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The Effect of the Group Investigation Model by Geogebra-Assisted on Student Learning Outcomes in Elementary Algebra Courses

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ABSTRACT

This research was conducted with the aim of finding out the effect of the Group Investigation learning model with Geogebra tools on the learning outcomes of elementary algebra students in the Bachelor of Mathematics Education study program at Bengkulu University. The type of research carried out was quasi experimental research with a pre-test post-test control group design. The research sample was students from the Bachelor of Mathematics Education study program at Bengkulu University, semester 1A with a total of 29 students and semester 1B with a total of 29 students. Semester 1A students applied the Group Investigation model assisted by Geogebra and semester 1B students applied the conventional method. The data was analyzed statistically descriptively and inferentially using t-test and obtained a value of $p-value$ or sig<0.05, namely 0.00<0.05, so it can be concluded that the use of the Group Investigation learning model assisted by Geogebra has affected student learning outcomes. Bengkulu University's Bachelor of Mathematics Education study program is effectively applied to elementary algebra learning in class and has an effect in improving student learning outcomes.

Keywords: geogebra, group investigation, learning outcomes, quasi experiment

INTRODUCTION

The Elementary Algebra course is a compulsory course offered in the FKIP UNIB Mathematics Education Undergraduate Study Program with a weight of 2 credits. This course aims to enable students to be able to solve problems related to quadratic equations and quadratic functions, and to be able to construct graphs. Hernawati revealed that students still make many facts and principle errors in Elementary Algebra courses[1]. Apart from that, in previous Elementary Algebra lessons, students experienced many difficulties in determining the roots of solutions to equations and quadratic functions, as well as difficulties in drawing graphs of quadratic functions. Then the learning outcomes of students from the class of 2022 in Elementary Algebra learning were previously still low, namely only getting an average score of 54.3. This is clearly a problem that must be resolved as early as possible.

Lecturers as facilitators in lectures must be able to facilitate students so that they can obtain the expected abilities. This ability will be maximized through activities that are centered on the students themselves. In the Minister of Education and Culture Regulation No. 3 of 2020, the characteristics of the learning process are regulated, which consist of interactive, holistic, integrative, scientific, contextual, thematic, effective, collaborative and student-centered nature. Lecturers should be able to design learning that meets these characteristics. One of the learning models that can be used is Group Investigation.

Shoimin revealed that Group Investigation is a form of cooperative learning model

which is based on the participation and activities of students to search for information on the material to be studied through the available materials[2]. The Group Investigation type cooperative learning model can create an active learning process, because students will learn more through the process of creation, working in groups, sharing knowledge and taking responsibility for the tasks given by the teacher. Slavin describes several steps in Group Investigation type cooperative learning, namely: 1) Identifying the Topic and Organizing Students into Groups; 2) Planning the Tasks to be Learned; 3) Carrying out Investigation; 4) Prepare Final Report; 5) Present the Final Report; and 6) Evaluation[3].

Group Investigation is very suitable for Elementary Algebra courses. To support lectures with this model, lecturers can use the Geogebra application. Geogebra can be used as a mathematics learning medium to demonstrate or visualize mathematical concepts and as a tool to construct mathematical concepts[4]. Geogebra is free, dynamic multiform math software for all educational levels that combines geometry, algebra, tables, graphs, statistics and calculus in one easy-to-use package. Some of Geogebra's advantages include: 1) graphs, algebra and tables are connected and very dynamic; 2) Easy to use but lots of advanced features, 3) authoring tool (modification tool) to create interactive learning materials as web pages; 4) available in many languages to our millions of users worldwide; and 5) Open source software that is freely available for non-commercial users[4]

Based on this, it can be stated that the formulation of the problem in this research is whether there is an influence of the Group Investigation learning model assisted by Geogebra on student learning outcomes in the Elementary Algebra course.

MATERIALS & METHODS

This type of research is Quasi Experimental, which is a type of experiment with the main characteristic of not using random assignment, but using existing groups, namely ordinary classes. This method is often used to assess the impact or cause-and-effect relationship between certain variables without using full randomization as in a true experiment. Using a pretest-posttest control group design research design.

