Correlational Study of Mathematical Problem Solving Ability of Vocational High Students Based on Self-Persistence

Supardi Uki Sajiman, *H Hasbullah, Sumaryati, Acep Musliman, Andri Suryana, Eva Yuni Rahmawati

Universitas Indraprasta PGRI, Jakarta, Indonesia

*Correspondent Author

ABSTRACT

The ability to solve mathematical problems is the main goal in learning mathematics to improve students' thinking power which is influenced by self-persistence. This study aimed to obtain empirical evidence regarding the effect of self-persistence on mathematical problem-solving abilities. The object of this study was students of Vocational High School in West Jakarta, Jakarta Province, Indonesia with 92 respondents. The data collection method used survey questionnaires on self-persistence variables and tests on mathematical problem-solving ability variables. The data analysis technique uses simple linear regression analysis with the help of the SPSS program. The results showed that there was a significant influence of self-persistence on the ability to solve mathematical problems

Keywords: Jakarta, Mathematics, Problem Solving, Self-Persistence, Vocational Intermediate School,

INTRODUCTION

Mathematics is a *universal* science that underlies the development of modern technology, has an important role in various disciplines, and advances human thinking. Although mathematics is a stand-alone science, mathematics can be used as an analytical tool for the process of scientific discovery (Asri & Noer, 2015). In addition, mathematics is the foundation of developments in the field of information and communication technology such as number theory, algebra, analysis, probability theory, and discrete mathematics (Puspitasari, 2016; Asfar & Taufan, 2019).

Mathematics is not a lesson that only serves to make students able to solve problems, but rather the formation of attitudes and personalities (Maryati & Priatna, 2017). To shape students' attitudes and personalities in learning mathematics, teachers must familiarize students with learning to reason by arguing critically, systematically, and logically in solving problems. Therefore, mathematics learning expects students to be able to be logical-rational, sharp in thinking and analyzing, critical, creative, fluent in communicating mathematically, and have the ability to solve problems (Munawarah, 2022).

The ability to solve mathematical problems is one of the main goals of learning mathematics (Amam, 2017). Through problem-solving, students have experience using their knowledge and skills to be applied to problem-solving by integrating the concepts and skills that have been learned (Masfingatin, 2013). Problem-solving ability is a person's ability to use complex logic skills to solve problems by collecting facts, analyzing the information collected, and building the most effective ways to achieve a goal (Attri, 2018; Pratiwi, Suendarti, & Hasbullah, 2019). Mathematical problem-solving ability can solve problems with steps according to Polya (La'ia, & Harefa, 2021). The problem-solving process generally consists of several steps, namely: First, understanding the problem is very important. Therefore, planning is needed on how to overcome the problem. Then, implementing the plan that has been prepared becomes the next step. Finally, reflecting on the results of the problem-solving process is very important

The ability to solve students' mathematical problems can be seen from the student learning process and student learning outcomes, however, there are still many schools in mathematics ignore solving mathematical problems and the learning process is only directed to students' ability to memorize information (Hasbullah, & Sajiman, 2019; Nurhaliza, 2023). The impact of it all, students consider mathematics subjects difficult, and many quickly give up when given math problems, because solving mathematics not only requires mathematical knowledge but also a mindset that does not give up easily (Febriyanti & Irawan, 2017). Problem-solving has the aim of encouraging students to be more active in exploring in solving problems.

Based on research by Sumartini (2016), the achievement of Vocational High School students in learning mathematics is still relatively low, especially in terms of the ability to solve mathematical problems based on the fact that as many as 73% of students still have relatively less problem-solving skills. Another study conducted by Nuryana and Rosyana (2019) found that the mathematical problem-solving ability of students at one of the vocational schools in Cimahi City was relatively low, with only 19.23% of students being able to solve problem-solving problems well. Meanwhile, research conducted by Hernaeny & Prastiwi (2021) shows that the mathematical problem-solving ability of tenth-grade students of Private Vocational Schools in Depok Regency is on average at low criteria with the percentage of indicators understanding problems at 2.78%, indicators of planning problems at 48.15% of the medium category, indicators of solving problems at 43.82% of the medium category and explaining and re-examining the results or the answer of 1.85% is shallow.

