System Law Number 20 of 2003).

Based on the quote above, education is expected to be able to provide human knowledge and skills so that they can develop their own potential, empower the potential of nature and the environment for the benefit of their lives. Mathematics is a branch of science that has an important role in the development of science and technology. There are many sciences whose discovery and development depend on mathematics, including management science.

To facilitate students in learning mathematics, students are expected to have skills or abilities in terms of counting or also known as numerical abilities. Numerical ability is the ability, accuracy and accuracy in arithmetic. One of the factors that influence learning outcomes is numerical ability. Students who have good numerical abilities are likely to get good or high learning outcomes. For this reason, numerical ability is very important because most of the material in learning mathematics requires a lot of calculations that must be mastered by students with their numerical abilities.

The situation that occurred in the Faculty of Economics, Universitas Sumatera Barat, not all students could do mathematical calculations well. This can be seen when students do exercises on matrix material and the application of linear functions in economics that require numerical skills. There are still many students who are confused in doing the exercise, especially with quite large numbers such as tens and hundreds. When doing the division of integers many students are hesitant in doing it. Likewise with multiplication, there were even some students who did not memorize multiplication from 1 to 10. From this the researcher concluded that not all students had good numerical skills, so that students in working on math problems tended to experience difficulties and led to low student mathematics learning outcomes.

Based on the results of the researchers' observations, the researchers found that there were still many student learning outcomes that were below the minimum standard. This can be seen in **Table 1**.

Table 1. Percentage of Completeness Daily Test Score 1 Odd Semester Class

Class	Total Students	Average	Completeness Percentage
M1	38	30,55	22,57
M2	41	45,78	37,56
MK	26	54,47	45,36
KJ	23	55,11	52,55

Source: Mathematics Economics Lecturer for Sumatera Barat University.

Based on **Table 1**, it can be seen that the average score of each class in the odd midterm exams is still very low. This shows that the majority of students are not able to complete the economics math test well. Based on interviews that the author conducted on July 29 2022 at the Universitas Sumatera Barat with several students, information was obtained that most students still had many difficulties with numerical calculations.

Besides that, according to the results of interviews with lecturers of economics mathematics, the obstacle that causes low student learning outcomes is the lack of students' ability to perform calculations and operate numbers when solving questions / exercises given. Researchers also conducted interviews with several students. They stated that they often found it difficult to perform calculations and operate numbers when solving math problems. Based on the background above, the researcher intends to conduct research on the Relationship Between Numerical Ability and Economic Mathematics Learning Outcomes at the Faculty of Economics, Universitas Sumatera Barat.

2. RESEARCH METHOD

This study uses a survey approach. According to Winarmo quoted by Suharsimi Arikunto, survey is a way of collecting data from a number of units or individuals at the same time (Suharsimi Arikunto,2016). The nature of this research is Ex Post Facto. Ex Post Facto research is a systematic empirical investigation without direct control of independent variables because these variables have occurred or because these variables basically cannot be manipulated. It is called expost facto because in this study no treatment was made on the object of research but only revealed facts to the respondent (Tatag, 2010). The population in this study were all management students at the Universitas Sumatera Barat who took a mathematics economics course in four classes consisting of 128 students.

The sample is part or representative of the population being studied. The sample selected must be able to represent and describe the overall characteristics of the population. In sampling, Suharsimi Arikunto explained: If there are less than 100 subjects, it is better to take all of them so that the research is a population study. However, if the number of subjects is large, it can be taken between 10-15% or 20-25% or more, depending on the ability of time, energy, funds, the narrow area of the observation area and the size of the risks borne by the researchers.

Based on the reasons mentioned above, the authors took a research sample of 32% of the total sample population, namely 128 students, so that the number of research samples was 41 students. Sampling of the population in this study using a random sampling technique. The source of the data in this study came from data on students' numerical ability scores and data on the results of learning mathematics economics from management students at the Universitas Sumatera Barat. Where the data collection techniques in this study were carried out using the test method. The material given in this test is material that includes numerical abilities. The numerical ability test includes several materials including addition, subtraction, division, multiplication, simple mathematical calculations, and social arithmetic. For the learning outcomes test includes all the material tested for the economic mathematics exam.

