

The Effect of Online Learning on Mathematics Learning Achievement in Elementary School Students

Norkholizah¹, Danuri², Hermanto³

¹ Universitas Negeri Yogyakarta, Indonesia; norkholizah0040pasca.2020@student.uny.ac.id

² Universitas Negeri Yogyakarta, Indonesia;; danuri@upy.ac.id

³ Universitas Negeri Yogyakarta, Indonesia;; hermansp@uny.ac.id

ARTICLE INFO

Keywords:

online learning mathematics;
learning achievement;
face-to-face learning

Article history:

Received 2022-02-14

Revised 2022-04-12

Accepted 2022-07-17

ABSTRACT

The purpose of this study is to measure the average percentage of mathematics learning achievement of fifth-grade students when online learning was implemented and its impact when face-to-face learning was limited. The population in this study was 150 fifth-grade students in Tanah Bumbu Regency with the type of ex-post fact research. The data collection technique was in the form of a test technique and a psychological scale in the form of an instrument with a simple linear regression analysis technique. Test requirements analysis to test the hypothesis using a simple regression test. Before the simple regression test, prerequisite tests were carried out in the form of normality test, linearity test, and heteroscedasticity test. Based on the research results, it is known that online learning partially has a significant effect of 3.6% on learning achievement in Mathematics. However, it is known that when applied face-to-face learning was limited, students had not fully mastered the previous material and the subject matter being studied.

This is an open access article under the [CC BY-NC-SA](#) license.



Corresponding Author:

Nurkholis

Universitas Negeri Yogyakarta, Indonesia; norkholizah0040pasca.2020@student.uny.ac.id

1. INTRODUCTION

The Covid-19 outbreak has had a very significant impact on various sectors of life, including the education sector (Jusmawati et al., 2020: 106). The changes that have occurred in the education sector due to Covid-19 require us to be ready and responsive in facing new challenges to learn new things (Siahaan, 2020: 1–3). Entering the new academic year 2021/2022, the Ministry of Education and Culture issued a circular regarding the implementation of limited face-to-face learning (Rusyada & Nasir, 2022:2). This is also in line with the issuance of a joint decree of four ministers containing Guidelines for Implementation of Learning during the Covid-19 Period (Ramadhan, et al, 2021: 86). In its application, it is carried out based on the situation and conditions in a school concerned. Every school also implements

a certain learning provisions, such as fully online learning methods, limited face-to-face learning, or hybrid learning methods (Yunianta, 2021: 53).

Although most schools in Indonesia have implemented limited face-to-face learning, the duration of learning time is still not same as the duration of normal learning. The duration of learning in the implementation of limited face-to-face learning is still relatively short compared to normal face-to-face learning (Mustakim, Dewi, & Mulyasari, 2021:171). In addition, for a long period students only carry out the online learning process (Yunus et al., 2021: 813). The application of online learning itself cannot be separated from the use of technology and internet networks as a support for accessing ongoing learning (Alessandro, 2018: 24). When online learning including Mathematics is carried out, all elements are required to be ready and responsive to face these challenges (Annur & Hermansyah, 2020: 195). On the other hand, students tend to think that Mathematics is a complicated and boring subject. This is because teachers are considered unable to adjust the method of delivering material to the characteristics of elementary school-aged students and their readiness to receive the lesson. (Priatna & Yuliardi, 2019: 6). Alshatri et al. (2019:448) stated that most elementary school-aged students can only understand Mathematics material in concrete form. However, if the lesson is in abstract form, students think learning Mathematics is very difficult. Mathematics lessons will be easier to understand if it is conveyed with fun learning methods. The better students' ability to understand mathematical concepts, the better the students' Mathematics learning achievement will be.

