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# The Relationship between Middle School Students' Learning Independence and Mathematical Reasoning Ability

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**Abstract**

This research aims to prove whether there is a relationship between independent learning and mathematical reasoning abilities in triangle material in class VII Nurjamilah Middle School, Bekasi. This type of research is quantitative with a correlation approach. The sample in this study was 28 people taken using random sampling technique. The instruments used have been tested for validity and reliability in the form of learning independence questionnaires and objective ability tests. Analysis prerequisite tests include the normality test (Liliefors) and linearity test. The data analysis technique used is to test the significance of the correlation coefficient with the *F*-test and *t*-test. The results of the research show: (1) there is a positive relationship between learning independence and mathematical reasoning ability with $r_{xy}$=0.462, which means the correlation level is moderate, (2) there is a significant influence between learning independence and mathematical reasoning ability with $t_{count}$=2.655>2.056=$t_{table}$, (3) the contribution of independent learning to mathematical reasoning abilities is 21.3%. The data obtained is normally distributed and the regression model is linear with the regression equation $\hat{Y}$=67.33+0.21$X$.

Keywords: Independent learning, Mathematical reasoning ability, Mathematics.

## 1 INTRODUCTION

Education is the foundation of human life in everyday life which must be built as fully as possible. With education, humans try to develop their potential both in knowledge and skills and change bad behavioral habits for the better. Based on the needs and demands of the times, human abilities continue to develop along with advances in science and technology and the development of civilization. Mathematics education is a general science that plays an important role in education both in scientific disciplines and in developing human thinking abilities which are the basis for the development of modern science and technology (Khair, 2018). Therefore, mathematics subjects need to be given to all students from elementary school to high school to equip students with the ability to think logically, critically and creatively and to be able to solve problems faced in everyday life. Mathematics is a subject that is difficult to understand and is not liked. This is due to students' lack of understanding in mathematics lessons and their dislike of mathematics because they always think mathematics is difficult and scary.

According to the National Council of Teachers of Mathematics (NCTM, 2000) sets five standards for mathematical abilities that students must have, namely problem solving abilities , communication skills, connection capabilities, reasoning ability, and representational capabilities. Therefore, reasoning skills are very important for students to develop and master.

Reasoning is a way of thinking to get a statement and conclusion in solving a problem which does not always come from formal logic so it is not limited to proof (Rizqi & Surya, 2017). So it can be concluded that reasoning is a thinking process that uses reasoning to produce a conclusion in solving a problem. The importance of reasoning in learning mathematics is so that students can easily solve mathematics problems. Because in mathematics problems there are several formulas and pictures that you have to think about logically in order to solve the problem well. If there are students whose reasoning skills are low, it will be difficult for them to solve problems and will hinder the student's own development. And if there are students who have high levels of reasoning, it will be easier for them to solve problems and their development will be much better than students who are low in reasoning. To achieve mathematical reasoning abilities in learning, students need adequate behavior, one of which is learning independence. Learning independence is a process where individuals take the initiative in planning, implementing and evaluating their learning system (Sundayana, 2016). So what is meant is that students learn on their own by taking the initiative without the help of others by determining their learning goals, learning resources and learning strategies according to their wishes. For students who lack independence, this will affect their grades.

Based on the results of initial observations in class VII of Nurjamilah Middle School, Bekasi, mathematics learning carried out by teachers has been good, however there has been a change in the system during this pandemic condition, namely with an alternating or rolling learning system. Therefore, judging from the assessment criteria at school, it must reach a KKM of 75, but in reality, during the daily tests, 65% of students scored less than the KKM. This is due to students' lack of mathematical reasoning abilities. Therefore, thinking logically is important for students.

Based on the results of the problem analysis above, research and problem formulas can be carried out to find out whether there is a relationship between independent learning and mathematical reasoning abilities in triangle material in class VII Nurjamilah Middle School, Bekasi.