These statistics are used to analyze the data by making generally accepted conclusions. The characteristic of infernential data analysis is the use of certain statistical formulas (eg t test, F test, etc.). Thus, inferential statistics serves to generalize the results of a sample study to the population (Sambas,2019). To perform the statistical test, the following tests were carried out: To perform the statistical test, the normality test was conducted to test whether in a regression model, the dependent variable, the independent variable, or both have a normal distribution, or not. To see data that is normally distributed, we can use the interpretation of the P-value, that is, the data is normally distributed if the P-value is greater than the real level = 0.05. The next test is linearity test. The linearity check of the data is carried out with the help of the SPSS application, with test criteria, if the value of r (probability value/critical value) is less than or equal to (=) than the specified level so that the data has a linear pattern, otherwise the data is not linearly patterned.

After analyzing the data and it was found that the data were normally distributed, homogeneous and had a linear pattern, then further analysis was carried out, namely linear correlation analysis. Correlation analysis is a way to find out whether or not there is a relationship between the independent variable and the dependent variable. If there is a relationship between these variables it will result in changes that occur in one of the variables will result in changes in other variables. In this study, to prove whether there was a correlation between numerical abilities and students' mathematics learning outcomes, product moment correlation analysis was used with formulas.

$$r = \frac{n\sum X_i Y_i - (\sum X_i)(\sum Y_i)}{\sqrt{\{n\sum X^2{}_i - (\sum X_i)^2\}\{n\sum Y^2{}_i - (\sum Y_i)^2\}}}$$

Information:

r = correlation coefficient

n = data size

Xi = Independent variable to i

Yi = Variable bound to i

The price of r moves from -1 and +1, the negative sign indicates a negative correlation and the positive sign indicates a positive correlation, specifically for r = 0, this means that there is no linear relationship between the two variables.

The size of the correlation coefficient that has been calculated and the strength and weakness of the relationship between variable X and variable Y, does not have any meaning if the correlation coefficient that has been calculated/obtained has not been tested. Thus, testing the correlation coefficient is carried out to determine whether or not the relationship between the variables studied is significant.

Testing the correlation coefficient can be done by observing the following steps for testing the hypothesis: Determine the statistical hypothesis formulation that is in accordance with the proposed research hypothesis. H0: There is no significant relationship between numerical abilities and students' learning outcomes in economics mathematics. H1: There is a significant relationship between numerical abilities and economics students' learning outcomes in mathematics. In social or educational research, it is common to use $\propto = 0.05$. This determination is used as a guideline for determining/finding table values according to the statistical test used, in this case the t test. The location in the t distribution table is usually in the top row in the table. Determine determined and calculate the value of the statistical test used. In the simple correlation analysed the statistical test used is the t test, with the formula:

$$t = r\sqrt{\frac{n-2}{1-r^2}}$$

Information:

t = significant test of x and y correlation

r = correlation x and y

n = Number of samples

Comparing the t test value to the t table value with the test criteria: if the t test value is greater than or equal to (=) the t table value, then the null hypothesis is rejected. Testing the significance of the correlation coefficient can be known through the application of the SPSS program. The criterion used is if the value of r is greater than (>) a certain value of a then it is accepted, meaning that there is no significant relationship between variable X and variable Y. Conversely, if the value of r is less than (<) a certain value of a then it is rejected, meaning that there is meaningful relationship between variable X and variable Y.

3. RESULTS AND DISCUSSION

Results

The research data that is described consists of the independent variable and the dependent variable, the independent variable is numerical ability and the dependent variable is the results of student economics learning mathematics. This research data is the result of research conducted at the Faculty of Economics, Universitas Sumatera Barat.

a. Description of Numerical Abilities

Numerical ability data were obtained through objective tests on 41 West Sumatra university management students. Based on the data collected.