However, in reality, there are obstacles in implementing online learning. Based on the results of interviews and observations at SDN 1 Sungai Dua, SDN 2 Sarigadung, SDN 5 Tungkaran Pangeran, SDN Bakarangan, and SDN Barugelang which were held from December 1, 2021, to February 10, 2022, there are three problems in the field. First, the learning achievement in Mathematics after the implementation face-to-face learning was decreasing. This is evidenced by the average of end-of-semester assessments during online learning from five schools of 76.5. Then, it was decreased with an average score of 68 from the KKM 75 when face-to-face learning was implemented. Second, there was a decrease in students' ability to understand mathematical concepts when they started the limited face-to-face learning. This was evidenced by (1) a lot of subject matter that students had not understood; (2) students had difficulty in understanding the next subject matter; and (3) students had difficulty in doing the Mathematics assignments. Third, the enthusiasm of students in learning was getting low. This was proven that (1) the students were not enthusiastic during the learning process, and did not want to ask questions if they had difficulty in understanding the material; (2) students pretended to have understood the subject matter.

In addition, when participating in online learning activities, the students had difficulty accessing the internet network. Difficulty in accessing the internet network made students difficult to understand the material being studied properly. Difficulties in understanding the previous subject matter have an impact on students' understanding of the next material, especially when face-to-face learning is limited. When face-to-face learning is limited, students got difficulty in repeating the lessons they had learned during online learning because the material was not well understood. If this continues, it will impact on the students' achievement in learning Mathematics. Masyithoh & Arfinanti (2021:160) said that online learning of Mathematics had an influence on the level of mastery of students' material when face-to-face learning began to be limited. The teacher is responsible for creating a meaningful learning process and helping students to understand the lesson well (Retnawati et al., 2017: 268). This is because at online learning period, there was limited learning time, the lack of media and the use of interactive learning models. The limited time made teachers difficult to design learning in accordance with the expected learning objectives (Widyastuti, 2022: 205).

This is in accordance with Sari's research (2017) which stated that it was difficult for teachers to design and use learning media so that the target was not as expected. In face-to-face learning, it is also difficult for teachers to understand the character and potential of each student in the classroom. This makes teachers also difficult to design learning based on the interests and potential of students to make students more enthusiastic to participate the learning activity in class. Besides, Kusumaningrum &

Wijayanto (2020) said that learning Mathematics online made students unable to get maximum learning. Furthermore, Anugrahana (2020) said that online learning was less than optimally applied in elementary schools which led to low understanding and mastery of the lessons delivered by teachers. In addition, Fahrhadina & Rahmatina (2022: 5) stated that the implementation of online learning had a significant effect when the implementation of face-to-face learning was limited because students still did not fully master the material in the previous class.

Based on the explanation above, the researchers want to examine the effect of online learning on Mathematics learning achievement of the fifth-grade students in Tanah Bumbu Regency and the impact of the implementation of limited face-to-face learning. This research is expected to have positive benefits for students and teachers in achieving the expected learning objectives and optimal learning achievement in Mathematics.

2. METHODS

This study used quantitative research method with the type of Expost Facto research. Expost facto research is research that examines events that have occurred based on field conditions and cannot be manipulated (Ibrahim & Suardiman, 2014: 66). This study aims to determine the effect of online learning on Mathematics learning achievement and its impact when the implementation of face-to-face learning is limited. The research was conducted from December 1, 2021, to February 10, 2022 at four schools in Tanah Bumbu Regency, namely SDN 1 Sungai Dua, SDN 2 Sarigadung, SDN 5 Tungkaran Pangeran, SDN Bakarangan, and SDN Barugelang with a sample of 150 fifth-grade of elementary schools students.

Research data were obtained based on questionnaires and test instruments distributed to students. The questionnaire containing of 15 questions about online learning was distributed via google form, while the test instrument containing of 15 Mathematics questions was given to students face-to-face. The validity of the questionnaire and the instrument was measured through validity and reliability tests. The validity test was measured using SPSS for windows version 21. The questionnaire will be declared valid if the calculated r value was greater than r table. Furthermore, the data will be declared reliable if $\alpha > 0.6$.

