

Effect of Online Learning On Mathematical Critical Thinking Skills of Grade VIII Junior High School Students

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ABSTRACT

This research aims to find out whether or not online learning affects the mathematical critical thinking skills of class VIII. The method used in this study is Pre-Experimental Designs with a quantitative approach, this research design uses a one-group pretest-posttest design. The subject of this study is a class VIII student at Madinatul Ulum Jombang Junior High School in the 2021/2022 school year. The instruments used in this study are tests and non-test. The data collection techniques in this research are test and Questionnaire test, and data analysis using t-test with the help of SPSS application version 16 for windows. The results of online learning on mathematical critical thinking skills obtained a - significance value of < 0.05 , namely a test significance value of $0.003 < 0.05$ and a Questionnaire significance value of $0.000 < 0.05$. This shows that there is an influence of online learning on the mathematical critical thinking skills of grade VIII students.

Keywords: *Online Learning; Mathematical critical thinking skills.*

INTRODUCTION

Indonesia is currently experiencing bad conditions due to a pandemic virus originating from China called Covid-19. the World Health Organization states that the virus is transmitted very quickly and can cause death. This virus attacks respiratory infections such as coughs and colds but is more deadly. Based on data from the task force Covid-19 stated as of August 8, 2021, Indonesia confirmed the number of positive cases 3,666,031 with the number of additions per 26,415 patients. As a result of the increase in Covid-19 cases in Indonesia since July 1, 2021, the president announced the PPKM (Restriction of Community Activities) policy. This policy is continuing until September 13, 2021, by lowering the level, from the emergency level to level 4 and although various indicators of pandemic management in Indonesia are improving, but tightening policies are still needed to prevent a rise in coronavirus cases in the future (Intan, 2021)

One of the policies of the government is to eliminate face-to-face learning replaced it with online learning. Online learning is a process to help learners to be able to learn well where the activity is connected through the internet network without meeting in person. But as a result of the government's policy of hammering online learning may be able to bring the influence felt by several elementary to secondary school students. One of them is about the ability to think critically of mathematical students in mathematics subjects. On the other hand, teachers also find it difficult to implement effective learning for students.

Though the ability to think critically is one of the mental activities that cannot be separated from human life (Nasrulloh & Umardiyah, 2020). This means that the ability to think critically has the same importance as the ability to read and write. Especially in the process of learning mathematics that predominantly adhered to thinking power, it is necessary to build thinking skills, especially the ability to think critically to be able to overcome problems that tend to be abstract (Syahbana, 2012)

Abdullah (2013) stated that mathematical critical thinking is a mental activity in the field of mathematics whose process uses the steps of the scientific method. As for indicators of achievement of the mathematical critical thinking ability of learners (Prihartini et al., 2016) : (1) Analyze and clarify problems (2) Identify and evaluate existing assumptions (3) Draft clarifications with valuable

considerations (4) Make explanations (5) Make conclusions.

Some research on the influence of online learning obtained positive results namely there is an influence, but research focusing on mathematical critical thinking skills has not been done.

Based on observations at Madinatul Ulum Jombang Junior High School in this time of emigrants, the online learning process that took place in the school delivered material through Whatsapp group (WA). But in its implementation, there are still some obstacles, such as the limitations of infrastructure facilities owned by students. being one of the factors that affect the effectiveness of online learning, encouraged also by the lazy attitude of some students also makes online learning less interested by teachers. Moreover, the lesson of mathematics has been known as a lesson that is less in demand by several students. It is possible that online learning can affect the mathematical thinking skills of Class VIII students.

Based on the above description, research needs to be done on the mathematical critical thinking skills of students of class VIII at the time of a pandemic like this. One of the things that can be done is to examine online learning practitioners to the mathematical critical thinking skills of grade VIII junior high school students.

METHOD

The approach used in this study is a quantitative approach with the type of experimental research and pre-experimental design designs because in addition to the ability to think critically as an independent variable there is still online learning is a dependent variable that can be influenced by external variables (Sugiyono, 2016). This form of research uses one-group pretest-posttest designs. This research was conducted at Madinatul Ulum Jombang Junior High School. This research was conducted in the odd semester of mathematics learning of the 2021/2022 school year which was indubitable to the material being taught, namely the coordinates of courtesies. The population of this study is all students of class VIII Madinatul Ulum Jombang Junior High School in the 2021/2022 school year which numbered 19 students. The sample used in this study was all students of class VIII Madinatul Ulum Jombang Junior High School, because the population is less than 30 then the sample used is the entire existing population. The data collection techniques used are tests and questionnaires. Instruments used are: tests to find out the mathematical critical thinking skills of students. And questionnaires to know the characteristics of students' mathematical critical thinking patterns in learning activities. The instrument that has been compiled is then carried out a validity test by 2 testers. The examiner is a lecturer as a material expert and a mathematics teacher as a media expert. Before carrying out the hypothesis test, there are prerequisite tests that must be done. The prerequisite test in this study is the normality test using Kolmogorov-Smirnov. The hypothesis tests used in this study used the T-test formula. There are two t-test formulas used, the first paired t-test sample for hypothesis test results test and one sample t-test for testing questionnaire results with the help of SPSS Version 16 For Windows.

