The Effect Of The Geogebra-Assisted Group Investigation Model On Student Learning Outcomes In Low Algebra COURSES

Elwan Stiadi¹, Tria Utari², Fitriani³

¹²University of Bengkulu, Indonesia
² Ahmad Dahan Sinjai Islamic University, Indonesia
E-mail correspondence: elwanstadi@unib.ac.id
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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 influence in improving student learning outcomes.

Keywords: Geogebra; Group Investigation; Learning Results; Quasi Experiment

1. Introduction

In the S1 Mathematics Education Study Program FKIP UNIB, the Low Algebra course is a compulsory subject. The achievement of this Low Algebra course is that students are able to explain concepts and solve problems related to Quadratic Equations, Quadratic Functions, Rational Functions and Drawing graphs of rational functions, irrational equations and inequalities, and Logarithms. But in this study Focusing on the goal that students can solve problems related to quadratic equations and quadratic functions and construct graphs. Hernawati et al. (2021) revealed that students still make many errors in facts and principles in the Low Algebra course. In addition, in learning Low Algebra in the previous class of 2022 students, students had many difficulties in determining the roots of solving quadratic equations and functions, as well as difficulties in drawing graphs of a quadratic function. Then the learning outcomes of the class of 2022 students in the previous Low Algebra learning were still low, which only got an average score of 54.3. This is obviously a problem that must be solved as early as possible.

Lecturers as lecture facilitators must be able to help students gain the expected abilities. Learner-focused activities enhance this ability. Minister of Education and Culture Regulation Number 3 of 2020 sets standards for effective, collaborative, holistic, integrative, contextual, thematic, and student-centered learning processes. Lecturers must have the ability to make learning that meets these criteria. To improve learning outcomes, one of the learning models that can be used is Group Investigation.
Shoimin (2014) indicates that one type of cooperative learning model is called Group Investigation is based on the participation and activity of learners to search for information on their own about the topic to be studied using available resources. This model can make the learning process more active because learners will learn more through the process of creation, group work, sharing, and sharing information. According to Slavin deep Shoimin (2014), There are six stages of cooperative learning similar to group inquiry. They are the following: define topics and organize students into groups; planning the tasks to be studied; conduct investigations; prepare a final report; present the final report; and evaluate.

Group Investigation very suitable for Lower Algebra courses. This is supported by the statement Maslihah et al. (2020) which states that Group Investigation has a positive influence on improving learning achievement in Algebra. Lecturers can use the Geogebra application to support lectures with this model. As a mathematical learning tool, Geogebra can be used to demonstrate or visualize mathematical concepts and assist in constructing new concepts (Utari & Stiadi, 2022). Geogebra is a dynamic, free and multifunctional math software suitable for all levels of education that combines geometry, algebra, tables, graphs, statistics and calculus in an easy-to-use package (D. Putri et al., 2021). Some of the advantages of Geogebra are as follows: 1) Graphs, algebra, and tables are connected and highly dynamic; 2) Easy to use but has many advanced features; 3) authoring tool (modifier tool) to make interactive learning materials as web pages; 4) available in many languages for our millions of users worldwide; and 5) Open source software freely available to non-commercial users (Utari & Stiadi, 2022).

Research related to the effect of the Geogebra-assisted Group Investigation model on the learning outcomes of Low Algebra has never been carried out, usually research is carried out in other courses or in Algebra lessons at school. In addition, this research has never been conducted before in the S1 Mathematics Education study program FKIP UNIB. Therefore, this research is very important to be carried out in seeing the influence of the Group Investigation model assisted by Geogebra on the learning outcomes of the S1 Mathematics Education study program FKIP UNIB in the Low Algebra course. Thus, the formulation of this research problem is whether the learning outcomes of students in the Low Algebra course are influenced by the Group Investigation model assisted by Geogebra.

