



## Cooperative Model Type Group Investigation; An Implementation On Mathematics Learning Straight Line Equation Material

**Danaya Leaficha Maweru**

Department of Mathematics, FMIPAK, Universitas Negeri Manado, Indonesia

**Aaltje S. Pangemanan**

Department of Mathematics, FMIPAK, Universitas Negeri Manado, Indonesia

**Anekke Pesik**

Department of Mathematics, FMIPAK, Universitas Negeri Manado, Indonesia

Korespondensi penulis: [leafichadanaya@gmail.com](mailto:leafichadanaya@gmail.com)

**Abstract.** Learning outcomes refer to the successful attainment of educational objectives by students who actively engage in the process of learning. Nevertheless, it is evident that student learning outcomes remain subpar, hence necessitating the implementation of a learning model aimed at enhancing student learning outcomes. The Group Investigation (GI) Learning Model is an educational approach that has been shown to enhance student learning results. The primary objective of this study was to assess the impact of implementing the Group Investigation (GI) Cooperative learning model and the direct learning model on the learning outcomes of eighth-grade students at SMP N 6 Tondano. Specifically, the study focused on the topic of straight-line equations. The research employed a Quasi-Experimental Design as its chosen methodology. The present study comprised two classes, namely class VIII B as the experimental group and class VIII A as the control group. The sampling methodology employed in this study was Cluster Random Sampling. The methodology employed in this study involves the utilization of written tests for the purpose of data collecting. Based on the findings of the study, the statistical analysis using the *t*-test yielded a *t*-value of 2.5709, while the critical *t*-value (*t*-table) was determined to be 2.0322. Consequently, the calculated *t*-value exceeded the critical *t*-value (*t*-count > *t*-table). This implies that the null hypothesis (*H*<sub>0</sub>) is rejected in favor of the alternative hypothesis (*H*<sub>1</sub>). Based on the findings, it can be inferred that students who were exposed to the Group Investigation (GI) cooperative learning model exhibited superior learning outcomes compared to students who were subjected to the direct learning model. This observation was made specifically in the context of studying straight-line equations among eighth-grade students at SMP Negeri 6 Tondano.

**Keywords:** Group Investigation, Learning Outcomes, Straight Line Equation

**Abstrak.** Hasil pembelajaran mengacu pada keberhasilan pencapaian tujuan pendidikan oleh siswa yang terlibat aktif dalam proses pembelajaran. Namun demikian, ternyata hasil belajar siswa masih di bawah standar, sehingga perlu diterapkannya model pembelajaran yang bertujuan untuk meningkatkan hasil belajar siswa. Model Pembelajaran Group Investigation (GI) merupakan suatu pendekatan pendidikan yang terbukti dapat meningkatkan hasil belajar siswa. Tujuan utama penelitian ini adalah untuk mengetahui pengaruh penerapan model pembelajaran Kooperatif Group Investigation (GI) dan model pembelajaran langsung terhadap hasil belajar siswa kelas VIII SMP N 6 Tondano. Secara khusus penelitian ini terfokus pada topik persamaan garis lurus. Penelitian ini menggunakan Quasi-Experimental Design sebagai metodologi yang dipilih. Penelitian ini terdiri dari dua kelas, yaitu kelas VIII B sebagai kelompok eksperimen dan kelas VIII A sebagai kelompok kontrol. Metodologi pengambilan sampel yang digunakan dalam penelitian ini adalah Cluster Random Sampling. Metodologi yang digunakan dalam penelitian ini melibatkan pemanfaatan tes tertulis untuk tujuan pengumpulan data. Berdasarkan hasil penelitian, analisis statistik dengan menggunakan uji *t* menghasilkan nilai *t* sebesar 2,5709, sedangkan nilai *t* kritis (*t* tabel) ditetapkan sebesar 2,0322. Akibatnya nilai *t* hitung melebihi nilai *t* kritis (*t*-hitung > *t*-tabel). Hal ini menyiratkan bahwa hipotesis nol (*H*<sub>0</sub>) ditolak dan mendukung hipotesis alternatif (*H*<sub>1</sub>). Berdasarkan hasil penelitian dapat disimpulkan bahwa siswa yang diberikan model pembelajaran kooperatif Group Investigation (GI) menunjukkan hasil belajar yang lebih unggul dibandingkan dengan siswa yang diberikan model pembelajaran langsung. Observasi ini dilakukan khusus dalam konteks pembelajaran persamaan garis lurus pada siswa kelas VIII di SMP Negeri 6 Tondano.

