The effect of learning independence on mathematics learning achievement seventh grade of junior high school students

Afrida Yanti, Muhamad Sofian Hadi *

Faculty of Education, Universitas Muhammadiyah Jakarta, Jl. K.H. Ahmad Dahlan, Kota Tangerang Selatan, Banten 15419, Indonesia
* Corresponding Author. Email: afridayantiaf@gmail.com

Abstract: The low independence of student learning, especially in mathematics lessons, is a driver for research. Based on observations, most students do not realize the importance of learning independence. Many students don't want to learn math, and most don't like it because they think math is too difficult. Survey methods with simple regression analysis are used in research. The study aims to determine the effect of independence on mathematics learning achievement of seventh grade students at State Junior High School 7 Bekasi City in the even semester of the 2022/2023 academic year. Sampling using a simple random sampling technique with 38 students from seventh grade at Junior High School 7 Bekasi City. Data analysis using the help of the Statistical Program for Social Science (SPSS) 22 program with stages of descriptive statistical analysis, testing prerequisites for data analysis (normality test, linearity test, and hypothesis test). The results of the study can be concluded that there is an influence of independence on mathematics learning achievement in seventh grade of junior high school students. The effect of independence on students' mathematics learning achievement was 10.4%, and 89.6% was influenced by other factors.

Keywords: Learning achievement; Learning independence; Mathematics Learning

INTRODUCTION

Education is useful in improving the quality of life in society. According to Siagian et al. (2020), education is a human learning process to become better. Virgana (2018) said that national education aims to develop the potential of students to become people of faith, piety, noble character, knowledge, capable, creative, independent, and responsible for what is done. Through education, it can produce students who are knowledgeable, broad-minded, and can compete in the future.

Mathematics is one of the other important subjects in education. Mathematics is the science underlying technological developments, plays a role in the scientific field and can advance the human mind (Nabillah & Abadi, 2019). Sari and Himmi (2019) stated that mathematics is a subject that cannot be separated from life because mathematics grows and develops into human activities and produces a human mindset. According to Suendarti (2019), mathematics needs to be learned by students so that they can meet practical needs and can be used in solving problems in life.

The problem experienced in education, especially mathematics lessons, is the low achievement of students. Based on PISA 2018, the percentage of outstanding Indonesian students is still relatively low and although it has succeeded in increasing access of 15-year-

olds to the school system, efforts still need to be made in educating them so that the target of outstanding people becomes 15-20% by 2030 (Kemendikbud, 2019).

Learning achievement is a measurement obtained or assessment of student learning after participating in learning activities. These achievements can be described in the form of numbers or sentences that represent what students have obtained. Measurement of student achievement is useful for determining the level of success, diagnosing learning difficulties, and guiding them to get better results than before (Apriyanto et al., 2020). Learning achievement is related to knowledge but includes aspects of attitudes and skills (Ningsih & Nurrahmah, 2016). Learning achievement is not only related to knowledge but also includes aspects of attitudes and skills (Ningsih & Nurrahmah, 2016).

Learning achievement in mathematics is the result obtained by students during mathematics learning which can be in the form of understanding, experience, knowledge, and mathematical skills. According to Sirait (2016), mathematics learning outcomes are mastery of knowledge and skills in mathematics lessons obtained from students' efforts in active interaction of subjects with their environment. According to Ahmad, if students get low achievement, it means that educational and learning goals have not been achieved if high learning achievement means that educational goals are declared successful (Suciati, 2016).

Previous research relevant to the research was examining the effect of learning independence on mathematics learning outcomes in elementary schools (Siagian et al., 2020). While this study examines the effect of learning independence on mathematics learning achievement seventh grade of junior high school students. Learning independence is needed for students so that learning achievement can be optimal. Nasution et al. (2018) stated that by having learning independence, students can achieve optimal learning achievement at school. According to Rahayu and Aini (2021), what affects the success of learning mathematics is learning independence. Sugianto et al. (2020) stated that independent learning requires a sense of responsibility, initiative in thinking, strong will, and the ability to accept all consequences that arise. Learning accompanied by independence will encourage students to learn with full responsibility, strong will, and high discipline so that the learning achievements achieved can be optimal (Asmar, 2018).