The calculation method used is descriptive statistical analysis and inferential analysis. The variables that become the object of descriptive analysis are online learning and Mathematics learning achievement of the fifth-grade students in Tanah Bumbu Regency. Furthermore, for the inferential analysis, normality, linearity, and simple regression tests were done. Normality test using Kolmogorov Smirnov aims to determine whether the data distributed is normal or not. The data is normally distributed if the significant value is > 0.05 . While the linearity test is seen based on the sig. linearity value with a significant value > 0.05 . The next step is a simple linear regression test to determine whether the X variable affects the Y variable or not with r value < 0.05 .

3. FINDINGS AND DISCUSSION

The results of the study aim to see the effect of online learning on Mathematics learning achievement. The following is a table of students' online learning questionnaire results:

Table 1. Frequency of Students' Online Learning Categories

Category	Frequency	Percentage
Well	23	15.33%
Enough	105	70%
Not enough	22	14.67%

Table 2. Frequency of Students' Achievement Category

Category	Frequency	Percentage
Well	26	17.33%
Enough	95	63.33%
Not enough	26	17.33%

After the questionnaire was distributed, it was followed by a reliability test. Reliability test is used to test the level of confidence of the questionnaire to be used. The test results showed that the Cronbach's Alpha is $0.811 > 0.6$, so that the questionnaire used can be trusted to use in the field.

After the reliability test was done, the next step was to test the requirements analysis to test the hypothesis using a simple regression test. Before a simple regression test was carried out, the data must go through a model feasibility test. The model feasibility test includes normality test, linearity test, and heteroscedasticity test.

a. Normality test

The normality test is used to determine whether the data used is normally distributed or not (Purwanto, 2006: 286). The test used is the Kolmogorov Smirnov normality test because the data is more than 50 samples.

The following is the result of the normality test:

Table 3 Normality Test Result

Data	Sig.	P	P data	Information
Online Learning	0.05	1.009	$0.05 < 1.009$	Normal distribution
Learning achievement	0.05	0.975	$0.05 < 0.975$	Normal distribution

b. Linearity Test

Linearity test is used to determine whether there is a linear relationship between the independent variables and the dependent variable being tested (Noor, 2011: 179). The result of the linearity test can be seen in Figure 1 below.

ANOVA Table							
			Sum of Squares	df	Mean Square	F	Sig.
Prestasi Belajar * Pembelajaran Daring	Between Groups	(Combined)	310.222	23	13.488	.986	.488
		Linearity	73.102	1	73.102	5.345	.022
		Deviation from Linearity	237.120	22	10.778	.788	.735
Within Groups			1723.112	126	13.675		
Total			2033.333	149			

Figure 1. Linearity Test Result

Based on the test results, it was obtained the value of sig. linearity of 0.022 ($0.022 < 0.05$) so it can be stated that the data have a linear relationship.

c. Heteroscedasticity Test

Heteroscedasticity test is used to test whether in the regression model there is an inequality of variation from the residual value of observations from one to another. (Santoso, 2017: 46). A good study is one that does not occur heteroscedasticity with a sig value > 0.05 (Islam et al., 2017: 361).

The following is the result of the heteroscedasticity test:

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.093	1.822		2.246	.026
	Pembelajaran Daring	-.019	.030	-.050	-.610	.543

a. Dependent Variable: Abs_RES

Figure 2. Heteroscedasticity Test Result

In the result above, it is known that online learning has a Sig value. of 0.543 > 0.05. It can be stated if there is no heteroscedasticity symptom in the tested data.

d. Simple Linear Regression Test

Simple linear regression test was used to measure the influence of the independent variable on the dependent variable.

