

The Impact of Geogebra Classic Application on Learning Geometry

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Submission date: 18-Jan-2020 02:46PM (UTC+0700)

Submission ID: 1243374921

File name: JURNAL_9.pdf (548.45K)

Word count: 1981

Character count: 10697

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To cite this article: D Triwahyuningtyas *et al* 2019 *J. Phys.: Conf. Ser.* **1381** 012033

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The impact of geogebra classic application on learning geometry

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Abstract

This study aimed to identify the impact of Geogebra Classic application towards geometry learning outcome of fifth graders. The method employed was experimental research using Non-equivalent Control Group Design. Serving as the subjects of this study were students of fifth grade in an elementary school in Malang, Indonesia. The data were required through statistical tests and analyses through SPSS 21.0 for Windows. The results of the study showed that the average difference of the score of fifth graders after having treatment of using the application were 66.4 for the pre-test and 81.2 for the post-test. In the meantime, the t-test on the study revealed that the value was $0.002 < 0.05$ meaning that the hypothesis was accepted. This indicated that there is an impact of the use of Geogebra Classic application on geometry learning outcome of the fifth graders. Therefore, it can be concluded that Geogebra Classic application was able to help students understand geometry-related learning materials.

6 Introduction

Geogebra is a software combining geometry, algebra, and calculus possibly representing a variety of mathematical things [1–3]. On Geogebra, such things as points, vectors, and lines of a cone, for instance, can be displayed in a dynamic graphical representation [4,5]. This characteristic enables various mathematical concepts to move back and forth [6]. The software also offers several interactive alternative applications for teaching mathematics [4].

There have been several studies discussing Geogebra software in learning mathematics. It has also been proven that the software is a good learning medium for effective learning [7]. In addition, it has been also found that Geogebra is able to help students understand basic concepts and contents of mathematics [8,9]. Geogebra has been proven effective in developing interactive learning texts (eBooks) with the most advanced technology [10] and integral topics [11]. In middle schools, Geogebra has been identified to be influential towards learning mathematics [12]. However, there is limited number of studies proving that Geogebra is effectively used in learning mathematics in elementary schools.

In elementary schools, introduction to geometry usually starts with the characteristics of the important concepts and parts of a certain region of space [13]. A region of space consists of a couple of points, lines, and planes or surfaces [14]. Integrating Geogebra will possible encourage students to reflect how to find the parts of geometry [15]. Geogebra is also able to help students investigate and represent geometry [16]. This study focuses on identifying the impact of the use of Geogebra Classic application towards geometry learning outcome of fifth graders. This is due to the fact that elementary school students still have difficulties in manually determining the parts of geometry.

2. Method

The study was conducted in an experimental method by collecting quantitative data using statistical analyses [17]. The subjects were 50 fifth graders in an elementary school in Malang, Indonesia, which were divided into two groups namely experimental and control groups. The experimental group received a treatment which was the use of Geogebra Classic application during learning sessions while the control group used Microsoft Power Point during the learning session. Thus, the research design used in this study was Nonequivalent Control Group Design in an attempt to find out the impact of the application on geometry learning outcome.

To collect the data needed, this study used a test as its research instrument. The type of test used was an achievement test where it investigated the learning outcome by comparing the results of pre-test and those of post-test. The pre-test was administered to show students' initial knowledge and ability and the post-test aimed to identify the results after they had received the treatment. The data collected were then analyzed through statistical analyses using SPSS 21.0 for Windows.

Geogebra Classic

Geogebra Classic is used as a presentation media to illustrate various mathematical concepts [9]. Geogebra Classic provides a variety of mechanisms for learning mathematics that are taught and studied in class [1]. In elementary school students Geogebra Classic is presented in the form of videos. In this study, the Geogebra Classic application was implemented on learning a cube, a beam, and a triangular prism. Figure 1 shows how the application works on explaining a cube.

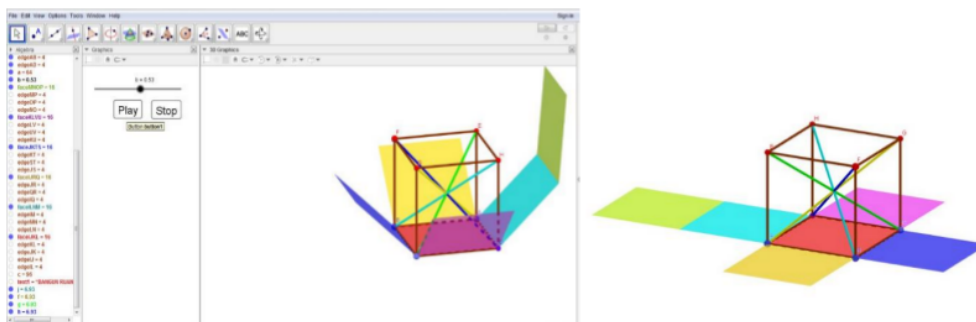


Figure 1. How a cube is formed using Geogebra Classic application

The fifth graders did not directly learn how to build a cube using Geogebra Classic, yet they had to identify how the cube is formed using the application. Presentation in the form of slow motion video displays the parts of the building that includes: vertex, ribs and diagonal space. So that through the Geogebra Classic application, students can describe the built webs of geometry.

3. Results and Discussion

The results of the study showed that the learning outcome of the experimental group was lower in the pre-test (66.4) in comparison with that of the control group (72.4). However, in the post-test, the experimental group outperformed the control group in terms of the learning outcome average score (81.2 for the experimental group and 78.4 for the control group). In the meantime, the results of the data normality distribution test of both the pre-test and post-test showed significant average (0.085) meaning that the data were normally distributed (> 0.05). The results of the data homogeneity test on both the pre-test and post-test also showed significant average (0.275) indicating that the data were homogeneous (> 0.05). To find out how influential the treatment on both the groups, this study analyzed the results of the data distribution normality and data homogeneity tests using an independent sample t-test using SPSS 21.0 for Windows. The results are shown in Table 1.

Table 1. The results of hypothesis test using SPSS 21.0

		Independent Samples Test					
		Levene's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference
Pretest Posttest	Equal variances assumed	2,165	,148	-3,304	48	,002	-14,80000
	Equal variances not assumed			-3,304	45,682	,002	-14,80000

The results of the hypothesis test on Table 1 indicates that the significance of Levene's Test for Equality of Variances is $0.148 > 0.05$ meaning that the variance between the pre-test and the post-test were homogeneous or similar. The significance value of the 2-tailed test also implied that the hypothesis is accepted ($0.002 < 0.05$). Decision making in the translation of the Independent Samples hypothesis test can be concluded that the hypothesis is accepted. This means that the use of Geogebra Classic application has a significant impact on learning geometry for fifth graders in Malang, Indonesia. Based on the data analysis, Geogebra Classic encourages students to reflect on how a region of space is formed [15] and to thoroughly analyze a series of processes of forming a certain geometrical space [18] through an exploration phase [19]. The application also proves that learning geometry is fun [20].

4. Conclusion

Geogebra Classic was applicable in learning mathematics, particularly in learning geometry. The use of the application is also able to help students find the concepts of how a certain geometrical space is form. Based on the results of the Independent Samples t test or the average 2 difference test used to test two averages on two independent data groups using SPSS 21.0 For Windows, it was found that the use of Geogebra Classic application was influential towards fifth graders' learning outcome on geometry so that it is suggested that teachers use the application on learning geometry.

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