The low mathematical problem-solving ability of Vocational High School students is caused by many factors. One of the factors that causes students' mathematical problem-solving ability is self-persistence (Ardiansyah, 2020). Self-persistence is a character possessed by individuals needed for the completion and achievement of a task (Mugiarso, Setyowani, & Tedra, 2018). To measure the high and low self-persistence, several aspects are needed that can support it. This self-persistence indicator is taken from the self-persistence dimension, expressed by Nafisah, (2022) a; awareness directed at the goal indicated by the awareness contained in a person that leads to something in the form of pursuing the desired goal, b; continuous or reapplication efforts indicated by time management in doing tasks, which shows continuity in a business process, and shows the amount of effort made, c; the temptation to quit indicated by activities that are fun and relaxing.

Various studies show that self-persistence is related to the mathematical problem-solving ability of Vocational High School students. Research conducted by Ana (2022), shows that self-persistence influences the mathematical problem-solving ability of high school students. Therefore, this study aims to determine the effect of self-persistence on the mathematical problem-solving ability of Vocational High School students.

METHODOLOGY

The methodology of this study is survey research design, where the author seeks to obtain the most complete picture possible of the observed phenomena, and then tries to draw conclusions based on the picture that has been obtained and how different variables affect each other. This study investigated the impact of self-persistence on mathematical problem-solving abilities.

The data collection technique used is Field Research, which is research carried out directly on the object studied. Data collection in this study used a survey method, namely by distributing questionnaires to Jakarta Provincial Vocational High School students on self-persistence variables and using tests on mathematical problem-solving ability variables (Creswell, 2012). The study consisted of 92 respondents. Data analysis techniques in testing the effect of self-persistence on mathematical problem-solving abilities using simple linear regression statistics with the help of the SPSS program

RESULT AND DISCUSSION

Result

This study consisted of variables of self-persistence and mathematical problem-solving ability. Self-persistence

data using questionnaires and data on mathematical problem-solving ability were measured using tests on 92 respondents. The results of data collection can be stated descriptively in Table 1.

Table 1: Descriptive analysis

Statistics		Self-Persistence	mathematical problem-solving ability
N	Valid	92	92
	Missing	0	0
Mean		75.50	54.21
Median		76.00	53.00
Mode		76	53
Std. Deviation		16.194	15.853
Minimum		33	16
Maximum		100	95

The Self-Persistence score obtained from 92 respondents had an average of 75.50 with a standard deviation of 16.194, a median of 76, a minimum score of 33, and a maximum score of 100. From the description it can also be seen that the average and middle values are almost the same, namely 75.50 and 76, this shows that the Self-Persistence data obtained in this study is quite representative.

Meanwhile, the mathematical problem-solving abilities score obtained from 92 respondents had an average of 54.21, with a standard deviation of 15.853, a median of 53.00, a mode of 53, a minimum score of 16, and a maximum score of 95. The standard deviation score of 15.853, shows that the difference in answers between respondents is high. This shows that the mathematical problem-solving abilities of respondents vary. From the description, it can also be seen that the average and median values are almost the same, namely 54.21 and 53.00. This shows that the mathematical solving abilities score data in this study is quite representative

Research Question One: *How do Self-Persistence in mathematical problem-solving ability?*

Table 2: Regression Model Summary for Self-Persistence in mathematical problem-solving ability

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.650[a]	.423	.416	12.113
a. Predictors: (Constant), Self-Persistence				

The summary model table shows that there is a high positive relationship (R = 0.650) between Self-Persistence with mathematical problem-solving ability. This implies an increase in Self-Persistence in mathematical

problem-solving abilities. The R-Square for the overall model is 0.423, with an Adjusted R-Square of 0.416. This suggests that 42,3% of the variations in mathematical problem-solving ability can be accounted for by Self-Persistence.