Nurfadilah and Hakim (2019) stated that freedom of learning is a necessity for learning mathematics. Meanwhile, according to Nurhafsari (2019), learning independence is when students are actively involved in determining goals, strategies, and supervising cognitive and affective processes in completing academic tasks. Afiani (2016) stated that independence makes students trained and have the habit of doing good actions, students have discipline in the learning process.

Suhendri (2011) also argues that an influential element in learning mathematics is learning independence. This is because learning resources do not only come from teachers. Other learning resources can come from the environment, social media, and books. Students with high creativity will feel that the lessons they get from the teacher are still lacking, so they need to find outside information. With this additional information, they will add to the knowledge they previously gained in school. Therefore, the need for independent learning in mathematics learning.

The reality on the ground is different from what was expected. Students still depend on resources and what teachers provide during the learning process. Students do not have the initiative to learn independently, even though they already have books that can be a source of learning outside of school. When teachers assign assignments, they still depend on other friends. There are also when formative or summative assessments steal each other to get answers. Dependence on others causes learners not to try to learn mathematics. Though the task of learners is to be able to be responsible for their learning so that they do not depend on others and can manage themselves, when is the right time to ask for help and when not to need the help of others in learning. With independent learning, students have the initiative to learn to be better prepared to face math problems, no longer depend on others, and believe in their

abilities. Based on the explanation that has been explained, this research focuses on students' learning independence and their academic performance in mathematics at the junior high school level.

METHOD

The research was carried out at State Junior High School 7 Bekasi City in the even semester of the 2022/2023 academic year. The study used survey methods accompanied by simple regression analysis. The survey method is a technique of collecting information by making a list of questions asked to respondents. Simple regression analysis is a method that serves to model the relationship between one independent variable and the dependent variable. With this method, researchers test characteristics or relationships between variables without the intervention of researchers (Lestari & Yudhanegara, 2015). According to Suendarti (2020), the survey method is data collection by taking several population objects and reflecting the population by paying attention to the balance between the number of variables, accuracy, labor, time, and cost.

The population is the overall data that identifies a phenomenon (Priyastama, 2017). The study population included all seventh-grade students at State Junior High School 7 Bekasi City totaling 378 students. Researchers can use samples taken from populations if the population is too large which does not allow researchers to study all populations (Lestari & Yudhanegara, 2015). According to Arikunto (2021), it is better to take all if the subject is less than 100, but if more than 100 can be taken between 10%-25%. The sampling technique uses simple random sampling. Based on Arikunto's opinion, researchers took a sample of 10%, namely 38 students.

The research procedure starts from the planning, implementation, and completion stages. Descriptive analysis is a data analysis technique used. The stages of data analysis start from describing the data on each research variable, conducting analysis, and testing hypotheses. The technique of collecting data on mathematics learning achievement variables is to take school document data from research samples. The data is in the form of scores from the summative assessment at the end of the odd semester of the 2022/2023 academic year, which is in December 2022. The data collected aims to determine the achievement of students in learning mathematics. The instrument in the study is a questionnaire that is useful for data collection on the variable of learning independence. The questionnaire was created and distributed via a Google Form link in February 2023. The learning independence questionnaire consists of several indicators, namely discipline, self-confidence, responsibility, learning management, and the use of various learning resources.

The questionnaire used the Likert scale. Students choose one alternative answer by marking a checklist (√). The Likert scale is a rating scale that presents a choice of scales with values to measure the level of agreement with a statement/question (Maryuliana et al., 2016). Sugiyono (2015) said, variables measured on the Likert scale are translated first into indicators and will later be used as a starting point for the preparation of instruments in the form of statements. Alternative answers in the study are Strongly Agree, Agree, Hesitate, Disagree, and Strongly Disagree. Scoring for each answer choice with the following conditions: Strongly Agree to score 5, Agree to score 4, Hesitate to score 3, Disagree to score 2, and Strongly Disagree to score 1.

