The Influence of Student Learning Independence on The Mathematical Problem Solving Ability

Ayu Andaru Lisnawati*, St. Budi Waluya, Scolastika Mariani

Universitas Negeri Semarang, Indonesia

Abstract

This study aims to determine the effect of student learning independence on the ability to solve mathematical problems in grade VII MTs Nurul Muslim Jepara students. This type of research is quantitative research. This research was conducted at MTs Nurul Muslim for the 2022/2023 academic year. The results showed that There is a significant influence between learning independence on problem solving ability shown by the results of simple linear regression obtained simple linear regression equation . If (Y ̂=39,896+0,401XX=0learning independence does not exist), then an equation is obtained . This means that there is still a problem-solving ability score of . This shows that the value is not only influenced by Y ̂=39,89639,896Y ̂ X alone, but there are other factors that also affect it. Furthermore, the value of the coefficient of determination = 14.5%. This means that the effect of learning independence (on problem-solving ability (Y) is .X)14,5%.

*Correspondence Address:
E-mail: ayuandaru03@students.unnes.ac.id

INTRODUCTION

Education is one of the important aspects in the life of every individual, the high quality of education is also an important factor in the progress of a country. Law of the Republic of Indonesia No. 20 of 2003 paragraph 1 explains that education is a conscious and planned effort to create a learning atmosphere and learning process so that students can actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves, society, nation and state.

Ki Hadjar Dewantara in (Musanna, 2017) interprets education as a process of providing guidance to develop children's potential. In the learning process, student involvement in learning must always be created and continue to use the right teaching model so that children's potential can develop. Teachers create a pleasant atmosphere and encourage students to be active in the learning process.

One of the disciplines that plays an important role in education is mathematics. Mathematics is the basic science of modern technology development (Septianingsih et al., 2013). In addition, mathematics also plays an important role in the discipline of science and the development of human thought (Nurfitrianyanti, 2016). Learning mathematics requires a high level of reasoning and logic, leading to mathematics learning activities in order for students to become intelligent, creative, skilled and independent so that students have the ability to solve problems. Mathematics learning aims to develop all students' mathematical abilities in order to obtain good and maximum mathematics learning results (Yarmayani, 2016). One of the important goals to achieve these learning outcomes is to maximize problem-solving skills in learning.

Judging from the curriculum aspect, solving mathematical problems is one of the objectives in the learning process (Cahyani &; Setyawati, 2016). The importance of problem solving in learning is conveyed by the *National Council of Teachers of Mathematics* (NCTM). According to NCTM (2000) the mathematical thinking process in mathematics learning includes five main standard competencies, namely problem solving ability, reasoning ability, connection ability, communication ability and representation ability. Therefore, the ability to solve problems has an important role in achieving mathematics learning goals. However, in reality, at this time students' mathematical problem-solving ability is still low. One of the causes of low problem-solving ability is that learning does not provide opportunities for students to develop their problem-solving abilities.

Based on the results of interviews with mathematics teachers at MTs Nurul Muslim Jepara, information was obtained about the method of teaching mathematics at MTs using conventional methods. The learning process carried out still uses teacher-centered learning. The method that is often used in learning mathematics in MTs uses the lecture method, the teacher explains the material in front of the class and then gives examples of questions related to the material. After finishing the lecture, the teacher asked the students to do practice questions at LKS.

Based on interviews, it was also obtained that student learning outcomes in mathematics subjects were still low and less than optimal students' ability to solve problems. This can be seen from the number of grade VIII students who obtained mathematics scores below the KKM (Minimum Completeness Criteria) of 72 during the Midterm Assessment 1 of the 2020/2021 academic year. Student learning outcomes in the Midterm Exam 1 of the 2020/2021 academic year can be seen in table 1.