As explained by Sugiyono, this experimental design is an extension of an experimental design which is actually difficult to carry out[5]. Although this design includes a control group, it is unable to fully control external variables that influence the conduct of the experiment.

The pretest-posttest control group design approach compares two groups, the first group will apply the Group Investigation method supported by the Geogebra device as the experimental group, while the second group will use the usual learning method without the use of Geogebra as the control group. The control group is selected non-equivalently because there is no randomization, by looking for a group that is comparable to the treatment group in baseline characteristics or conditions.

Before providing treatment, a pre-test was carried out to measure the initial learning outcomes of the two groups. After that, the experimental group will receive treatment in the form of applying the Group Investigation method assisted by Geogebra in learning, while the control group will continue learning using conventional methods without using Geogebra, namely the lecture learning method.

After treatment, a posttest was carried out on both groups to measure final learning outcomes. The differences between learning outcomes in the pre-test and post-test in the two groups will be analyzed to assess the effect of using the Group Investigation method assisted by Geogebra on student learning outcomes.

The subjects of this research consisted of students from the Bachelor of Mathematics Education study program at Bengkulu University, semester 1A with a total of 29

students and semester 1B with a total of 29 students. Semester 1A students applied the Group Investigation model assisted by Geogebra as the experimental class and semester 1B students applied the conventional method as the control class.
The data analysis technique used is inferential statistical techniques by using SPSS, namely prerequisite tests which include normality tests and homogeneity tests. After that, a t test was carried out to test the hypothesis taken, that is t-test.

RESULT

A. Description of Assessment Results

This research was carried out at Bengkulu University with the aim of finding out the significant influence of the Geogebra-assisted Group Investigation model on student learning outcomes in the Elementary Algebra course. This research involved two research groups, namely the experimental class and the control class. The experimental class uses the Group Investigation learning model with the help of Geogebra and the control class uses the conventional learning model. This research method is a Quasi Experimental research method. This research data consists of an initial test (pre-test) and a final test (post-test) and the researcher obtained data from the results of the initial test (pre-test) and final test (post-test) carried out on the experimental class and control class. The results data obtained can be seen in the following table:
The recapitulation of the pre-test and post-test results in this research can be seen in the following table:

Table 1. Descriptive of students' pre-test and post-test result

Description	***Pre-test* Conventional**	***Pre-test Group Investigation***	***Post-test* Conventional**	***Post-test Group Investigation***
Number of Students	29	29	29	29
Mean	22.76	23.8	60.87	71.9
Median	25	25	60	70
The highest score	40	45	80	90
The Lowest Scroe	10	10	40	50
Standard Deviation	1.6	9.87	11.8	10.56
Variance	74.26	97.6	139.4	111.45
Skewness	0.22	0.18	-0.256	-0.27

Based on table 1, it can be seen that there was an increase in student learning outcomes before and after being given learning using the Group Investigation model.

B. Test prerequisites

1. Pre-test normality test for the experimental class and control class

Normality test results for the initial test (pre-test) using the SPSS application on experimental class data (Group Investigation learning model assisted by the GeoGebra application) and control class (conventional model) with a sample size of 29 students each, the results obtained are as in table 2.

Table 2. Pre-test Normality Test Results

	Experimental Class	**Control Class**
Value of sig.	0,200	0,200

From the table above, the sig value is obtained. the experimental class and control class is 0.200 > 0.05. So both classes have a normal distribution.

2. Test the homogeneity of the pre-test for the experimental class and the control class

The results of the homogeneity test for the initial test (pre-test) using the SPSS application on experimental class data (Group Investigation learning model assisted by the GeoGebra application) and control class (conventional model), obtained results as in table 3.

Table 3. Pre-test Homogeneity Test Results

		Levene Statistic	df1	df2	Sig.
Value	Based on Mean	0,695	1	56	0,408

From the table above, the sig value is obtained. = 0.408 > 0.05. So the two groups/classes are homogeneous. Based on the results of the normality and homogeneity tests, the two classes can be used for research.