### 1.1 Learning Independence

Independence is a very important aspect of personality for individuals. A person in living this life is never free from trials and challenges. A person with relatively high independence is able to face all problems, because someone who is independent does not depend on other people and always tries to face and solve existing problems. Independent learning is a learning activity that is driven more by one's own will, one's own choice and one's own responsibility for learning (Tirtarahardja & La Sulo, 2005). Explained by Sugianto, Suryandari, and Age (2020), a student's activity is to study knowledge that he already has without help from other people and must have an active nature and also have high initiative in the learning process.

According to Mulyadi and Syahid (2020) factors that affect independence are : 1) Exogenous Factors, are factors that come from outside such as family, school, and community. Factors that come from the family such as the circumstances of parents, many children in the family, socioeconomic circumstances and so on. Factors that come from schools, for example, education and guidance obtained from schools, while factors from the community are conditions and attitudes of people who do not pay attention to educational problems. 2) Endogenous factors are factors that come from the students themselves, namely physiological factors and psychological factors. Physiological factors include the physical condition of students, healthy or unhealthy, while psychological factors are talent, interest, independent attitude, motivation, intelligence and others (Mulyadi & Syahid, 2020).

From the opinions of the experts above, it can be concluded that independent learning is a student's learning process carried out alone, aimed at developing the student's abilities that

he already has as well as high willingness and motivation by supporting several important aspects so that the independent learning process can run smoothly. maximum.

According to Muchyidin (2017), indicators of learning independence are having confidence in oneself, learning activities that are self-directed, having a sense of responsibility, having one's own initiative, and being happy with problem centered learning. According to Nahdliyati et al. (2016), students' learning independence can be seen from several indicators, namely initiative, self-confidence, motivation, discipline and responsibility.

There are several indicators of learning independence applied by researchers that students must master, namely: 1) Having initiative. 2) Don't depend on other people. 3) Have self-confidence. 4) Have a sense of responsibility.

### 1.2 Reasoning Ability

Ability can be defined as ability, skill and strength. Reasoning can also be interpreted as something that can control something with reason and not with feelings or experience (Pusat Bahasa Departemen Pendidikan Nasional, 2008). Reasoning ability is a high level thinking ability in the mathematics learning process. So mathematical reasoning is closely related to mathematics learning because mathematics is understood through reasoning and reasoning can be understood through learning mathematics (Romsih, 2019). Therefore, students' reasoning abilities will be trained through learning mathematics. Mathematical reasoning is reasoning about and with mathematical objects that is needed to draw conclusions or make a new statement that is true based on several statements whose truth has been previously proven or assumed (Kusumawardani, Wardono, & Kartono, 2018).

According to Wardhani (2008), there are several indicators of reasoning ability that must be possessed in the Regulation of the Director General of Basic Education, Ministry of National Education Number 506/C/Kep/PP/2004: 1) being able to make conjectures, 2) carrying out mathematical manipulations, 3) drawing conclusions, namely compiling evidence by providing reasons or evidence. regarding the truth of the solution, 4) drawing conclusions from statements, 5) checking the validity of an argument and finding patterns or properties of mathematical phenomena to make generalizations.

## 2 RESEARCH METHODS

This research is a type of quantitative correlation research. Correlational research was conducted to determine the relationship between student learning independence and students' mathematical reasoning abilities. The research variables are student learning independence as the independent variable (X) and reasoning ability as the dependent variable (Y). This research was conducted at Nurjamilah Middle School, Bekasi. The population in this research was 172 students. The sampling technique used is Cluster Random Sampling. The sample in this study consisted of 28 students taken from class VII.A.

The instruments used were questionnaires for independent learning with Likert scale assessments and objective ability tests for mathematical reasoning abilities. The independent learning instrument consists of 25 questionnaire items and for objective abilities there are 10 questions. This instrument must be tested first to determine its validity and reliability. Next, data analysis prerequisite tests are carried out using: 1) normality test (Liliefors) to find out whether the data obtained is normally distributed or not, 2) linearity test using analysis of variance (ANOVA) to find out whether the regression is linear or not, 3) test correlation coefficient hypothesis using the Product Moment correlation technique, correlation significance test (*t*-test) and coefficient of determination test to find out how much variable X contributes to variable Y.