**Kata Kunci :** Group Investigation, Hasil Belajar, Persamaan Garis Lurus

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\* Danaya Leaficha Maweru, [leafichadanaya@gmail.com](mailto:leafichadanaya@gmail.com)

## **INTRODUCTION**

Education is very important for humans today. Education is a conscious effort deliberately designed to achieve predetermined goals, namely, to improve the quality of human resources (Supriyanto, 2014; Adnyana & Yudaparmita, 2022; Sayekti & Rimayati, 2023). One way to improve human resources is through learning at school (Saa, 2018; Abrori & Muali, 2020; Lubis et al., 2022). National education aims to educate the nation and make human resources responsible for themselves (Suwartini, 2017; Widiansyah, 2018; Kusuna & Outrim, 2020).

Article 3 of Law 20/2003 on the National Education System states: "National education functions to develop capabilities and form dignified national character and civilization to educate the nation's life, aims to develop the potential for students to become human beings who believe and fear God Almighty. Esa has a noble character, is healthy, knowledgeable, capable, creative, independent, and becomes a democratic and responsible citizen" (Omeri, 2015; Fitriyani, 2018; Hermanto, 2020). Thus, national character development is a form of follow-up to be achieved.

Mathematics is a science with an important position in basic knowledge, technology support, and other sciences. We can encounter problems related to number, size, and shape every time. This has caused mathematics to become one of the subjects taught at every education level, from elementary school to the university level (Amir, 2014; Purwanti, 2015; Permatasari, 2021). However, mathematics is inseparable from teacher curriculum changes to achieve more advanced educational outcomes.

Mathematics is still considered difficult for some students because mathematics provides a high level of difficulty. Few students view mathematics as a boring, scary, and scary subject (Putrianti et al., 2017; Nisa & Vebrianto, 2021; Oktavianti & Munandar, 2023). For this reason, the role of the teacher as a facilitator greatly influences students' success in the educational process (Purwaningsih, 2016; Buchari, 2018; Sukitman et al., 2020). Besides that, the teacher also creates conducive learning conditions to arouse students' enthusiasm for thinking (Sopian, 2016; Suryana, 2017; Daga, 2021). For this reason, teachers are required to teach material correctly and creatively by utilizing various learning models and media.

Based on the results of brief observations conducted by researchers at SMP Negeri 6 Tondano, it was found that many students needed help understanding mathematics, especially in straight-line equations, where students could not solve problems related to straight-line equations. The researcher also interviewed mathematics teachers at Tondano 6 Public Middle School and found that the way teachers taught was less creative and did not make use of

learning models, where the teacher only taught with a direct learning model that only gave procedural material (i.e., knowledge of how to implement something), does not involve students a lot. Teachers must use learning models appropriate to the material taught so students cannot be actively involved. Researchers also found recognition from teachers who had reasons about Direct Learning making it easier for them to teach and were reluctant to make instructional media because they had little time, as well as complaints from students who could not understand the material provided because interaction in class was only one way. So that students become less active and feel bored. These things cause the average daily test on students' straight line equation material to be very low, where 65% of students have not reached the Learning Objectives Achievement Criteria (KKTP) set by the teacher, which is 70. The researcher is interested in finding solutions to existing problems from the facts in the field.

The Group Investigation (GI) Type Cooperative learning model is one of the solutions that can overcome the problems above. The application of the Group Investigation (GI) Cooperative learning model can help students become more active (Astuti, 2014), create an interesting learning atmosphere for students (Sulasti, 2014), increase cooperation between students so that students are more motivated in learning and do not feel bored about math lessons (Fauhah & Rosy, 2021). The Group Investigation (GI) Cooperative learning model is a learning model that involves small groups where students work together in the process of discovery, planning, and discussion, then presenting in front of the class (Hartoto, 2016). The learning model must be appropriate and follow the material or teaching materials to achieve learning objectives (Setiawan & Basyari, 2017; Rohana, 2020). Using learning models in teaching largely determines the quality of teaching and learning outcomes (Cholifah et al., 2018; Djonomiarjo, 2020; Zagoto, 2022). For this reason, educators must play an active role in order to improve satisfactory student learning outcomes.