3. Post-test normality test for the experimental class and control class

Normality test results for the final test (post-test) using the SPSS application on experimental class data (Group Investigation learning model assisted by the GeoGebra application) and control class (conventional model) with a sample size of 29 students each, the results obtained are as in table 4.

Table 4. Post-test Normality Test Results

	Experimental Class	Control Class
Value of sig.	0,062	0,200

From the table above, the sig value is obtained. experimental class and control class more than 0.05. So both classes have a normal distribution.

4. Post-test homogeneity test of the experimental class and control class

The results of the homogeneity test for the initial test (post-test) using the SPSS application on experimental class data (Group Investigation learning model assisted by the GeoGebra application) and control class (conventional model), obtained results as in table 5.

Table 5. Post-test Homogeneity Test Results

		Levene Statistic	df1	df2	Sig.
Value	Based on Mean	0,136	1	56	0,713

From the table above, the sig value is obtained. = 0.713 > 0.05. So the two groups/classes are homogeneous.

5. t-test

It is known that the two experimental classes and the control class are normally distributed and have the same or homogeneous variance, so hypothesis testing can be continued using the t test statistic.

Hypothesis:

H0 : $\mu_1 = \mu_0$

H1 : $\mu_1 > \mu_0$

Where:

μ_1 is the average student learning outcome of the Geogebra-assisted Group Investigation model

μ_0 is the average student learning outcome in the conventional model

Table 6. t test results

t-test for Equality of Means		
t	df	Sig.
3,752	56	0,000

Based on the results of the t test in table 6, the t_count =3.752 is obtained and we know the t_table =2.668. In accordance with the hypothesis testing criteria, because t_count > t_table then H0 is rejected and H1 is accepted. Which means it is true that learning using the Group Investigation method with the help of the Geogebra application can influence the Elementary Algebra learning outcomes of Bengkulu University students.

DISCUSSION

In accordance with the hypothesis testing criteria, because t_count > t_table then H0 is rejected and H1 is accepted. Which means it is true that learning using the Group Investigation method with the help of the Geogebra application can influence the Elementary Algebra learning outcomes of Bengkulu University students.

The Group Investigation learning model assisted by GeoGebra is an active learning model that can be applied in the classroom.

This statement is in accordance with the opinion of Qamaruzzaman & Fajriah who stated that the learning process using the Group Investigation learning method with the help of the GeoGebra application can improve student learning outcomes, because students become active during the learning process, especially when carrying out investigations[6].

Group Investigation is a group learning model based on discovery or inquiry[7]. In implementing the Group Investigation learning model, it includes steps consisting of six stages, namely: 1) Forming a group; 2) Identify the topic; 3) Planning the investigation; 4) Carrying out investigations; 5) Prepare final report; 6) Present the final report; and 7) Evaluation[8]. The steps used by researchers refer to the steps proposed by Slavin[9]. The group investigation model can improve learning outcomes due to group work. These results are in accordance with the research results of Widyanto which stated at the time the learning process of forming heterogeneous groups can influence the learning outcomes of students with low and medium abilities when asking questions to students with high abilities[7].

Based on the results of previous research, in Salsabila et al., it can be concluded that the Group Investigation learning model in learning can produce several benefits, including fostering leadership attitudes, social skills, and can improve the quality of learning outcomes that are better in terms of knowledge than conventional methods[10]. In research by Faujiyah et al., it was concluded that learning using the Group Investigation learning model can grow and develop students' thinking abilities to be better and can contribute well to their learning abilities[11]. In Pratimi et al. research, the application of the Group Investigation learning model can improve social studies learning outcomes on the theme of my dreams in class IV of SD Negeri 6 Panjer in the 2018/2019 academic year[8]. Likewise, in Rahmawati et al. research it was concluded that the Group Investigation model is one learning model that meets student centered learning and is in accordance with the characteristics of physics by motivating students to be active in understanding concepts by involving the data collection process through group discussion activities[12].

Apart from that, using Geogebra can also make students more interested and active in class. This is in line with research conducted by Fitriasari which states that learning using geogebra can make students more active in the learning process[13].