RESULT AND DISCUSSION

Result

After the study, researchers obtained data results from two instruments that had been declared valid by two testers. The data is in the form of test results (pretest and posttest) and questionnaire results.

- **Student Pretest and Posttest Results**

This test is given to learners before and after treatment. Test results of learners' mathematical critical thinking skills before and after class VIII online learning can be seen in table 2.

Table 1. Student pretest and posttest results

Statistics	Pretest	Posttest
Average	71,05	85,78
Std. Deviation	25,362	12,295
Highest score	100	100
Lowest value	0	65
Amount of data	19	19

Based on Table 1 it can be known that the average posttest value is higher than the pretest. This can be interpreted that there is an increase in students' mathematical critical thinking skills due to the

application of online learning.

- Student Questionnaire results

Result calculation of the percentage of mathematical critical thinking skills of learners is presented in table 2.

Table 2. Results of Students' Mathematical Critical Thinking Skills

No.	Value Interval	Category	N	F	Percentage
1	32 – 40	Good	19	19	100 %
2	23 – 31	Enough		0	0 %
3	14 – 22	Less		0	0 %
4	5 – 13	Bad		0	0 %
Sum			19	19	100 %

Based on Table 2 it can be known that the percentage of the ability to think mathematically critically of learners is 100%. Then the results of the percentage must be consulted with the following percentage achievements.

Table 3. Categorization of Mathematical Critical Thinking Ability Data

Percentage Score	Category
$80,00\% \leq P \leq 100\%$	High
$60,00\% \leq P \leq 79,99\%$	Keep
$40,00\% \leq P \leq 59,99\%$	Less
$20,00\% \leq P \leq 39,99\%$	Low
$0\% \leq P \leq 19,99\%$	Very Low

Based on the results of the percentage obtained that is 100%, the percentage is found at intervals. Which means high. Then it can be interpreted that the value of mathematical critical thinking skills of learners in the group is relatively high.

- Prerequisite test

This sample prerequisite test is done using test results data and questionnaire results. This prerequisite test is a normality test that uses Kolmogorov Smirnov. The results of the data normality test are presented in table 4 and table 5.

Table 4. Pretest and Posttest Normality Testing Results

One-Sample Kolmogorov-Smirnov Test		
		Pretest Posttest
N		19
Normal Parameters	Mean	.0000000
	Std. Deviation	8.37607411
Most Extreme Differences	Absolute	,254
	Positive	,193
	Negative	-,254
Kolmogorov-Smirnov Z		1,109
Asymp. Sig. (2-tailed)		,171

Based on table 4 shows that the significance value of the Kolmogorov Smirnov test from pretest and posttest of $0.171 > 0.05$ significance level is greater than 0.05 so it can be concluded that the data on the mathematical critical thinking ability of learners is a normal distribution.

Table 5. Questionnaire Normality Testing Results

One-Sample Kolmogorov-Smirnov Test	
Questionnaire Result	
N	19

Normal Parameters	Mean	34,6842
	Std. Deviation	1,85750
Most Extreme Differences	Absolute	,186
	Positive	,186
	Negative	-,146
Kolmogorov-Smirnov Z		,811
Asymp. Sig. (2-tailed)		,526

Based on table 5 shows that the significance value of the Kolmogorov Smirnov test at the questionnaire of $0.526 > 0.05$ significance level is greater than 0.05 so that it can be concluded that the data of the learning learner's mathematical Critical Thinking ability is a normal distribution.

- Hypothesis testing

The hypothesis tests used in this study used the T-test formula. There are two t-tests formulas used, first paired t-test samples for hypothesis test results testing and one sample t-test for testing questionnaire results. The results of the hypothesis test are presented in table 6 and table 7.

Table 6. The Hypothesis of Test Results (Pretest and Posttest)

Paired Sample t-test								
	Paired Difference					T	Df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error mean	95% Confidence Interval Of Difference				
				lower	upper			
Hasil Tes	-1,473	18,38	4,216	-23,596	-5,877	-3,495	18	.003

Based on the table above shows that the value t calculates -3,870 with a significance of 0.003. The signification value shows $0.003 < 0.05$, so it can be interpreted that there is a significant influence of online learning on the ability to think mathematically class VIII junior high school.