Based on the description above, this research was conducted titled "Implementation of the Group Investigation (GI) Cooperative Model in Learning Straight Line Equations Materials."

## **METHOD**

The design of this study uses quantitative research. The research method used in this research is quasi-experimental or quasi-experimental. The definition of quasi-experimental in the quasi-experimental method has a control group, so it cannot fully function to control external variables that affect the implementation of the experiment.

This method was developed to overcome difficulties in determining the control group in research.

The research design chosen was the Post-test-only Control Group Design. The experimental and control groups were compared. The experimental class received treatment, while the control class did not. The following Table 1 as a design in this study:

**Table 1** Research Design

Group	Treatment	Post-test
Experiment	X	$O_1$
Control	-	$O_2$

Information:

X = Treatment of the GI learning model

$O_1$  = Post-test value of the experimental class

$O_2$  = Post-test value of control class

This study's population was all class VIII SMP Negeri 6 Tondano students. The sample is class VIIIB as the experimental class and class VIIIA as the control class. The instruments used in this study consisted of learning instruments and measurement instruments. Learning instruments include Teaching Modules and LKPD and measurement instruments, namely written tests (post-test) on the material of Straight Line Equations in the form of description questions, which have previously been consulted with the supervisor to determine whether the test is appropriate for research.

The data collection technique in this study was in the form of a test. The test conducted in this study was in the form of a post-test. After the teaching and learning process is complete, post-tests will be given control and experimental classes to determine the learning outcomes achieved by students.

## RESULT AND DISCUSSION

### A. Result

Researchers have conducted research at SMP Negeri 6 Tondano and collected data from two classes. The first class is class VIII B, with a total of 19 students as an experimental class that uses the Group Investigation cooperative learning model, and the second class is class VIII A, which uses a direct learning model with a total of 17 students.

This research was conducted in the Odd Semester of the 2022/2023 Academic Year in learning mathematics with the subject of Straight Equations. The data taken is the result of the

post-test. The results of the analysis of the posttest control class and experimental class can be seen in Table 2 below:

**Table 2.** Descriptive Statistics of Posttest Data for Control Class and Experimental Class

No	Statistics	Statistical Value	
		Control Class	Experiment Class
1	Minimum Score	65	70
2	Maximum Score	85	100
3	Total	1266	1523
4	N	17	19
5	Average	74,4705	80,1578
6	Standard Deviation	6,2661	6,9303
7	Variance	39,2647	48,0292

Based on the table above, it can be seen that the average in the experimental class was 80.1578 with a minimum score of 70, while the average in the control class was 74.4705 with a minimum score of 65, which concluded that the use of the Group Investigation Cooperative learning model was higher than just using the direct learning model.

Before testing the hypothesis using the t-test, the two classes' normality and homogeneity tests of variance were first performed. The data used is the posttest from both classes, namely the experimental and control classes. The post-test data was analyzed to determine the normality and diversity of the data as a condition for testing the hypothesis using the t-test of two classes. Inferential analysis in this study used the Liliefors test for the normality test, homogeneity of variance test, and hypothesis testing.

## B. Prerequisite Test

### 1. Normality Test Using the Liliefors Test

#### 1) Experiment Class

For the normality test, use the Liliefors test with the following hypothesis formula:

$H_0$ : Data is normally distributed

$H_1$ : Data is not normally distributed

Significant level:  $\alpha=0.05$

Criticism Area :

Reject  $H_0$  if  $L_{count} > L_{table}$

Accept  $H_0$  if  $L_{count} \leq L_{table}$

In the table of critical values for the Liliefors Test:  $n = 19 \rightarrow L_{(19)(0,05)} = 0,1965$

Based on the calculation results, the experimental class  $L_{\text{count}} = 0.1933$  with  $L_{\text{table}} = 0.1965$  for  $n = 19$  and  $\alpha = 0.05$ . This means that  $L_{\text{count}} = 0.1933 < L_{\text{table}} = 0.1965$ ; thus,  $H_1$  is rejected,  $H_0$  is accepted, and the sample data comes from a normally distributed population.

