THE EFFECTIVENESS OF USING DESMOS GRAPH CALCULATOR APPLICATION IN FUNCTIONAL MATERIALS

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ABSTRAK

Pembelajaran matematika dianggap sulit karena adanya kesinambungan konsep, matematika yang bersifat abstrak, serta kurang maksimal media pembelajaran untuk menjadi perantara dalam pembelajaran. Aplikasi kalkulator grafik Desmos merupakan aplikasi yang dapat diunduh di playstore dengan gratis dan memiliki beban memori yang kecil sehingga cocok untuk media pembelajaran dalam smartphone siswa. Materi fungsi kelas X mata pelajaran matematika wajib terdapat sub materi tentang grafik fungsi. Tujuan penelitian untuk mengetahui keefektifan aplikasi kalkulator grafik desmos dalam materi fungsi di MA Salafiyah Yapensa Jenggot. Metode penelitian menggunakan metode kuantitatif dengan sumber data primer hasil instrument pretest dan postest. Lalu analisis data menggunakan uji normalitas data dan Wilcoxon Signed Rank Test. Hasil dari analisis data menunjukkan bahwa terdapat perbedaan nilai sebelum menggunakan aplikasi kalkulator grafik desmos dan sesudah menggunakan aplikasi kalkulator grafik desmos. Kemudian setelah dibandingkan antara mean pretest dan postest terdapat perbedaan yang cukup signifikan yakni antara 53,39 banding 81,57. Oleh karena itu, aplikasi kalkulator grafik Desmos efektif sebagai media pembelajaran.

Kata kunci *:* **Aplikasi Matematika, Media Pembelajaran, dan Fungsi.**

ABSTRACT

Learning mathematics is considered difficult because of the continuity of concepts, abstract mathematics, and the lack of maximum learning media to become intermediaries in learning. The Desmos graphing calculator application is an application that can be downloaded on the Playstore for free and has a small memory load making it suitable for learning media on student smartphones. The material for the function of class X mathematics subjects must have sub-materials about function graphs. The purpose of the study was to determine the

effectiveness of the Desmos graphing calculator application in the function of the MA Salafiyah Yapensa Jenggot. The research method uses quantitative methods with primary data sources from the results of the pretest and posttest instruments. Then the data analysis used the data normality test and the Wilcoxon Signed Rank Test. The results of the data analysis show that there are differences in values before using the Desmos graphing calculator application and after using the Desmos graphing calculator application. Then after being compared between the mean pretest and posttest, there is a significant difference between 53.39 and 81.57. Therefore, the Desmos graphing calculator application is effective as a learning medium.

Keywords: Mathematics Applications, Learning Media, and Functions.

INTRODUCTION

Learning mathematics is often called difficult by students. According to Amir (2016: 35) this is because mathematics has a relationship between concepts so that if students are left behind in one concept, they will find it difficult to understand the next material. Students often find it difficult to calculate quickly, analyze logic, write, draw and feel lazy to re-learn math material. So there is a need for new, more innovative nuances to attract students' interest in learning mathematics.

According to Zayyadi et al (2017:26) learning media is needed in learning so that students can receive optimal learning. The many types of learning media are adapted to their functions and objectives in learning. Technological developments are an important point in this regard. Making the choice of learning media more diverse. In this case, the media in mathematics learning, with the existence of learning media in mathematics, is expected to make it easier for students to accept the concept of the material and more easily understand the mathematical material presented.

One of the reasons why mathematics is considered difficult is the nature of the abstraction of mathematics. Mathematics is the mother of all sciences, so that sometimes in many ways it still seems abstraction of mathematics because the integration of science is not easy to understand. Not only students, teachers sometimes experience problems in teaching mathematics (Holisin, 2016: 2). This is due to the lack of strength of students in understanding the concept of mathematical material. Mathematics learning still relies on memorization with conventional strategies that still use the teacher center , so that it does not bring out students' creativity in learning mathematics. Learning mathematics through media is needed so that mathematics learning becomes more concrete. Mustaqim (2016:174) explains that learning media is an intermediary tool for teachers and students. So that the learning media becomes a liaison and distributes information to students. Learning media can also be part of students to

map things that are real into things that are abstract.

Mathematics is taught from elementary to intermediate level and above with some differences. The first difference is the difference in the presentation pattern. Beginning in childhood, mathematics is still informal with clapping and singing until elementary school which becomes the basic concept of understanding, continuing to the next level of education. Then the second difference is the limitation or what is then known as various forms of simplification of the material by adjusting the level of education (Rahmah, 2013: 4). After that the last difference is between real thinking and mathematical abstraction. Well, as elementary school children say every time they study, they must always look at things that can be touched, seen with the naked eye. Then the more children are required to be able to understand abstract material, for example diagonal lines in the room . This is where the role of the learning media. To help the process of mathematical constructivism easier. So that children are able to understand the material better and optimally in accordance with the objectives and learning targets. This is in line with Awaludin et al (2019: 67) who stated that learning media can increase children's interest in learning.