Table 1. Frequency Distribution of Numerical Ability Data:

Class	Frequency (F)	Midpoint (X)	F.X
50 – 54	5	52	260
55 – 59	1	57	57
60 – 64	12	62	744
65 – 69	9	67	603
70 – 74	9	72	648
75 – 79	4	77	308
80 – 84	1	82	82
Total	41		2702

Table 2. Description Numerical Ability data

Description (X)	Value
Maximum Value	80
Minimum Value	50
Mean	65,90
Median	65,88
Modus	63,42

Based on the numerical ability test questions in the form of an objective test consisting of 40 items with answer choices (1–4), the range of scores obtained by students is (50-80) and the average score (mean) is 65, 90, the median value of data (Median) is 65.88, the data that appears most often (Modus) is 63.42. Meanwhile, the research data obtained a minimum score of 50 and a maximum score of 80. The following diagrams and graphs of the research data will be presented:

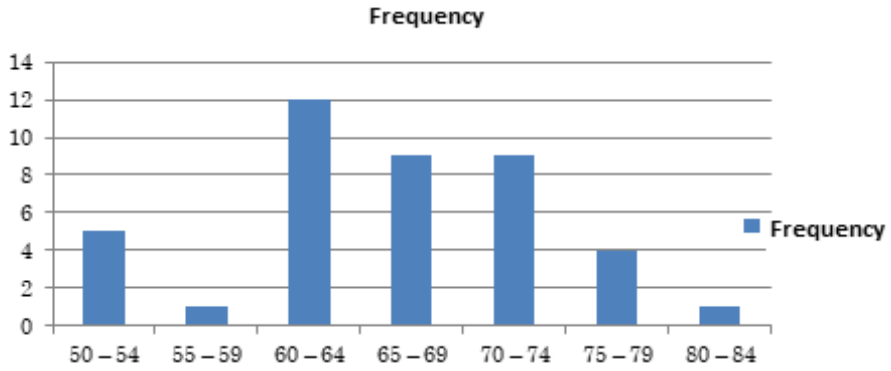

Figure 1. Description of the Frequency of Numerical Abilities

b. Description of Mathematics Learning Outcomes

Data on mathematics learning outcomes obtained through learning achievement tests on 41 management students at the Faculty of Economics, Universitas Sumatera Barat. Based on the collected data.

Table 3. Frequency Distribution of Learning Outcome Data

Class	Frequency (F)	Midpoint (X)	F.X
55 – 58	2	56,5	113
59 – 62	7	60,5	423,5
63 – 67	17	65	1105
68 – 71	9	69,5	625,5
72 – 75	4	73,5	294
76 – 79	0	77,5	0
80 – 83	2	81,5	163
55 – 58	2	56,5	113
Total	41		2724

Table 4. Description Mathematics Learning Outcomes

Description (Y)	Value
Maximum Value	80
Minimum Value	55
Mean	66,43
Median	66,55
Modus	65,83

Based on the learning outcomes test questions in the form of an essay test consisting of 7 items, the range of scores obtained by students is (55-80) and the average score (mean) is 66.43, the median value of the data (median) is 66, 55, the data that appears most often (mode) is 65.83. Meanwhile, the research data obtained a minimum score of 55 and a maximum score of 80. The following diagram will present the research data.

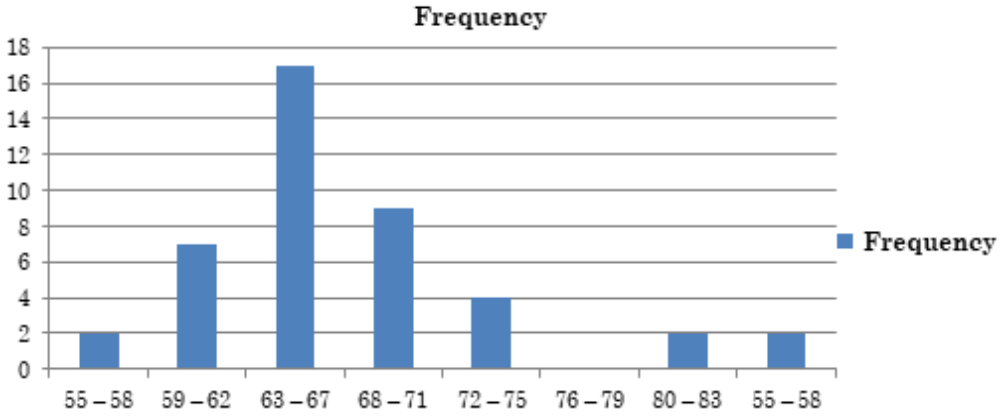

Figure 2. Description of the Mathematics Learning Outcomes

c. Research Data Analysis

To perform statistical tests, several requirements of analysis must be carried out, namely Normality and Linearity tests. Based on calculations using the SPSS software, it was obtained for the online game variable and learning outcomes the P-Value value was greater than the level used (ie 0.05) successively for numerical abilities = 0.383, learning outcomes = 0.475 so that the numerical abilities variables and results The study studied followed a normal distribution. Linearity Test, Based on the results of calculations using SPSS 16, it was obtained that the value of r was smaller than the value of used (ie 0.05), or 0.00 < 0.05, so that the x variable over the y variable had a linear pattern.