2. Method

This type of research is Quasi-Experimental or pseudo-experimental. This study used a research design pretest-posttest control group design. Experimental research can be interpreted as a research method used to look for influences on others under controlled conditions (Sugiyono dalam Ramadhan, 2022). 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 an experimental group, while the second group will use a direct learning model without the use of Geogebra as a control group. The control group was selected non-equivalently because there was no randomization, by looking for a group comparable to the treatment group in its initial characteristics or conditions. Before giving treatment, a pretest was carried out to measure the initial learning outcomes of both groups. After that, the experimental group will receive treatment in the form of applying the Geogebra-assisted Group Investigation method in learning, while the control group will continue learning with conventional methods without using Geogebra, namely with a direct learning model.

After treatment, posttests were performed in both groups to measure final learning outcomes. The difference between pre-test and post-test learning outcomes in both groups will be analyzed to assess the effect of using the Geogebra-assisted Group Investigation method on student learning outcomes.

The subjects of this study consisted of students of the S1 Mathematics Education study program at Bengkulu University in semester 1A with 29 students and semester 1B with 29 students. Semester 1A students applied the Geogebra-assisted Group Investigation model as an experimental class and semester 1B students applied conventional methods as a control class.

The instrument in this study is a test instrument for learning outcomes of Low Algebra. Before being given to students, the learning outcome test instrument was validated first by two lecturers of the S1 Mathematics Education Study Program FKIP UNIB. This validity test is called the logical validity test. Logical validity is a validity test based on expert judgment aimed at producing decent question
3. Results and Discussion

3.1 Description of Assessment Results

This research was conducted at the University of Bengkulu with the aim of determining the significant influence of the geogebra-assisted Group Investigation model on student learning outcomes in the Low Algebra course. This study involved two research groups, namely the experimental class and the control class. In the experimental class using the Group Investigation learning model assisted by GeoGebra and in the control class using a conventional learning model. This research method is a Quasi-Experimental research method. The data of this study consisted of initial tests (pre-test) and final tests (post-test) conducted on the experimental class and control class. The data obtained can be seen in the following table. The recapitulation of the pre-test and post-test results in this study can be seen in Table 1 below:

<table>
<thead>
<tr>
<th>Description</th>
<th>Conventional Pre-test</th>
<th>Pre-test Group Investigation</th>
<th>Post-test Conventional</th>
<th>Post-test Group Investigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Students</td>
<td>29</td>
<td>29</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>War – War</td>
<td>22,76</td>
<td>23,8</td>
<td>60,87</td>
<td>71,9</td>
</tr>
<tr>
<td>Median</td>
<td>25</td>
<td>25</td>
<td>60</td>
<td>70</td>
</tr>
<tr>
<td>Top Rated</td>
<td>40</td>
<td>45</td>
<td>80</td>
<td>90</td>
</tr>
<tr>
<td>Lowest Value</td>
<td>10</td>
<td>10</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>1.6</td>
<td>9.87</td>
<td>11.8</td>
<td>10.56</td>
</tr>
<tr>
<td>Skewness</td>
<td>0.22</td>
<td>0.18</td>
<td>-0.256</td>
<td>-0.27</td>
</tr>
</tbody>
</table>

Based on Table 1, it can be seen that there is an increase in student learning outcomes before and after learning with the Group Investigation model.

3.2 Test prerequisites

1. Experimental class and control class pre-test normality test

The results of the normality 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) with a sample of 29 students each, obtained results as in Table 2.

<table>
<thead>
<tr>
<th>Sig value.</th>
<th>0.200</th>
<th>0.200</th>
</tr>
</thead>
</table>

From Table 2 obtained the value of sig. The experimental class and control class are 0.200 > 0.05. So the two classes are normally distributed.

2. Test homogeneity pre-test experimental class and control class

The homogeneity 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), obtained results as in Table 3.

<table>
<thead>
<tr>
<th>Value Based on Mean</th>
<th>Levene Statistic</th>
<th>df1</th>
<th>df2</th>
<th>Say.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.695</td>
<td>1</td>
<td>56</td>
<td>0.408</td>
</tr>
</tbody>
</table>
From Table 3 obtained the value of sig. = 0.408 > 0.05. Then the two groups/classes are homogeneous. Based on the results of the normality and homogeneity test, the two classes can be used for research.

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

The results of the normality test 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 of 29 students each, obtained results as in Table 4.