Table 7. Hypothesis Questionnaire results

One-Sample Test						
	Test Value = 0					
	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	upper
Questionnaire Result	81,392	18	,000	34.68421	33,788	35,579

Based on the table above indicates that the value t calculates 84,392 with a significance of 0.000. The significant value indicates $0.000 < 0.05$, so it can be interpreted that there is a significant influence of online learning on the ability of mathematical critical thinking class VIII junior high school.

Discussion

This research aims to find out whether or not online learning influences the mathematical critical thinking skills of grade VIII junior high school students. Online learning is applied to research objects that have previously been given about pretest. This research activity was carried out on August 27, 2021, at Madinatul Ulum Jombang Junior High School class VIII on the material position of points and lines on the coordinates of Cartesius. This study was conducted in 3 meetings. The first meeting of researchers gave tests to students online through Whatsapp groups to find out students' mathematical critical thinking skills. The next meeting of students is given treatment, researchers explain how to solve a mathematical problem with the procedure of mathematical critical thinking indicators through video learning and worksheet completion. In this case, students are pressured to actively ask questions even though learning is carried out online. The data outlined in the data of test results and student questionnaires. The data presented is a test of students' mathematical critical thinking skills conducted before and after treatment.

While the data questionnaire the ability to think critically mathematically students are done after being given treatment. Based on the data, it can be known that the average posttest score is 85.78 higher than the pretest score of 71.05 meaning that the student's test score has increased. As for the results of the student questionnaire percentage obtained was 100% which means that the ability of students in mathematical critical thinking is relatively good.

The instruments used in this study are tests and questionnaires. Both instruments are used as a measuring tool regarding students' mathematical critical thinking skills, the instruments in this study were validated by two examiners, one lecturer, and one math teacher. This study was conducted at Madinatul Ulum Junior High School in class VIII.

The study used a group of experiments given online learning treatment. As a result of the pretest, the minimum score obtained by students is 0, while at the time of the minimum posttest obtained by students is 65. Furthermore, the maximum value of pretest and posttest is equally 100. Based on observations, the students showed a mathematical and precise posttest solution step in each problem, it can be said that students have been able to use mathematical critical thinking patterns when students solve problems. This is different from the pretest settlement where there are still many students who only include answers but there is no settlement process.

Completion by using this critical thinking pattern can train the student's brain to be able to think critically in daily activities because the ability to think critically cannot be separated from human life today, this is in line with the opinion (Nasrulloh & Umaradiyah, 2020) which states that critical thinking skills are one of the mental activities that cannot be separated from human life.

In measuring the ability to think mathematically, researchers also use questionnaires as research instruments where in this questionnaire there is a question about how students think about the ability to think critically mathematically that they have done. The results of the questionnaire that has been given to students, overall all students get a grade between 32 to 40 which is the maximum value in the questionnaire. It falls into the category of good, in other words, 100% of students in the class can think critically mathematically well. Where this percentage is included in table 3 then we can know that the level of critical thinking contained in the group is relatively high.

In the study of the test hypothesis, the results showed that there was an influence of online learning on the critical thinking skills of grade VIII students. It can be seen that the significance value of $0.003 < 0.05$, as is the case with the hypothesis testing of the questionnaire. It can be seen that the significance value of $0.00 < 0.05$. It can then be interpreted that H_0 is rejected and H_a is accepted which means there is an influence of online learning on students' critical thinking skills.

The results of this study are in line with research conducted by Miftahul Jannah et al (2021) which prove that there is an influence of online learning on students' abilities, this is shown by differences in grades. The posttest average value of 86.85 is higher than the pretest average value of 50.40. Similarly, proposed by Egidius Dewa et al (2020) who stated that virtual laboratories have advantages that can make learners more interested in learning the material. The intended virtual laboratory is a medium used in learning such as video learning.

CONCLUSIONS

Based on the data analysis and discussion above can be concluded that the application of online learning in students of class VIII Junior High School Madinatul Ulum Jombang can affect the ability to think critically mathematically students. The results of calculations using Paired sample T-test on test results and One-sample t-test on questionnaire results show that sig. (2-tailed) is $0.003 < 0.05$ for the test's significant value and $0.00 < 0.05$ for the significance value of the questionnaire result. Thus it can be concluded that H_0 is rejected and H_a is accepted that there is an influence of online learning on the mathematical critical thinking skills of students of grade VIII junior high school.

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