Al Faruqi (2019: 67) explains that in an industrial era that continues to develop, various kinds of technology have also developed. The development of this technology adapts to human needs and interests. For example, sophisticated devices are now more needed because they can make video calls than old devices that can only exchange messages and calls. Then computers are needed to simplify human work in terms of typing, design, counting and so on. This means that all the technology that is currently developing is the result of making human work easier.

Unfortunately, not everyone understands this. Many people do not understand that there is a simpler way to solve problems using the technology they have. Most of today's technology used is limited to certain applications or fields. According to Mokalu et al (2016: 8) parents who are only the head of the family sometimes do not understand about the many uses of smartphones. Applications that are often opened are still limited to communication and entertainment applications.

Not to mention the problematic if today's technology or gadgets are misused a lot. As a result, the development and growth of students can be disrupted. Students' focus is easily reduced when studying. This was stated by Subarkah (2019:128) because gadgets have radiation rays that are not good for children's development. Until it is necessary to shape the mental health of students in dealing with technology itself. This is very unfortunate. Given the main purpose of technology is to help human work. Children are more familiar with tiktok and youtube as a refreshing medium rather than as a medium for seeking new knowledge. This makes the use of the device is certainly less than optimal. (Kusumawati, 2020:90)

The need for education on how to use the right technology and introduction to various technologies that can make work more effective.

So that children in particular and the general public become smart in the use of technology. According to Karina et al (2021:227) after training or socialization to children. Children tend to feel satisfied and happy when introduced to unfamiliar technologies. So they are also aware of other applications besides the ones they have been using. This can reduce the negative level of technology for children. Smartphones, gadgets, tablets, PC computers and other types of technology can support the quality and development of education when used optimally (Budiman, 2017: 33). Effective and efficient use can make students understand the material better. Applications that can be used include social media, youtube, email, powerpoint, and other supporting applications.

The benefits of technology as a true learning medium have been continuously developed and updated from the beginning. Bastian (2015:57) explains that various kinds of industries compete with each other to provide the best for the community, both commercially and non-commercially. This can be used as a means to continue to use technology, especially applications that are useful as learning media. Therefore, now there are many applications that can be downloaded for free on the Playstore. However, students have not used these applications due to ignorance and also because of limited information on how to operate. So it requires direct introduction to students.

One application that can be used is the Desmos graphing calculator application. This application has been tested to be used as a learning medium for class X function material in compulsory mathematics subjects. The purpose of this study was to determine the effectiveness of the Desmos calculator application as a learning medium for compulsory mathematics subjects for class X functions. This research was conducted at Madrasah Aliyah Salafiyah Yapensa Jenggot located in Pekalongan City by involving two classes, namely class X MIPA and class X IPS. . The involvement of these two classes became the sample in order to strengthen the validity of the research results. And to find out the views of the MIPA class and the IPS class.

DISCUSSION

This type of research is a case study which is a study of a particular case or object (Mundir, 2013:6). Then case study research according to Hardani et al is research on a case. A case is not always based on problems, such as obstacles and so on, but a case can also be due to the superiority of the object of research (Hardini et al, 2020:64). And in this study, the case that became the center of attention was the effectiveness of using the Desmos graphing calculator application in the function material.

The type of research used in this research is quantitative method. Then the data used is the type of primary data or data taken directly from the field. The source of the data is the data on students' scores in working on the pretest and posttest instruments and then also comes from the results of interviews with students. The time of the research was carried out from October to November 2021. The method of data collection was by giving pretest

instruments to students, then posttest instruments and interviews with several students.

Data derived from the results of student instrument scores were then tested by testing for normality using the SPSS 26 application, calculated using the manual method and using the data analysis submenu. Then the data is continued to find out the comparison of differences using the T Paired Test if the data is normally distributed data. However, if the data is not normally distributed, the next test will use the Wicoxon Signed Rank Test using the SPSS 26 application.

After that, if it is proven that the data does have a significant difference. Then proceed with the statistical comparison of descriptive data. The results of the analysis are then presented in tables of results from the analysis using the SPSS 26 application to make it easier for readers to understand.

This study involved students of class X both in the Mathematics and Natural Sciences class and in the Social Sciences class in Compulsory Mathematics. The students started working on the pretest questions, namely the function graph instrument after studying the function graph material first. Then after that, students get a posttest instrument by using the media aid of the Desmos graphing calculator application.

With a total of 51 students. The data was then tested using the normality test to find out whether it was normal data or not. Testing using the SPSS 26 application.

Table 1. Tests of Normality

	Kolmogorov-Smirnov [a]			Shapiro-Wilk		
	Statistics	df	Sig.	Statistics	df	Sig.
pretest	.065	51	.200 *	.981	51	.600
posttest	.323	51	.000	.772	51	.000

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

H_0 : Data normally distributed

H_a : Data is not normally distributed

Ghozali stated that the data can be declared normally distributed if the probability of significance (as seen from the *Asymp. Sig* 2-tailed value) is greater than the value (in this study using a value of or equal to and vice versa (Ghozali, 2021:33). The probability of significance in the pretest using the Kolmogorov-Smirnov test is 0.2 which indicates greater than 0.05. Meanwhile, the posttest using the Kolmogorov-Smirnov is at 0.00 so it is less than 0.05. This indicates that the data looks normal. but in the posttest data section the data looks abnormal.