<table>
<thead>
<tr>
<th>Table 4 Post-test Normality Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sig value.</td>
</tr>
<tr>
<td>------------</td>
</tr>
<tr>
<td>0.062</td>
</tr>
</tbody>
</table>

From Table 4 obtained the value of sig. The experimental class and control class are more than 0.05. So the two classes are normally distributed.

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

The homogeneity test results 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>
<thead>
<tr>
<th>Table 5 Post-test Homogeneity Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levene Statistic</td>
</tr>
<tr>
<td>------------------</td>
</tr>
<tr>
<td>0.136</td>
</tr>
</tbody>
</table>

From Table 5 obtained the value of sig. = 0.713 > 0.05. Then the two groups/classes are homogeneous.

- Uji Hypothesis

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

H0 : μ1 = μ0
H1 : μ1 > μ0

With : μ1 is the average learning outcome of Group Investigation model students assisted by GeoGebra
μ0 is the average student learning outcome of the direct learning model

<table>
<thead>
<tr>
<th>Table 6 Test Results t</th>
</tr>
</thead>
<tbody>
<tr>
<td>t</td>
</tr>
<tr>
<td>3.752</td>
</tr>
</tbody>
</table>

Based on the results of the t test in Table 6, the price = 3.752 and we know the price = 2.668. In accordance with the criteria of hypothesis testing, because then \(t_{hitung} > t_{table}\) \(H_0\) is rejected and \(H_1\) is accepted. Which means it is true that learning using the Group Investigation method with the help of GeoGebra application can affect the learning outcomes of Low Algebra University of Bengkulu students.

Learning model Group Investigation with the help of GeoGebra is an active learning model that can be used in the classroom. This statement is in accordance with the opinion Qamaruzzaman & Fajriah (2022) which states that using learning methods Group Investigation with the help of GeoGebra can improve the learning outcomes of learners, because they become more active during the learning process, especially during investigations carried out. In addition, this is also supported by research results Natsir & Taufik (2020); Yuri & Jamaan (2021) which states that the model Group Investigation can make students more active in the learning process so as to improve students’ mathematics learning outcomes.
The group learning model based on discovery or inquiry is known as Group Investigation (Widyanto, 2017). This model consists of six stages, namely group formation, subject identification, investigation planning, investigation implementation, final report preparation, final report presentation, and evaluation (Pratami et al., 2019). Researchers using the Slavin method Slavin (in Taniredja, 2014). Because of group work, Group Investigation can improve learning outcomes. These results are in accordance with the results of the study Widyanto (2017), Widyanto (2017), which states that when the learning process of group formation is carried out heterogeneously, the learning outcomes of low- and medium-ability students can be influenced by the learning process of high-ability students. This is also supported by research Ayuwanti (2017) which states each learner in the group enjoys learning that allows them to cooperate and interact with each other regardless of their background and this learning allows them to share different ideas and opinions, argue in understanding the material, and solve problems.

In previous studies, Salsabila et al. (2023) Find that model Group Investigation Can improve leadership attitudes, social abilities, and learning outcomes that are better in terms of knowledge than conventional methods. In research Faujiyah et al. (2017), it was also found that the use of group inquiry models can improve learning outcomes. According to research conducted by Abida (2020); Hanisah et al. (2014); D. U. Putri et al. (2022); Situmorang (2017), model deployment Group Investigation can improve students’ Mathematics learning outcomes. In addition, in research conducted by Rahmawati et al. (2020); Ayuwanti (2017), type Group Investigation is one of the learning models that encourages students to dare to express opinions and actively learn concepts.

Type Group Investigation can improve students’ ability to communicate. This is in line with the results of the study Ayuwanti (2017); Handayani et al. (2022); Kumbaraningtyas et al. (2019) which states that in learning with models Group Investigation can improve student communication skills where students are trained to communicate when discussing groups in solving problems given by educators. In addition, the use of geogebra can also make students more interested and active when in class. This is in line with research conducted Fitriasari (2017) which states that learning using geogebra can make students more active in the learning process.

4. 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 affect the learning outcomes of Bengkulu University students in the Low Algebra course.

Bibliography