RESULTS AND DISCUSSION

Results

Descriptive Statistical Analysis

The Statistical Program for Social Science (SPSS) 22 program is used as a tool to facilitate the processing of descriptive statistical analysis. The results of descriptive statistical processing are presented in Table 1. The learning independence questionnaire that had been given to 38 students obtained an average score of 103.68. While the median and mode values are 104.00

and 86 respectively. This indicates that learning independence in mathematics learning tends to be positive and shows a fairly high number. From this description, it can also be seen that the mean and median values are almost the same, namely 103.68 and 104.00. Based on this, it was obtained that the learning independence score data in this study was quite representative or representative of the population. Meanwhile, scores that are above average are more than those below average, indicating that high independence outweighs low ones.

Table 1. Summary of Descriptive Statistics

	Independent learning	Learning achievement
Mean	103,68	74,63
Median	104,00	77,50
Mode	86	89
Std. Deviation	13,169	19,335
Variance	173,411	373,861

The midterm summative assessment scores of 38 respondents had an average of 74.63. While the median and mode values are 77.50 and 89 respectively. From this description, the mean and median values are almost the same, namely 74.63 and 77.50. Based on this, it was obtained that the data on the value of mathematics learning achievement of students in the study was quite representative or representative of the population. While scores that are above the average more than those below the average indicate that high learning motivation is more than low.

Data Analysis Prerequisite Testing

Normality test

Priyastama (2017) said that normality tests need to be carried out in testing the data produced as normally distributed or not. Normality testing is performed if the study uses non-parametric statistics. Normality testing was performed with the Kolmogrov-Smirnov test using the Statistical Program for Social Science (SPSS) 22. The normality test for each sample uses the following conditions:

H_0 : normally distributed data.

H_1 : data is not normally distributed.

If the Significant value (Sig.) In the Kolmogorov-Smirnov method for all samples shows >0.05 then H_0 is accepted. That is, the data in the study sample is normally distributed. Information for the normality test can be seen in Table 2.

Table 2. Normality Test Results

		Independent learning	Learning achievement
Normal Parameters[a,b]		103,68	
	Mean		74,63
	Std. Deviation	13,169	19,335
Asymp. Sig. (2-tailed)		,200[c,d]	
			,149[c]

a. Test distribution is normal
b. Calculated from data
c. Lilliefors significance correction
d. This is a lower bound of true significance

In Table 2 Significant values were obtained on the variables of learning independence of 0.200>0.05 and learning achievement of 0.149>0.05. It can be concluded that the data from all samples in this study are normally distributed. A normal distribution is a probability function that indicates the spread or distribution of a variable. If the data obtained are normally distributed, it can be assumed that the data are randomly drawn from the normal population.

Linearity Test

The linearity test has the aim of knowing and proving the relationship between the variables studied has a linear relationship. The test was conducted by conducting regression analysis with the Statistical Program for Social Science (SPSS) 22 program. The conditions used in the linearity test are as follows:

H_0: linear a relationship of independence variables with mathematics learning achievement

H_1: nonlinear relationship of independence variables with mathematics learning achievement.

The Statistical Program for Social Science (SPSS) 22 program was used to determine the linearity of the two variables. The H_0 criterion is accepted if the value is Significant (Sig.)>0.05 and H_1 is rejected if Significant (Sig.) < 0.05. The results of linearity testing for simple regression are in Table 3.

Table 3. Linearity Tes Results

	F	Sig.
Deviation from Linearity	1,138	,445

The results of the linearity test on all research samples gave a Significant value (Sig.) of 0.445 and the value was more than 0.05 so that it was concluded that H_0 was accepted. This means that there is a linear relationship between the variable of learning independence and mathematics learning achievement. Linear data shows the pattern of the relationship between the two variables close to one line (straight).

Hypothesis test

Hypothesis testing and data analysis using the Statistical Program for Social Science (SPSS) 22. There is a significant influence of the learning independence variable (variable X) on mathematics learning achievement (Y) if the value of Sig.<0.05. However, there is no significant influence of variable learning independence (X) on mathematics learning achievement (Y) if the value of Sig.<0.05 is obtained. Significant Value (Sig.) is a number listed in the variable learning independence column Sig. The results of hypothesis testing are shown in Table 4 and Table 5.