Research Question Two: *What is the effect of Self-Persistence on mathematical problem-solving ability?*

Ho: *Self-persistence does not significantly affect mathematical problem-solving ability.*

Ha: *Self-persistence significantly affects mathematical problem-solving ability.*

Table 3: Regression Coefficients for Self-Persistence in mathematical problem-solving ability

Coefficients					
Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
1 (Constant)	6.158	6.053		1.017	.312
Self-Persistence	.636	.078	.650	8.116	.000
a. Dependent Variable: mathematical problem-solving ability					

The table for regression coefficients indicates that the regression equation is given by mathematical problem-solving ability = 6,158 + 0.636 x Self-Persistence

This is when there is no Self-Persistence, and mathematic problem-solving ability is at 6,158. When Self-Persistence, increases by one unit, mathematical problem-solving ability increases by 0.636. This increase is significant at the 5% level of significance as indicated by the p-value of 0.000.

Table 4: ANOVA Table of Regression Analysis for Self-Persistence in mathematical problem-solving ability

ANOVA[a]					
Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	9664.744	1	9664.744	65.874	.000[b]
Residual	13204.332	90	146.715		
Total	22869.076	91			
a. Dependent Variable: mathematical problem-solving ability					
b. Predictors: (Constant), Self-Persistence					

The ANOVA table shows that F $(1,90)$ = 68.874 with p = 0.000. This suggests that there is a significant effect of Self-Persistence on mathematical problem-solving ability, H0 is rejected. which means that the regression coefficient is significant, in other words, there is a significant influence of Self-Persistence variables on mathematical problem-solving ability.

Discussion

From testing the hypothesis, it was obtained that the value of p = 0.000 < 0.05 and F-calculate = 65.874, then H0 was rejected which means there is a significant influence of self-persistence variables on the ability to solve mathematical problems. The ability to solve mathematical problems is closely related to student self-persistence, where the more persistent students are in learning activities, the more they will continue to improve their ability to solve problems in mathematics. Students' self-persistence is developed and improved consistently, to create a mathematical problem-solving ability.

The results of the study reinforce the results of a study conducted by Ana, (2022), showing that self-persistence has a direct or indirect influence on the ability to solve mathematical problems. Solving ability in a problem is expressed in the process of finding a solution in mathematics learning that relates consistent reasoning power, so that it has a relationship with self-persistence because it is identical to consistency, both are interconnected (Ardiansyah, 2020)

Another research result that strengthens this research is Nugraha (2015) which shows that self-persistence has a significant influence on the ability to solve mathematical problems. Mathematical Problem Solving is a student's skill to find solutions to problems that arise from mathematics. The skill of finding solutions to mathematical problems requires consistency synonymous with self-persistence.

CONCLUSIONS

Based on the results of data collection, data processing, and hypothesis testing, conclusions can be drawn, namely, self-persistence has a positive and significant effect on the ability to solve mathematical problems, this is evidenced by the value of sig 0.000 < 0.05 and the value of t-calculate = 6.807. The results showed self-persistence toward solving mathematical problems. The ability to solve mathematical problems is closely related to the persistence of the students themselves, where the more persistent students are in teaching and learning activities, the more they will continue to improve their ability to solve problems in mathematics. The recommendation of the study is Student self-persistence must be developed and improved consistently, to create an ability to solve students' math problems.

REFERENCES

1. Amam, A. (2017). Penilaian kemampuan pemecahan masalah matematis siswa SMP. Teorema: Teori dan Riset Matematika, 2(1), 39-46.
2. Ana, S. (2022). Hubungan Persistensi Diri Terhadap Kemampuan Pemecahan Masalah Matematis Ditinjau Dari Kemandirian Belajar Di Masa Pandemi Covid-19 (Doctoral dissertation, UIN Raden Intan Lampung).
3. Ardiansyah, M. (2020). Pengaruh Persistensi Diri, Kebiasaan Belajar dan Konsep Diri terhadap Kemampuan Pemecahan Masalah Matematika. Diskusi Panel Nasional Pendidikan Matematika, 6(1).
4. Asfar, A. M. I. T., & Taufan, I. (2019). Analisis Mata Pelajaran Matematika SMP (Transmisi–Proses–Praksis–Produk). Bone. https://doi. org/10.13140/RG, 2(10732.00643).
5. Asri, E. Y., & Noer, S. H. (2015). Guided discovery learning dalam pembelajaran matematika. In Prosiding Seminar Nasional Matematika dan Pendidikan Matematika (pp. 891-896).
6. Attri, R. (2018). Accelerating complex problem-solving skills: problem-centered training design methods. Singapore: Speed To Proficiency Research: S2PRo.
7. Creswell, J. W. (2012). Educational Research: Planning, Conducting and Evaluating Quantitative dan Qualitative Research (4th ed.). Pearson Education, Inc.