CONCLUSION

After analyzing the data and discussing the research results, it can be concluded that learning using the group investigation method with the help of the Geogebra application can influence the learning outcomes of Bengkulu University students in the Elementary Algebra course.

Declaration by Authors

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REFERENCES

1. P. L. Hernawati, T. V. D. Saputro, and R. Andy, “Analisis Kesulitan Belajar Siswa Dalam Mata Kuliah Matematika Dasar,” *Pendidik. Bagi Masy. di Drh. 3 T*, pp. 28–35, 2021, [Online]. Available: http://e-conf.usd.ac.id/index.php/sfkip/2021
2. A. Shoimin, *68 model pembelajaran inovatif dalam kurikulum 2013*. Yogyakarta: Ar-Ruzz Media, 2014.
3. Slavin, *Cooperative learning*. Bandung: Nusa Media, 2009.
4. T. Utari and E. Stiadi, “Pengaruh Model Team Based Project Berbantuan Aplikasi Geogebra Dan Youtube Pada Matakuliah Konstruksi Geometri Terhadap Hasil Belajar Mahasiswa,” *J. Penelit. Pembelajaran Mat. Sekol.*, vol. 6, no. 1, pp. 128–135, 2022, doi: 10.33369/jp2ms.6.1.128-135.
5. Sugiyono, *Metode penelitian kuantitatif, kualitatif, dan r & d*. Alfabeta, 2013.

6. M. Qamaruzzaman and N. Fajriah, "Penerapan Group Investigation dan Penemuan Terbimbing Berbantukan Media Geogebra untuk Meningkatkan Aktivitas dan Hasil Belajar Persamaan dan Fungsi Kuadrat Siswa Kelas X-TSM SMK Negeri 5 Banjarmasin," *Julak J. pembeLAjaran pendidiK*, vol. 1, pp. 255–271, 2022.
7. P. Widyanto, "Penerapan Metode Pembelajaran Group Investigation Berbantuan Media Flanelgraf Untuk Meningkatkan Minat Dan Hasil Belajar Siswa Pada Mata Pelajaran IPA," *J. Pendidik. Dasar Nusant.*, vol. Vol. 3, no. No. 1, pp. 118–129, 2017, [Online]. Available: https://ojs.unpkediri.ac.id/index.php/pgsd/article/view/708/572
8. A. Z. Pratami, S. Suhartono, and M. Salimi, "Penerapan model pembelajaran group investigation untuk meningkatkan hasil belajar Ilmu Pengetahuan Sosial," *Harmon. Sos. J. Pendidik. IPS*, vol. 6, no. 2, pp. 164–174, 2019, doi: 10.21831/hsjpi.v6i2.23535.
9. Taniredja, *Model-model pembelajaran inovatif dan efektif*. Bandung: Alfabeta, 2014.
10. N. Salsabila, R. Yusri, and P. Kooperatif, "Pengaruh Model Pembelajaran Kooeratif Tipe Group Investigation the Effect of the Group Investigation Type Cooperative Learning Model on Student Mathematics Learning Outcomes," *J. Equ. Teor. dan Penelit. Pendidik. Mat.*, vol. 6, 2023.
11. C. R. Faujiyah, I. Suhada, and S. Hartati, "Penerapan Model Pembelajaran Group Investigation Terhadap Hasil Belajar Siswa Pada Materi Sistem Ekskresi Manusia," *J. BIOEDUIN Progr. Stud. Pendidik. Biol.*, vol. 7, no. 1, pp. 64–75, 2017, doi: 10.15575/bioeduin.v7i1.2454.
12. A. Rahmawati, S. Bektiarso, and Subiki, "Model Group Investigation Disertai Peta Konsep Pada Pembelajaran Fisika," *Webinar Pendidik. Fis. 2020*, vol. 5, no. 1, pp. 65–69, 2020.
13. P. Fitriasari, "Pemanfaatan software geogebra dalam pembelajaran," vol. 3, no. 1, pp. 57–69, 2017, doi: https://doi.org/https://doi.org/10.19109/jpmrafa.v3i1.1441.

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