The results of a simple linear regression test can be seen in the figure below:

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.190 ^a	.036	.029	3.63934

a. Predictors: (Constant), Pembelajaran Daring

Figure 3. Simple Linear Regression Test Result

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.495	3.237		.153	.879
	Pembelajaran Daring	.127	.054	.190	2.349	.020

a. Dependent Variable: Prestasi Belajar

Figure 4 Significance Test Result

The Effect of Online Learning on Mathematics Learning Achievement

Based on the results of the data analysis above, it is known that online learning has a significant effect on learning achievement in Mathematics with an effective contribution of 3.6% with a value of $t_{count} \geq t_{table}$ ($2.349 \geq 1.976$) and has a significance of 0.020. This means that online learning has a significant effect on Mathematics learning achievement by 3.6%. This is supported by research of Tumembow et al. (2021: 672) which stated that online learning had a significant effect on learning achievement in Mathematics with an effective contribution of 74.1% with a value of $t_{count} \geq t_{table}$ ($13.492 \geq 1.295$) and has a significance of 0.020. In addition, Dewi et al. (2021:234) stated that online learning had a significant effect on Mathematics learning achievement with an effective contribution of 98.01.1% with a value of $t_{count} \geq t_{table}$ ($3.510 \geq 2.060$) and had a significance of 0.000. Furthermore, Dh & Hafid (2022: 85) stated that online learning partially had a significant effect on learning achievement in Mathematics with a value of $t_{count} \geq t_{table}$ ($5.527 \geq 1.663$) and had a significance of 0.000. In conclusion, online learning significantly affects the students' Mathematics learning achievement.

However, on the other hand, online learning has an impact when the implementation of limited face-to-face learning begins when the students still have not fully mastered the Mathematics subject matter in the previous class well. Masyithoh & Arfinanti (2021:160) said that learning mathematics that was carried out online had an influence on the level of mastery of students' material when face-to-face

learning began to be limited. This is because at the online learning there is limited learning time, the lack of media and the use of interactive learning models. Besides, Kusumaningrum & Wijayanto (2020) stated that learning mathematics online made students unable to get maximum learning. Furthermore, Anugrahana (2020) said that online learning was less than optimally applied in elementary schools which led to low understanding and mastery of the lessons delivered by teachers. In addition, Fahratina & Rahmatina (2022: 5) stated that the implementation of online learning had a significant effect when the implementation of face-to-face learning was limited because students still did not fully master the material in the previous class. In other words, during online learning students have difficulty in listening to the teacher's explanations well and even tend not to understand some or all of the explanations from the teacher.

The statements of several expert opinions above are corroborated by research conducted (Fauziah & Ratnaningsih, 2021: 128) which stated that students' Mathematics learning achievement is greatly decreased during the implementation of limited face-to-face learning with an average score of 67 from the KKM 75. In addition, Argawi & Pujiastuti (2021: 202) stated that when face-to-face learning was carried out, the percentage of completeness of the sixth-grade students in Mathematics only reached 69%. It was far below the average in the sixth-grade in the previous year, which was 85%. Widyastuti (2022: 205) stated that during face-to-face learning, teachers get difficult to create good learning because the shorter study hours and less ability to create appropriate learning methods, media and models, so that there is a decline in Mathematics learning achievement with classical completeness averages by 57.14 % (La Ode Onde et al., 2021: 4405). Besides, Widyastuti (2022: 202) stated that there was a decrease in Mathematics learning achievement when face-to-face learning was applied, namely only 32% of students were able to meet the standards of the KKM 75 while other students were below the KKM.

The decrease in students' ability to understand mathematical concepts when they start limited face-to-face learning cannot be separated from the influence of online learning, namely due to limited teacher-student meetings, lack of learning assistance, lack of independence, and the characteristics of Mathematics itself. (Widyastuti, 2022: 205). Students have difficulty in understanding the material presented and feel that no material is understood during online learning (Mamolo, 2022: 5). In addition, students feel pressured during online learning because the tasks given by the teacher are more than before the online learning was implemented (Mamolo, 2022: 5). Every time the lesson starts, students feel anxious because they are afraid of being given a lot of assignments, so when teachers give assignments, students ask someone else to do it. In addition, students feel that does not get anything for a whole semester during the online learning (Mamolo, 2022: 5).