Based on this, the test cannot be continued using the *paired t test* or paired t test because there are data that are not normally distributed. So it is continued with testing using the *Wilcoxon Signed Rank Test* . This test aims to assess whether there is a significant difference between the pretest and posttest data.

The first stage is the formulation of the hypothesis. The following is the formulation of the hypothesis,

H0 : X = Y : There is no difference in values before using the Desmos graphing calculator application and after using the Desmos graphing calculator application.

H1 : X μY : There is a difference in values before using the Desmos graphing calculator application and after using the Desmos graphing calculator application.

Then the *Wicoxon Signed Rank Test* continued using the SPSS 26 application. The results can be seen in table 2 and table 3.

Table 2. Ranks

		N	Mean Rank	Sum of Ranks
posttest - pretest	Negative Ranks	2 [a]	11.00	22.00
	Positive Ranks	49 [b]	26.61	1304.00
	Ties	0 [c]		
	Total	51		

a. posttest < pretest

b. posttest > pretest

c. posttest = pretest

Table 3. Test Statistics [a]

	posttest - pretest
Z	-6.009 [b]
asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

The following are the rules for making decisions on hypotheses.

the two-tailed significance probability p value, H_1 is accepted and H_0 rejected.

the two-tailed significance probability > p value, H_0 is accepted and H_1 is rejected.

Based on table 3 regarding the Wilcoxon test results, because the significance probability is 0.00, it is smaller than the p value with a value of = 5% or 0.05, then H_1 is accepted and H_0 is rejected or there is a difference in value before using the Desmos graphing calculator application and after using the desmos graphing calculator application or it can be expressed as X Y. It can be concluded that there is a significant difference between the pretest and posttest.

In addition, by looking at table 2. It shows *negative ranks* 2, *positive ranks* 49, and *ties* 0. *Negative ranks* is the number of students who have decreased in value from pretest to posttest. While the *positive ranks* are the number of students who have increased in value from *pretest* to *posttest* . And *ties* is the number of

students who have the same *pretest* and *posttest scores.* Therefore, it can be seen that the number of students who experienced an increase in grades was much more than those who experienced a decrease.

Table 4. Descriptives

			Statistic	Std. Error
Pretest	Mean		53.3922	2.11643
	95% Confidence Interval for Mean	Lower Bound	49.1412	
		Upper Bound	57.6431	
	5% Trimmed Mean		53.1209	
	Median		54.0000	
	Variance		228.443	
	Std. Deviation		15.11434	
	Minimum		24.00	
	Maximum		92.00	
	Range		68.00	
	Interquartile Range		24.00	
	Skewness		.133	.333
	Kurtosis		-.424	.656
Posttest	Mean		81.5686	.54034
	95% Confidence Interval for Mean	Lower Bound	80.4833	
		Upper Bound	82.6539	
	5% Trimmed Mean		81.7429	
	Median		85.0000	
	Variance		14.890	
	Std. Deviation		3.85878	
	Minimum		75.00	
	Maximum		85.00	
	Range		10.00	
	Interquartile Range		7.00	
	Skewness		-.540	.333
	Kurtosis		-1.217	.656

Then, if we look at table 4 which shows the mean or average of the two data, it will appear that the average value of the pretest is 53.39 while the average value of the posttest data is 81.57. From these two comparisons, it is clear that the posttest score is much better than the pretest score.

Novi Haerunnisa et al researched the Desmos application. The result of the research is that the student learning outcomes averaged 61.16 for the experimental class,

higher than the control class at 48.41. In the normality test and homogeneity test, it is known that the experimental class and control class are normally distributed and homogeneous. After the t-test was carried out, the value of > (2.09339 > 2.074 then 0 was rejected and was accepted so that it can be said that Desmos application assisted learning is effective on student learning outcomes in linear program material for class XI TKJ SMK Negeri 1 Labuapi .

In addition, when students are asked questions. Some students admitted that they had difficulties in operating the Desmos graphing calculator application at the beginning. However, after understanding the correct steps, students were happy to be able to solve function and function graph problems using the Desmos graphing calculator application. Because it feels faster and simpler.

CONCLUSION

Based on the tests that have been carried out, the Desmos graphing calculator application is effectively used as a learning medium for class X students in the compulsory mathematics subject matter of functions. Applications that use android as a means of operation show evidence that technology can help improve understanding of mathematical and educational concepts.

Based on the results obtained from the research, it can be concluded that the use of application-based learning media is able to improve students' understanding of mathematics. So it is hoped that this will increase the enthusiasm of educators in continuing to innovate and take advantage of technology that has developed to further advance education.

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