Considering that the requirements needed as a linear correlation model between the dependent variable Y and the independent variable X have been fulfilled, the next analysis is to test the research hypothesis. The hypothesis of this study is: There is a significant relationship between numerical ability and the mathematics learning outcomes of management students at the Universitas Sumatera Barat. Hypothesis testing includes calculating the correlation coefficient:

$$r = \frac{n\sum X_i Y_i - (\sum X_i)(\sum Y_i)}{\sqrt{\{n\sum {X^2}_i - (\sum X_i)^2\}\{n\sum {Y^2}_i - (\sum Y_i)^2\}}}$$

$$r = \frac{(41)(177684) - (2647)(2735)}{\sqrt{\{(41)(173201) - (7006609)\}\{(41)(183743) - (7480225)\}}}$$

$$r = 0.64102$$

Based on the results of these calculations it can be seen that the correlation coefficient between the numerical ability variable (X) and the learning outcome variable (Y) is 0.642.The correlation coefficient when seen in the table of the closeness of the relationship between the X and Y variables which are in the moderate relationship category because they are in the interval $0.40 \leq r \leq 0.70$. Thus it can be concluded that the level of closeness of the numerical ability variable with learning outcomes is moderate. Testing the correlation coefficient can be done using the t test:

$$t = r\sqrt{\frac{n-2}{1-r^2}}$$

$$t = 0.64102\sqrt{\frac{41-2}{1-0.64102^2}}$$

$$t = 5.215$$

After testing the significance of the correlation coefficient, it can be seen that the value $t_{count} > t_{table}$ is $t_{count} = 5.215 > t_{table} = 1.68$ so it can be concluded that H0 is rejected. In addition, the researcher also tested it with the help of SPSS 16 software, based on the calculation results, the value $\rho <\propto or\ 0.00 < 0.05$ so that H0 was rejected. This means that there is a significant relationship between numerical ability and the learning outcomes of mathematics management students at the Faculty of Economics, Universitas Sumatera Barat.

Discussions

After describing the data and analyzing the data, a general description of the numerical abilities and mathematics learning outcomes of the students is carried out and to see if there is a relationship between numerical abilities and students' mathematics learning outcomes. Based on the results of the variable analysis calculations carried out, with the acceptance of the first hypothesis (H1) and rejection of the null hypothesis (Ho) where the calculated t value is greater than the t table value at a significant level of 5% $t_{count} = 5.215 > t_{table} = 1.68$. The correlation coefficient between the numerical ability variable (X) and the learning outcome variable (Y) is 0.642.The correlation coefficient when seen in the table of the closeness of the relationship between the X and Y variables which are in the moderate relationship category because they are in the interval $0.40 \leq r \leq 0.70$. The average score of the numerical ability variable in students' learning mathematics (Mean) is 65.90., the middle value of the data (Median) is 65.88, the data that appears most often (Modus) is 63.42. The average score of students' mathematics learning outcomes variable (Mean) is 66.43, the median value of the data (Median) is 66.55, the data that appears most often (Modus) is 65.83. Based on the discussion above, it can be concluded that there is a relationship between numerical ability and the results of learning mathematics from management students at the Faculty of Economics, Universitas Sumatera Barat.

4. CONCLUSION

The results showed that there was a significant relationship between numerical ability and the learning outcomes of economic mathematics students at the Faculty of Economics, Universitas Sumatera Barat, which was indicated by $t_{count}=5.215 > t_{table}=1.68$. This is also seen from the value of the correlation coefficient $r_{xy} = 0.641$, the correlation coefficient when seen in the table of the level of closeness of the relationship between X and Y variables, then the level of closeness of the relationship is in the medium relationship category because it is in the range of $0.40 \leq r_{xy} < 0.70$. So, it can be concluded that there is a significant relationship between numerical ability and the results of learning economics mathematics from students of management at the Faculty of Economics, Universitas Sumatera Barat.

CONFLICT OF INTEREST

There are no conflicts of interest declared by the authors.

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