Table 1. Student Learning Outcomes in Midterm Exam 1

Class	Students	Average
VIII A	34	65,6
VIII B	34	57,4
VIII C	36	60,2
VIII D	33	61,5

Based on table 1, it is very clear that the solution to the MTs Nurul Muslim Jepara math problem has not been able to reach KKM, the KKM set in the school is 72, so to achieve completeness the teacher must repeat it. Furthermore, the teacher explained that students still have difficulty in understanding contextual problems. As a result, students are not able to model problems in mathematical form. Students are also less skilled in solving problems according to the model that has been prepared. It shows students' ability to create and interpret mathematical models, presenting problems mathematically from a low problem. Based on this, the ability to create and interpret mathematical models, present problems mathematically from a problem is part of the indicator of

problem solving ability, so it can be said that the problem-solving ability of MTs Nurul Muslim Jepara students is still relatively low.

Based on the above problems, efforts are needed to improve students' problem-solving skills. The indicators of problem-solving ability according to (Polya, 1978) are 1) understanding the problem, 2) designing problem-solving strategies, 3) carrying out planning, 4) re-examining the results or solutions.

There are several factors that affect students' problem-solving abilities, one of which is learning independence. According to (Suhendri, 2012) learning independence is a learning activity carried out by students without relying on help from others, both friends and teachers in achieving learning goals so that they master the material or knowledge well with their own awareness and can apply their knowledge in solving problems in everyday life. Based on the results of research (Sulistyani &; Roza, 2020), learning independence can be used as one of the factors that can affect the mathematical problem solving ability of students.

independence is a person's ability to realize his desires in a real way without depending on others, in this case students find effective independent learning ways (F. Arifin &; Herman, 2018). Self-learning is often also called *self-regulated* learning or independent learning. Learning independence is a process that assists students in regulating their thoughts, behaviors, and feelings in order to make them successful in navigating their learning experience.

Indicators of student learning independence (Hidayati &; Listyani, 2010) formulate six, namely: (1) independence of others; (2) confidence or confidence; (3) behave trying to organize themselves in learning activities, (4) behave to meet their own needs; (5) Learning on one's own initiative; and (6) Attempted self-control

Based on the description of the problem above, researchers feel the need to conduct research related to the influence of solving ability on learning independence So the title of this study is "The influence of learning independence on the problem-solving ability of MTs Nurul Muslim Jepara students"

METHODS

The type of research used in this study is quantitative research using survey methods. The purpose of using the survey method in this study is to get an idea of whether or not there is an influence of learning independence on students' ability to solve problems in grade VII MTs Nurul Muslim Jepara students for the 2022/2023 academic year

This research was conducted at MTs Nurul Muslim located Mindahan RT 06 RW 2 Batealit Jepara in the even semester of the 2022/2023 academic year. The population in this study is all students of grade VII even semester MTs Nurul Muslim Jepara for the 2022/2023 academic year consisting of 106 students from three classes, namely classes VII A, VII B, and VII C. This study uses *a random sampling cluster sampling technique.* The sample in this study was class VII B with a total of 36 students.

There are two types of variables in this study, namely independent variables and dependent variables. The independent variable in this study is problem-solving ability while the dependent variable is problem-solving ability. The instrument of independence is learning using questionnaires and problem-solving skills using tests. The questionnaire was prepared based on a decrease in indicators of learning independence. Ability tests based on problem-solving steps according to Polya. Problem-solving ability tests in the form of description questions.

Data analysis used scores from questionnaires, learning independence, and problem-solving skills. Before the final analysis, the values of the two variables were tested for normality and tested by classical assumptions to find out whether there were still cases that interfered with the nature of the regression analysis, after which the data were tested using simple linear regression to determine the effect of learning independence on problem-solving abilities.

RESULTS AND DISCUSSION

Data analysis includes classical Assumption Test and simple regression test. This classical assumption test is used to determine whether there are still cases that occur and interfere with the nature of regression analysis. These cases include cases of multicollinearity, cases of heteroscedasticity, cases of autocorrelation, therefore through the stages of testing this classic assumption will be described regarding checking the three cases, will be explained as follows:

Normal P-P Plot of Regression Standardized Residual

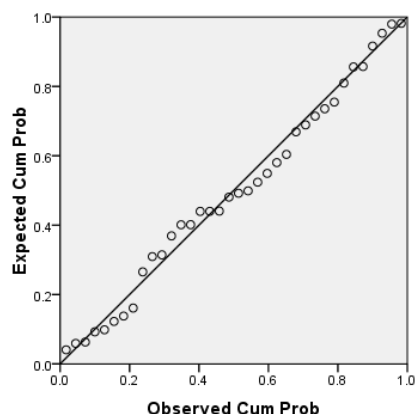**Dependent Variable: kemampuan pemecahan masalah**

Figure 1. Normality Test

From the figure 1, it can be seen that the data spreads around a diagonal line and follows the direction of the diagonal line, then the data is normally distributed and the regression model has met the assumption of normality,

Table 2. Autocorrelation Test

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.381[a]	.145	.120	13.86790	1.047

a. Predictors: (Constant), mathematical logical intelligence

b. Dependent Variable: problem-solving ability

From the table above, it appears that the Durbin-Watson value is 1.047. The value is in the interval -2<DW<2. It means that it is in an area that states that no autocorrelation occurs. This means that the assumption of each observational measurement from one observation to the next is qualified to have homogeneous variance.

Table 3. Multicholinerity Test

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	30.295	12.819		2.363	.024		
	kecerdasan logis-matematis	.299	.190	.284	1.573	.125	.768	1.303
	kecerdasan visual spasial	.279	.250	.202	1.118	.272	.768	1.303

a. Dependent Variable: kemampuan pemecahan masalah

Checking multicollinearity by looking at VIF and tolerence through reading output coefficients, from the table above it can be seen that the tolerence value between mathematical and analytical logical intelligence is the same at 0.768 and the VIF value between mathematical and analytical logical intelligence is the same at 1.303. Because the VIF value of the two variables is not greater than 10 or 5, it can be said that there is no multicollinearity in the two independent variables. Then the assumption is fulfilled.

Scatterplot

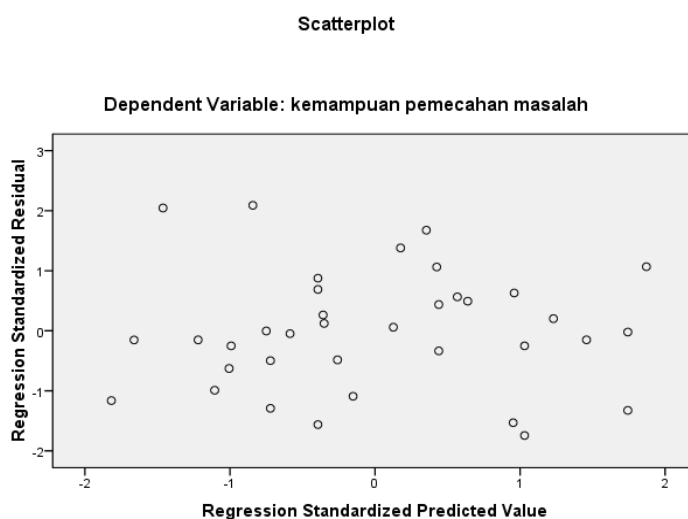**Dependent Variable: kemampuan pemecahan masalah**

Figure 2. Heteroscedasticity Test

From the figure above, it can be seen that the distribution of points does not form a certain pattern, so in other words heteroscedasticity does not occur. The classical assumption of heteroscedasticity in this model is fulfilled, that is, it is free from heteroscedasticity.

The data obtained is then calculated by simple linear regression analysis with. From calculations obtained simple linear regression equations . If $\hat{Y} = 39,896 + 0,401X$ $X = 0$ (learning independence does not exist), then an equation is obtained . This means that there is still a problem-solving ability score of . This shows that value is not only influenced by it, but there are other factors that also affect it.$Y = 39,896$ $39,896$ Y X

Correlation Coefficient in Simple Linear Regression Find the correlation coefficient using the *product moment* correlation formula obtained The magnitude of the correlation coefficient obtained from the calculation results is r = This value shows the level of relationship between the learning independence $0,381.$ X variable () to the problem-solving ability variable (Y) with medium criteria. Coefficient of Determination in Simple Linear Regression Based on calculations, the coefficient of determination = 14.5%. This means that the effect of mathematical logical intelligence (on problem-solving ability (Y) is equal to .X_1)$14,5\%$