Table 4. Anova Test Results

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	1443,745	1	1443,745	4,195	,048[b]
Residual	12389,097	36	344,142		
Total	13832,842	37			

a. Dependent variable: learning achievement
b. Predictors: Independent learning

Table 5. Hypothesis Test Results

R	R Square	Adjusted R Square	Std. An Error of the Estimate
,323[a]	,104	,079	18,551

a. Predictors: independent learning

In Table 4 shows a Significant value (Sig.) = 0.048 then a Significant value (Sig.) <0.05, which means there is an influence of learning independence on mathematics learning achievement. In addition to Table 5. obtained R Square value = 0.104, which means that the contribution of independence to mathematics learning achievement is 10.4% and 89.6% is influenced by other factors that are not studied. The value of R square is in the range of 0-1, meaning that the smaller the value of R square obtained by eating, the weaker the relationship between variables and the greater the value of R square, the stronger the relationship between these variables. After that, a simple regression test was carried out as shown in Table 6.

Table 6. Simple Regression Follow-up Test Results

Model	B	Std. Error	Beta	t	Sig.
(Constant)	25,448	24,201		1,052	,300
Independent learning	,474	,232	,323	2,048	,048

Dependent variable: learning achievement

Based on Table 6, a regression line equation is obtained that represents the influence of variable X on variable Y, namely (Y)ˆ = 25.448 + 0.474 X. Obtaining a Significant value (Sig.) = 0.048 or Sig.<0.05. That is, there is an influence of independence on mathematics learning achievement. Students who learn independently will easily follow the process of learning mathematics. The creation of a learning process accompanied by independence will make students learn better than before and they are able to manage learning activities effectively so that learning objectives can be achieved optimally.

Discussion

In learning activities, learning independence will require students to be active both before and after the learning process takes place. Independent students will prepare the material to be studied. After the learning process is complete, students will learn again about the material that has been delivered by reading or discussing. It is hoped that with independent learning, students will be able to try independently to find something new, innovate in solving problems and without always having to wait for direction from the teacher (Indah & Farida, 2021).

In addition to being active in preparing and reviewing learning materials, learning independence also fosters critical thinking and problem-solving skills in students. When students are encouraged to learn independently, they are more likely to analyze information, ask questions, and seek answers on their own. This kind of critical thinking is essential for students to develop a deeper understanding of the subject matter and to apply their knowledge to real-life situations. Moreover, learning independence also allows students to explore various resources beyond the classroom, such as online articles, videos, and interactive tools, which can enrich their learning experiences and broaden their knowledge (Delita et al., 2022).

Promoting learning independence can also enhance self-efficacy and motivation in students. When students have the confidence and ability to learn on their own, they are more likely to take ownership of their learning journey and set higher goals for themselves. This sense of empowerment can boost their motivation to learn and excel in their academic pursuits (Fachrunisa et al., 2022). Additionally, learning independence encourages students to develop a growth mindset, believing that their abilities can be developed through effort and dedication. As a result, they become more resilient in the face of challenges and setbacks, fostering a positive attitude towards learning and continuous improvement (Delita et al., 2022). Overall, cultivating learning independence in students not only enhances their academic performance but also equips them with crucial life skills for success in their future endeavors.

CONCLUSION

Based on the data from the study, it can be concluded that learning independence has a significant influence on the mathematics learning achievement of seventh-grade junior high school students, accounting for 10.4% of the variance. However, it is essential to note that other factors, not included in this study, also play a significant role, contributing to 89.6% of the variance in mathematics learning achievement. Learning independence is a skill that can be developed through self-study and proactive learning approaches. Students who are capable of learning independently are more likely to engage in self-directed learning, where they take the initiative to explore the subject matter beyond the classroom. In this process, seeking assistance from teachers, peers, or other knowledgeable individuals becomes a valuable resource to overcome challenges and deepen their understanding of the material. By encouraging and nurturing learning independence in students, educators can help them

become more resilient, curious, and self-motivated learners, contributing to their overall academic and personal growth.