# 3 RESEARCH RESULT

Based on the results of instrument trials in class VII.A, 28 respondents obtained 19 valid and reliable items for variable X (independence in learning) and 6 valid and reliable questions for variable Y (mathematical reasoning ability).

## 3.1 Learning Independence

Based on research data that has been collected regarding student learning independence, the highest score was 75, the lowest score was 56 with an average score of 66.07, median (middle score) of 68.35, mode (value that frequently appears) of 67.5 , the variance value is 28.11 and the standard deviation is 5.30. The following is a histogram and polygon graphic image for variable X.

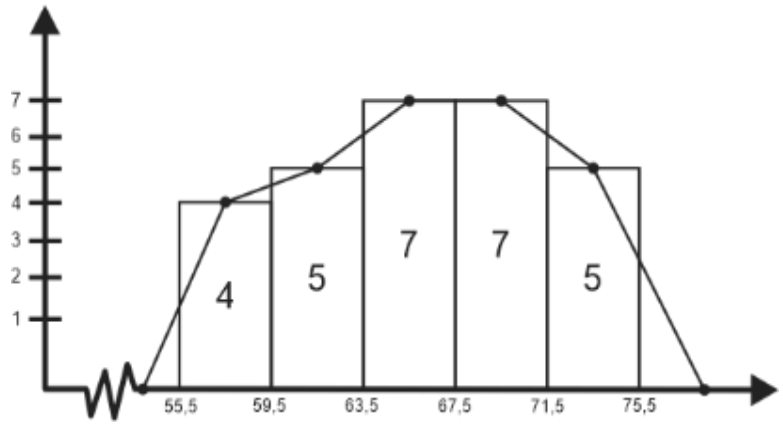


Figure 1. Histogram and Polygon Graphs of X Variables

## 3.2 Mathematical reasoning ability

Based on research data that has been collected through objective tests on mathematical reasoning abilities on the Triangle material, the highest value is 100, the lowest value is 63 with an average value of 81.5, the median (middle value) is 81.1, the mode (value that often appears) is 81.1, the variance value is 2681, and the standard deviation is 9.96. Here is a graphic image of the histogram and polygon for variable Y.

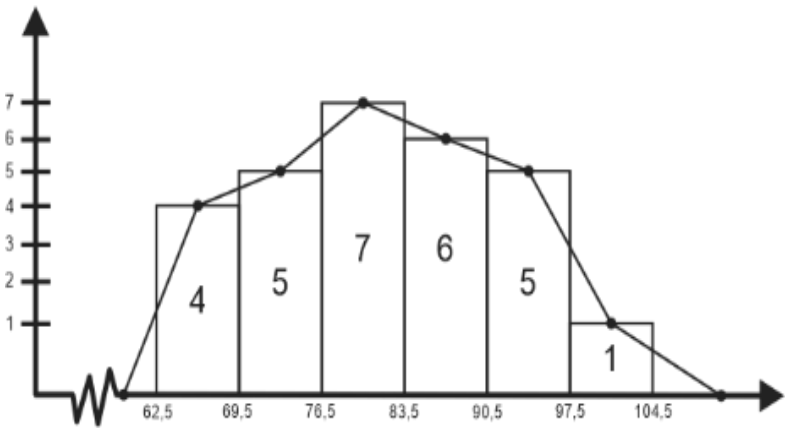


Figure 2. Histogram and Polygon Graphs of Y Variables

### 3.3 Data Analysis Prerequisite Test

Before hypothesis testing, a normality test is first carried out to find out whether the data is normally distributed or not.

Table 1. Normality Test of Variable X and Variable Y

| Variable | n | α | $L_{count}$ | $L_{table}$ | Conclusion |
|---|---|---|---|---|---|
| X | 28 | 0,05 | 0.0993 | 0.1641 | Normal Distributed |
| Y | 28 | 0,05 | 0.1247 | 0.1641 | Normal Distributed |

Based on Table 1, after calculations using the Liliefors test are obtained $L_{count}$ =0.993 (variable X) and $L_{count}$=0.1247 (variable Y) at a significant level 0.05 obtained $L_{table}$=0,1641 so that $L_{count}<L_{table}$ then it can be concluded $H_0$ received and both data are normally distributed. Next, test linearity to find out whether the data is linear or not. This test is performed using simple regression analysis (ANAVA).