One of the obstacles faced by students during online learning is limitations in accessing the network. It makes them difficult to join online classes that have been prepared by the teacher, so it is often to find students who miss lessons (Mamolo, 2022:6). Being behind in understanding the lessons delivered by the teacher during online learning makes students have to adapt and catch up on lessons that have not been understood (Mamolo, 2022: 5). On the other hand, online learning aims to train students' abilities in utilizing technology, but in reality not all students are able to access it properly (Mamolo, 2022:7). This is one of the causes of the decline in students' ability to understand mathematical concepts, so that there is a decrease in the students' Mathematics learning achievement after the implementation of face-to-face learning (Mamolo, 2022, p. 6). However, to overcome these problems, the things that teachers can do during face-to-face learning are to encourage students to be motivated to learn, create a conducive learning atmosphere, and involve students in every learning activity (Widyastuti, 2022: 206).

In this study, the suggestion is that teachers must implement activities that can improve learning achievement in Mathematics by providing innovative online learning, maximizing the quality of interaction between students and teachers, students with teaching materials, students and students, so that the learning atmosphere is not lost when it began to be implemented the limited face-to-face learning due to the length of time applying online learning. As for the obstacles obtained in this study was in collecting data. This is due to the length of time respondents fill out the questionnaire given. In

addition, there were several respondents who did not provide a response. This is due to network constraints at the respondent's place.

4. CONCLUSION

The conclusion of this study shows that online learning has a significant effect on Mathematics learning achievement in the fifth-grade students in Tanah Bumbu Regency. However, online learning have an impact when the implementation of limited face-to-face learning begins, when students still have not fully mastered the Mathematics subject matter in the previous class well. The decline in learning achievement in Mathematics after the implementation of face-to-face learning is limited, one of which is due to the low ability of students to understand mathematical concepts conveyed by teachers during online learning and difficulties in accessing the internet network, so it is often for students to miss the lessons. The students' Mathematics' learning achievement will be more optimal if online learning is packaged as attractively as possible and adapted to the conditions and characteristics of elementary school-aged students. For further research, it is recommended that the time of research implementation and data collection is optimized so that it does not take a long time.

The researchers express their deepest gratitude to all parties involved in this research, including teachers and students who contributed to the data collection. The researchers realize that without the help of all parties involved, this research could not be carried out properly.

REFERENCES

- Alessandro, B. (2018). Digital skills and competence, and digital and online learning. *Turin European Training Foundation.*, 72. https://www.etf.europa.eu/sites/default/files/2018-10/DSC_and_DOL_0.pdf
- Alshatri, S. H. H., Wakil, K., Jamal, K., & Bakhtyar, R. (2019). Teaching Aids Effectiveness in Learning Mathematics. *International Journal of Educational Research Review*, 448–453. <https://doi.org/https://doi.org/10.24331/ijere.573949>
- Annur, M. F., & Hermansyah. (2020). Analisis Kesulitan Mahasiswa Pendidikan Matematika dalam Pembelajaran Daring pada Masa Pandemi Covid-19. *Jurnal Kajian, Penelitian Dan Pengembangan Kependidikan*, 11, 195–201.
- Anugrahana, A. (2020). Hambatan, Solusi dan Harapan: Pembelajaran Daring Selama Masa Pandemi Covid-19 Oleh Guru Sekolah Dasar. *Scholaria: Jurnal Pendidikan Dan Kebudayaan*, 10(3), 282–289. <https://doi.org/10.24246/j.js.2020.v10.i3.p282-289>
- Argawi, A. S., & Pujiastuti, H. (2021). Analisis Kemampuan Pemahaman Konsep Matematis Siswa Sekolah Dasar Pada Masa Pandemi Covid-19. *Al Khawarizmi: Jurnal Pendidikan Dan Pembelajaran Matematika*, 5(1), 64. <https://doi.org/10.22373/jppm.v5i1.9974>
- Dewi, K. S., Ika, L., & Dwiprabowo, R. (2021). Pengaruh Pembelajaran Daring Terhadap Hasil Belajar Matematika. 228–235.
- Dh, S., & Hafid, A. (2022). Pengaruh Pembelajaran Daring Terhadap Prestasi Belajar Siswa Kelas IV Sekolah Dasar. 2(1), 80–86.
- Fauziah, Y. U., & Ratnaningsih, N. (2021). Problematika Hasil Belajar Matematika Pada Pembelajaran Tatap Muka Terbatas Pandemi Covid- 19 Ditinjau Dari Lingkungan Belajar. 3, 125–139.
- Ibrahim, D. S., & Suardiman, S. P. (2014). Pengaruh Penggunaan E-Learning Terhadap Motivasi Dan Prestasi Belajar Matematika Siswa Sd Negeri Tahunan Yogyakarta. *Jurnal Prima Edukasia*, 2(1), 66. <https://doi.org/10.21831/jpe.v2i1.2645>
- Islam, R., Bashawir, A., Ghani, A., Mahyudin, E., & Manickam, N. (2017). International Journal of Economics and Financial Issues Determinants of Factors that Affecting Inflation in Malaysia. *International Journal of Economics and Financial Issues*, 7(2), 355–364. <http://www.econjournals.com>
- Jusmawati, J., Satriawati, S., & Sabilah, B. (2020). Pengaruh Pembelajaran Berbasis Daring Terhadap Minat. *Jurnal Kajian Pendidikan Dasar*, 5(2), 106–111.