REFERENCES

Afiani, N. (2017). Pengaruh kemampuan komunikasi matematis dan kemandirian belajar terhadap prestasi belajar matematika [The influence of mathematical communication skills and self-directed learning on mathematics learning achievement]. *JKPM (Jurnal Kajian Pendidikan Matematika)*, *2*(1), 1-13. http://dx.doi.org/10.30998/jkpm.v2i1.1844

Apriyanto, M. T., & Herlina, L. (2020). Analisis prestasi belajar matematika pada masa pandemi ditinjau dari minat belajar siswa [Mathematics learning achievement analysis during the pandemic in terms of students' learning interest]. *Diskusi Panel Nasional Pendidikan Matematika*, *6*(1). Retrieved from https://proceeding.unindra.ac.id/index.php/DPNPMunindra/article/view/4774

Arikunto, S. (2021). *Dasar-dasar evaluasi pendidikan edisi 3 [Foundations of educational evaluation, 3rd edition]*. Bumi Aksara.

Asmar, E. (2018). Pengaruh kemandirian belajar dan minat belajar terhadap prestasi belajar ilmu pengetahuan alam [The influence of self-directed learning and learning interest on Natural Science learning achievement]. *Alfarisi: Jurnal Pendidikan MIPA*, *1*(1), 33–45. Retrieved from https://journal.lppmunindra.ac.id/index.php/alfarisi/article/view/2892

Delita, F., Berutu, N., & Nofrion, N. (2022). Online Learning: The Effects of Using E-Modules on Self-Efficacy, Motivation and Learning Outcomes. *Turkish Online Journal of Distance Education*, *23*(4), 93-107. https://doi.org/10.17718/tojde.1182760

Fachrunisa, A., Kuncoro, K. S., & Arigiyati, T. A. (2022). Development of Interactive E-Modules Assisted by The Kvisoft Flipbook Maker Application on Algebraic Forms Grade VII. *Journal of Mathematics and Mathematics Education*, *12*(1). https://doi.org/10.20961/jmme.v12i1.61091

Indah, R. P., & Farida, A. (2021). Pengaruh Kemandirian Belajar Siswa Terhadap Hasil Belajar Matematika [The impact of students' self-directed learning on mathematics learning outcomes]. *Jurnal Derivat: Jurnal Matematika Dan Pendidikan Matematika*, *8*(1), 41-47. Retrieved from https://journal.upy.ac.id/index.php/derivat/article/view/1641/0

Kemendikbud, B. (2019). Pendidikan di Indonesia belajar dari hasil PISA 2018 [Indonesian education learns from the results of PISA 2018]. *Pusat Penilaian Pendidikan Balitbang KEMENDIKBUD*, *021*, 1–206. http://repositori.kemdikbud.go.id/id/eprint/16742

Lestari, K. E., & Yudhanegara, M. R. (2015). Penelitian pendidikan matematika [Research in mathematics education]. *Bandung: PT Refika Aditama*, *2*(3).

Maryuliana, M., Subroto, I. M. I., & Haviana, S. F. C. (2016). Sistem informasi angket pengukuran skala kebutuhan materi pembelajaran tambahan sebagai pendukung pengambilan keputusan di sekolah menengah atas menggunakan skala likert [Information system of questionnaire for measuring the scale of additional learning material needs as decision support in high school using Likert scale]. *TRANSISTOR Elektro dan Informatika*, *1*(1), 1-12. http://dx.doi.org/10.30659/ei.1.1.1-12

Nabillah, T., & Abadi, A. P. (2020). Faktor penyebab rendahnya hasil belajar siswa [Factors causing low student learning outcomes]. *Prosiding Sesiomadika*, *2*(1c). Retrieved from https://journal.unsika.ac.id/index.php/sesiomadika/article/view/2685

Ningsih, R., & Nurrahmah, A. (2016). Pengaruh kemandirian belajar dan perhatian orang tua terhadap prestasi belajar matematika [The influence of self-directed learning and parental attention on mathematics learning achievement]. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, *6*(1). http://dx.doi.org/10.30998/formatif.v6i1.754

Nurfadilah, S., & Hakim, D. L. (2019). Kemandirian belajar siswa dalam proses pembelajaran matematika [Students' self-directed learning in the process of learning mathematics]. *Prosiding Sesiomadika*, *2*(1), 1214-1223. Retrieved from https://journal.unsika.ac.id/index.php/sesiomadika/article/view/2990