Table 2. Analysis of Variance (ANAVA) Regression Linearity

| Source of Variance | *dk* | *JK* | *RJK* | $F_{count}$ | $F_{table}$ |
|---|---|---|---|---|---|
| Total | 26 | 189800 | | | |
| Regression(a) | 1 | 186635,57 | 186635,57 | | |
| Regression (b/a) | 1 | 38,08 | 38,08 | -1,32 | 2,58 |
| Residue (residual) | 26 | 3126,35 | 120,24 | | |
| Tuna Mach (TC) | 11 | -97054,08 | -8823,10 | | |
| Error | 15 | 100180,43 | 6678,70 | | |

From the calculations carried out, $a$=67.23 and $b$=0.21 are obtained so that the regression equation is $\hat{Y}$=67.33+0.21$X$. his means that every addition of one unit of learning independence, the value of mathematical reasoning ability will be 0.21. Table 2 show that $F_{count}$= -1,32 and $F_{table}$=2,58 at a significant level of 0.05 so that $F_{count}<F_{table}$ then it can be concluded $H_0$ accepted and the relationship between variable X and variable Y is linear.

### 3.4 Research Hypothesis Test

To determine the relationship between variable X and variable Y, a correlation coefficient test was carried out using the Product Moment formula. From the calculation results, a value is obtained $r_{xy}$=0.462 means that there is a sufficient and positive correlation between learning independence and mathematical reasoning ability. To find out whether there is a significant influence between variable X and variable Y, a correlation significance test is carried out. From the calculation results, a value is obtained $t_{count}$=2.655. If consulted with $t_{table}$ a significant level of 0.05 and $dk$=26 obtained values $t_{table}$=2.056 so that $t_{count}>t_{tabel}$ then it can be concluded that there is a significant effect between variable X and variable Y.

To find out how much the contribution of variable X to variable Y is carried out a coefficient of determination test. From the results of the calculation, the coefficient of determination was obtained at 21.3%. This means that the contribution of learning independence to mathematical reasoning ability by 21.3% of the side is influenced by other factors.

## 4 DISCUSSION

Based on the results of the research obtained, this shows that there is a positive relationship between learning independence and the mathematical reasoning ability of students in grade VII SMP Nurjamilah Bekasi, which is addressed by the value of $r_{xy}$=0.462 by looking at the interpretation of the moderate correlation coefficient, it can be concluded that there is a

positive relationship between Learning Independence and Mathematical Reasoning Ability on Triangular Material in grade VII Junior High School Nurjamilah.

So it can be interpreted that the higher the score of learning independence in students, it will be followed by the high score of students' mathematical reasoning ability in grade VII of SMP Nurjamilah, Bekasi.

## 5 CONCLUSION

Based on the results of the analysis that has been done, it can be concluded that there is a positive relationship between learning independence and mathematical reasoning skills in grade VII of SMP Nurjamilah, Bekasi. From the results of the hypothesis test, a value is obtained $r_{xy}$=0.462 means that there is a sufficient and positive correlation between learning independence with mathematical reasoning ability and the contribution of learning independence to mathematical reasoning ability by 21.3%. The significance test of the correlation coefficient shows the value of $t_{count}$=2.655>2.056=$t_{table}$ means that there is a significant influence between learning independence and mathematical reasoning ability. From the linearity test, a value is obtained $F_{count}$= -1.32<2.58=$F_{table}$, so it can be concluded that the regression model is linear. This means that the relationship between learning independence and mathematical reasoning ability is unidirectional. If students have high learning independence in learning, then students' mathematical reasoning ability is also high and vice versa, if students have low student learning independence, students' mathematical reasoning abilities will also be low.

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