- Kusumaningrum, B., & Wijayanto, Z. (2020). *Apakah Pembelajaran Matematika Secara Daring Efektif? (Studi Kasus pada Pembelajaran Selama Masa*. 11(2), 136–142.
- La Ode Onde, M. K., Aswat, H., Sari, E. R., & Meliza, N. (2021). Analisis Pelaksanaan Pembelajaran Tatap Muka Terbatas (TMT) di masa New Normal terhadap Hasil Belajar Matematika di Sekolah Dasar. *Edukatif: Jurnal Ilmu Pendidikan*, 3(6), 4400–4406. <https://doi.org/10.31004/edukatif.v3i6.1449>
- Mamolo, L. A. (2022). Online Learning and Students' Mathematics Motivation, Self-Efficacy, and Anxiety in the "new Normal." *Education Research International*, 2022, 1–10. <https://doi.org/10.1155/2022/9439634>
- Noor, J. (2011). *Metodologi Penelitian Skripsi, Tesis, Disertasi & Karya Ilmiah*.
- Priatna, N., & Yuliardi, R. (2019). Pembelajaran Matematika untuk Guru SD dan Calon Guru SD. PT. Remaja Rosdakarya.
- Purwanto, M. N. (2006). *Ilmu pendidikan : teoritis dan praktis* (17th ed.). Remaja Rosdakarya.
- Retnawati, H., Kartowagiran, B., Arlinwibowo, J., & Sulistyaningsih, E. (2017). Why are the mathematics national examination items difficult and what is teachers' strategy to overcome it? *International Journal of Instruction*, 10(3), 257–276. <https://doi.org/10.12973/iji.2017.10317a>
- Siahaan, M. (2020). Dampak Pandemi Covid-19 Terhadap Dunia Pendidikan. *Jurnal Kajian Ilmiah*, 1(1), 73–80. <https://doi.org/10.31599/jki.v1i1.265>
- Santoso, S. (2017). *Statistik Multivariat dengan SPSS*. PT ELEX MEDIA KOMPUTINDO
- Tumembow, A. D., Parinsi, M. T., & Palilingan, V. R. (2021). EduTIK: Jurnal Pendidikan Teknologi Informasi dan Komunikasi Volume 1 Nomor 6, Desember 2021. *Jurnal Pendidikan Teknologi Informasi Dan Komunikasi*, 1, 665–674.
- Widyastuti, E. N. (2022). Kesulitan Guru Matematika Kelas VIII Dalam Menerapkan Pembelajaran Tatap Muka Terbatas Era New Normal. 8(1), 201–208. <https://doi.org/10.31949/educatio.v8i1.1965>
- Yunus, M., Setyosari, P., Utaya, S., & Kuswandi, D. (2021). The influence of online project collaborative learning and achievement motivation on problem-solving ability. *European Journal of Educational Research*, 10(2), 813–823. <https://doi.org/10.12973/EU-JER.10.2.813>