8. Febriyanti, C., & Irawan, A. (2017). Meningkatkan kemampuan pemecahan masalah dengan pembelajaran matematika realistik. Delta-Pi: Jurnal Matematika Dan Pendidikan Matematika, 6(1).

9. Hasbullah, H. & Sajiman, S. U, (2019). Eksplorasi kemampuan pemecahan masalah matematika siswa melalui kecerdasan logika matematika. Simposium Nasional Ilmiah & Call for Paper Unindra (Simponi), 1(1).

10. Hernaeny Ul'fah, & Prastiwi, S. (2021). Analisis Kemampuan Pemecahan Masalah Matematika Siswa SMK Pada Materi Sistem Persamaan Linear Dua Variabel Melalui Google Form. Jurnal Educatio, 7(4), 1791–1797. https://doi.org/10.31949/educatio.v7i4.1596

11. La'ia, H. T., & Harefa, D. (2021). Hubungan kemampuan pemecahan masalah matemetis dengan kemampuan komunikasi matematik siswa. Aksara: Jurnal Ilmu Pendidikan Nonformal, 7(2), 463-474.

12. Maryati, I., & Priatna, N. (2017). Integrasi nilai-nilai karakter matematika melalui pembelajaran kontekstual. Mosharafa: Jurnal Pendidikan Matematika, 6(3), 333-344.

13. Masfingatin, T. (2013). Proses berpikir siswa sekolah menengah pertama dalam memecahkan masalah matematika ditinjau dari adversity quotient. JIPM (Jurnal Ilmiah Pendidikan Matematika), 2(1).

14. Mugiarso, H., Setyowani, N., & Tedra, L. B. (2018). Self-efficacy dan persistensi mahasiswa ketika mengerjakan skripsi ditinjau dari kecemasan akademik. TERAPUTIK: Jurnal Bimbingan dan Konseling, 1(3), 171-175.

15. Munawarah, R. (2022). Manajemen supervisi akademik: Peningkatan mutu pembelajaran matematika madrasah aliyah. Penerbit P4I.

16. Nafisah, R. S. (2022). Pengaruh Persistensi Diri Dan Iklim Belajar Terhadap Prestasi Belajar Siswa (Survei Pada Mata Pelajaran Ekonomi Kelas XI SMA Negeri 10 Tasikmalaya Tahun Ajaran 2021/2022) (Doctoral dissertation, Universitas Siliwangi).

17. Nurhaliza, S. (2023). Pengaruh model problem based learning terhadap kemampuan pemecahan masalah matematika siswa kelas 3 MI NW Selong Tahun Pelajaran 2023/2024 (Doctoral dissertation, UIN Mataram).

18. Nuryana, D., & Rosyana, T. (2019). Analisis Kesalahan Siswa Smk Dalam Menyelesaikan Soal Pemecahan Masalah Matematik Pada Materi Program Linear. Jurnal Cendekia: Jurnal Pendidikan Matematika, 3(1), 11–20

19. Pratiwi, D., Suendarti, M., & Hasbullah, H. (2019). Pengaruh Efikasi Diri dan Kemandirian Belajar terhadap Kemampuan Pemecahan Masalah Matematika. JKPM (Jurnal Kajian Pendidikan Matematika), 5(1), 1-14.

20. Puspitasari, N. (2016). Kontribusi Matematika Terhadap Ilmu Komputer Di D3 Manajemen Informatika Politeknik Indonusa Surakarta. Jurnal Informa: Jurnal Penelitian dan Pengabdian Masyarakat, 3(2), 18-25.

21. Sumartini, T. S. (2016). Peningkatan kemampuan pemecahan masalah matemetis siswa melalui pembelajaran berbasis masalah. Mosharafa: Jurnal Pendidikan Matematika, 5(2), 148-158.