CONCLUSION

Based on the results of the study obtained: There is a significant influence between learning independence on problem-solving ability indicated by the correlation coefficient r = 0.380 and the coefficient of determination . This shows that learning independence to problem-solving ability is 14.5%, with regression equations. This means that there is still a problem-solving ability score of no magnitude without being influenced by variables Based on these conclusions, suggestions can be given, namely: before mathematics learning begins, teachers should guide students to learn independently, teachers should provide independent assignments that emphasize students' problem-solving abilities related to contextual problems.$r^2 = 0,145$ $\hat{Y} = 39,896 + 0,401X_1$ $39,896X$.

REFERENCES

Amalia, A., Syafitri, L. F., Triyana, V., & Sari, A. (2018). Masalah Matematik Dengan Self Efficacy Dan Kemandirian Belajar Siswa Smp. *Urnal Pembelajaran Matematika Inovatif*, *1*(5), 887–894.

Arifin, F., & Herman, T. (2018). Pengaruh Pembelajaran E-Learning Model Web Centrikc Course terhadap Pemahaman Konsep dan Kemandirian Belajae Matematika Siswa. *Jurnal Pendidikan Matematika*, *12*(2), 1–12.

Arifin, Z. (2016). *Ealvasi Pembelajaran.* PT Remaja Rosdakarya.

Arikunto, S. (2013). *Prosedur Penelitian Suatu Pendekatan Praktik.* Rineka Cipta.

Asmara, A. S., & Junaedi, I. (2018). Trend Paradigma Dalam Pendidikan Matematika. *Jurnal Pendidikan Dan Kebudayaan*, *8*(3), 309–314.

Badrulaini. (2018). Hubungan kemampuan pemecahan masalah dan kemandirian belajar terhadap hasil belajar matematika peserta didik. *Jurnal Pendidikan Tambusai*, *2*(4), 847–855. https://jptam.org/index.php/jptam/article/download/32/28

Cahyani, H., & Setyawati, R. W. (2016). Pentingnya Peningkatan Kemampuan Pemecahan Masalah Melalui PBL untuk Mempersiapkan Generasi Unggul Menghadapi MEA. *PRISMA, Prosiding Seminar Nasional Matematika*, 151–160.

Cahyono, A. N. (2010). Vygotskian Perspective : Proses Scaffolding untuk mencapai Zone of Proximal Development (ZPD) Peserta Didik dalam Pembelajaran Matematika. *Seminar Nasional Matematika Dan Pendidikan Matematika Yogyakarta, November.*

Cresswell, J. W. (2013). *Research Design (Pendekatan Kualitatif, Kuantitatif, dan Mixed.* Pustaka Pelajar.

Fajariah, E. S., Dwidayati, N. K., & Cahyono, E. (2017). Kemampuan Pemecahan Masalah Ditinjau dari Self-Efficacy Siswa dalam Implementasi Model Pembelajaran Arias Berpendekatan Saintifik. *Unnes Journal of Mathematics Education Research*, *6*(2), 259–265.

Giatman, M. (2018). Meningkatkan Aktifitas dan Kreatifitas Siswa Melalui Pembelajaran Berbasis Proyek. *Repository.Unp.Ac.Id*. http://repository.unp.ac.id/15075/1/Artikel Giatman Aptekindo-2018.pdf

Hidayati, K., & Listyani, E. (2010). pengembangan isntrumen kemandirian.pdf. *Jurnal Penelitisn Dan Evaluasi Pendidikan.*

Li, C.-L., Tseng, H.-M., Tseng, R.-F., & Lee, S.-J. (2005). Methods : Results : *Prof. Shwn-Jen Lee, Faculty and Institute of Physical Therapy, National Yang-Ming University.*, *8*, 100–106.