Nurhafsari, A. (2019). Kemandirian Belajar Matematika Siswa dalam Pembelajaran Kooperatif dengan Aktivitas Quick on The Draw [Students' self-directed learning in Cooperative Learning with Quick on The Draw activity in mathematics]. *GAUSS: Jurnal Pendidikan Matematika*, *1*(2), 97–107. https://doi.org/10.30656/gauss.v1i2.1051

Nasution, N., Rahayu, R. F., Yazid, S. T. M., & Amalia, D. (2018). Pengaruh kemandirian belajar terhadap hasil belajar siswa [The influence of self-directed learning on student learning outcomes]. *Jurnal Pendidikan Luar Sekolah*, *12*(1), 9-14. https://doi.org/10.32832/jpls.v12i1.2879

Priyastama, R. (2017). *Buku Sakti Kuasai SPSS [Mastering SPSS with the Powerful Book]*. Yogyakarta: START UP.

Rahayu, I. F., & Aini, I. N. (2021). Analisis kemandirian belajar dalam pembelajaran matematika pada siswa SMP [Analysis of self-directed learning in mathematics learning among junior high school students]. *JPMI (Jurnal Pembelajaran Matematika Inovatif)*, *4*(4), 789-798. https://doi.org/10.22460/jpmi.v4i4.789-798

Sari, N. K., & Himmi, N. (2019). Pengaruh kedisiplinan, rasa percaya diri, dan kecerdasan logis matematis terhadap hasil belajar matematika siswa [The influence of discipline, self-confidence, and mathematical logical intelligence on students' mathematics learning outcomes]. *PYTHAGORAS: Jurnal Program Studi Pendidikan Matematika*, *8*(1), 49-59. https://doi.org/10.33373/pythagoras.v8i1.1784

Siagian, H., Pangaribuan, J. J., & Silaban, P. J. (2020). Pengaruh kemandirian belajar terhadap hasil belajar Matematika siswa di sekolah dasar [The influence of self-directed learning on elementary school students' mathematics learning outcomes]. *Jurnal Basicedu*, *4*(4), 1363-1369. https://doi.org/10.31004/basicedu.v4i4.528

Sirait, E. D. (2016). Pengaruh minat belajar terhadap prestasi Belajar Matematika [The influence of learning interest on Mathematics learning achievement]. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, *6*(1), 35–43. https://doi.org/10.30998/formatif.v6i1.750

Suciati, W. (2016). *Kiat Sukses Melalui Kecerdasan Emosional dan Kemandirian Belajar [Success Tips through Emotional Intelligence and Self-Directed Learning]*. Bandung: CV. Rasi Terbit.

Suendarti, M. (2019). *Konsep-Konsep MIPA [Concepts in Science and Mathematics]*. Tangerang: PT Pustaka Mandiri.

Suendarti, M. (2020). *Buku Saku Penyusunan Power Point dan Dafter Pustaka [Pocket Book for Creating PowerPoint and Bibliography]*. Tangerang: PT Pustaka Mandiri.

Sugianto, I., Suryandari, S., & Age, L. D. (2020). Efektivitas model pembelajaran inkuiri terhadap kemandirian belajar siswa di rumah [Effectiveness of inquiry learning models on students' self-directed learning at home]. *Jurnal Inovasi Penelitian*, *1*(3), 159-170. https://doi.org/10.47492/jip.v1i3.63

Sugiyono. (2015). *Metode Penelitian Pendidikan: Pendekatan Kuantitatif, Kualitatif, dan R&D [Research Methods in Education: Quantitative, Qualitative, and R&D Approaches]*. Bandung: Alfabeta.

Suhendri, H. (2011). Pengaruh kecerdasan matematis–logis dan kemandirian belajar terhadap hasil belajar matematika [The influence of mathematical-logical intelligence and self-directed learning on mathematics learning outcomes]. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, *1*(1). http://dx.doi.org/10.30998/formatif.v1i1.61

Virgana. (2018). *Manajemen Kurikulum Pendidikan MIPA [Curriculum Management for Science and Mathematics Education]*. Jakarta: Pustaka Mandiri.