Mahasneh, A. M., & Alwan, A. F. (2018). The effect of project-based learning on student teacher self-efficacy and achievement. *International Journal of Instruction*, *11*(3), 511–524. https://doi.org/10.12973/iji.2018.11335a

Mayasari, & Rosyana, T. (2019). Pemecahan Masalah Matematis Siswa Smp. *Jurnal Cendikia: Pendidikan Matematika*, *3*(1), 82–89.

Musanna, A. (2017). INDIGENISASI PENDIDIKAN : Rasionalitas Revitalisasi Praksis Pendidikan Ki Hadjar Dewantara INDIGENIZING EDUCATION : Rationalization toward Revitalization of Ki Hadjar Dewantara Educational Praxis. *Jurnal Pendidikan Dan Kebudayaan*, *2*, 117–133.

Ngaeni, E. N., & Saefudin, A. A. (2017). Menciptakan Pembelajaran Matematika Yang Efektif Dalam Pemecahan Masalah Matematika Dengan Model Pembelajaran Problem Posing. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *6*(2), 264. https://doi.org/10.24127/ajpm.v6i2.896

Polya, G. (1978). How to solve it: a new aspect of mathematical method second edition. In *The Mathematical Gazette* (Vol. 30, p. 181). http://www.jstor.org/stable/3609122?origin=crossref

Putra, A. L. T., & Dwidayati, N. K. (2018). Kemampuan pemecahan masalah berdasarkan implementasi strategi pembelajaran aktif firing line berpendekatan konstruktivisme. *Seminar Nasional Pendidikan Matematika Ahmad Dahlan 2018*, 482–492.

Rohmawati, A. (2015). Efektivitas Pembelajaran. *Jurnal Pendidikan Usia Dini*, *9*(1), 15–32.

Sastrika, I. A. K., Sadia, I. W., & Muderawan, I. W. (2013). Terhadap Pemahaman Konsep Kimia Dan Keterampilan. *E-Journal Program Pascasarjana Universitas Pendidikan Ganesha Program Studi IPA*, *3*(2).

Septianingsih, R., Afri, L. E., & Richardo, R. (2013). *Peningkatan Kemampuan Pemecahan Masalah Matematis Siswa SMP melalui Strategi Pembelajaran the Power of Two.*

Song, L., & Hill, J. R. (2013). A Conceptual Model for Understanding Self-Directed Learning in Online Environments. *Journal of Interactive Online Learning*, *6*(December).

Sudjana. (2005). *Metoda Statistika.* penerbit tarsito.

Sugiyono. (2010). *Statistika untuk Penelitian.* penerbit Alfabeta.

Suhendri, H. (2012). Pengaruh Kecerdasan Matematis-Logis , Rasa Percaya Diri , Dan Kemandirian Belajar Terhadap. *Seminar Nasional Matematika Dan Pendidikan Matematika FMIPA UNY*, *November*, 978–979.

Sukestiyarno. (2020). *Olah data Penelitian Pendidikan Berbatu SPSS.* UNNES Press.

Sulistyani, D., & Roza, Y. (2020). Hubungan Kemandirian Belajar dengan Kemampuan Pemecahan Masalah Matematis. *J Urnal Pendidikan Matematika*, *11*(1), 1–12. https://doi.org/http://dx.doi.org/10.36709/jpm.v11i1.9638 Available

Susanto, A. (2016). *Teori Belajar dan Pembelajaran di Sekolah Dasar*. Fajar Interpratama Mandiri.

Tall, D. (2013). Integrating History, Technology and Education in Mathematics David. *História e Tecnologia No Ensino Da Matemática*, 1–17.

Wismath, S., Orr, D., Zhong, M., Wismath, S., & Program, L. E. (2014). *Student Perception of Problem Solving Skills Authors ' Contact Information Key Words : 7*(3), 1–17.

Yarmayani, A. (2016). Analisis Kemampuan Pemecahan Masalah Matematis Siswa Kelas Xi Mipa Sma Negeri 1 Kota Jambi. *Jurnal Ilmiah Dikdaya*, *6*(2), 12–19.

Yaumi. (2012). *Pembelajaran Berbasis Multiple Intelligences*. Dian Rakyat.