## 2) Control Class

For the normality test, use the Liliefors test with the following hypothesis formula:

$H_0$ : Data is normally distributed

$H_1$ : Data is not normally distributed

Significant level:  $\alpha=0.05$

Criticism Area :

Reject  $H_0$  if  $L_{\text{count}} > L_{\text{table}}$

Accept  $H_0$  if  $L_{\text{count}} \leq L_{\text{table}}$

In the table of critical values for the Liliefors Test:  $n = 17 \rightarrow L_{(17)(0,05)} = 0,2071$

Based on the calculation results,  $L_{\text{count}}$  control class = 0.1740 with  $L_{\text{table}} = 0.2071$  for  $n = 18$  and  $\alpha = 0.05$ . This means that  $L_{\text{count}} = 0.1740 < L_{\text{table}} = 0.2071$ ,  $H_1$  is rejected,  $H_0$  is accepted, and the sample data comes from a normally distributed population.

## 2. Variance Homogeneity Test

The data used to test the homogeneity of variance are the post-test results from the experimental and control classes. The statistical hypothesis to be tested in both groups is:

$H_0 : \sigma_1^2 = \sigma_2^2$  (both variances are the same)

$H_1 : \sigma_1^2 \neq \sigma_2^2$  (the two variances are not the same)

With the provision of :

Accept  $H_0$  if  $F_{\text{count}} < F_{\text{table}}$

Reject  $H_0$  if  $F_{\text{count}} \geq F_{\text{table}}$

The results of the analysis of statistical homogeneity testing of variance F test on post-test data, with  $S_1^2 = 48,0292$  and  $S_2^2 = 39,2647$  give a value of  $F_{\text{count}} = 1.2232$  while  $F_{\text{table}} = 2.6522$ .

This shows that  $F_{\text{count}} < F_{\text{table}}$  so that  $H_0$  is accepted or  $H_0 : \sigma_1^2 = \sigma_2^2$  (both variances are the same). So, the experimental and control classes' variance is homogeneous.

### 3. Hypothesis test

Because the normality test for the post-test results of the two classes has been fulfilled, the hypothesis testing using the T-test statistic can be continued.

Statistical Hypothesis:

$$H_0 : \mu_1 \leq \mu_2$$

$$H_1 : \mu_1 > \mu_2$$

Information :

$\mu_1$  = Average post-test score of students taught using the Group Investigation Type Cooperative learning method

$\mu_2$  = Average post-test score of students taught using the direct learning model

Hypothesis testing steps:

Determine the real level ( $\alpha$ ) = 0.05

Criteria:

$H_0$  Accepted if  $T_{count} \leq T_{table}$

$H_1$  Accepted if  $T_{count} > T_{table}$

By using the T-test formula as follows:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{s \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} \quad \text{with } S = \sqrt{\frac{(n_1-1)s_1^2 + (n_1-1)s_2^2}{n_1+n_2-2}} \quad dk = n_1 + n_2 - 2$$

$$T_{count} = \frac{\bar{x}_1 - \bar{x}_2}{s \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} = 2,5709$$

Conclusion:  $H_0$  is rejected because  $T_{count} = 2.5709 > T_{table} = 2.0322$

Testing the hypothesis with a significance level of 0.05 obtained  $T_{count} > T_{table}$ ;  $H_0$  was rejected, and  $H_1$  was accepted. So, it can be concluded that the average learning outcomes of students who use the Group Investigation Cooperative learning method are higher than those of students who do not use direct learning methods.

### C. Discussion

Based on the results of existing research, it can be seen that the average learning outcomes of the experimental class were higher than the average learning outcomes of the control class, where both classes were given tests in the form of descriptions of 6 questions, each question having a different weight. Based on the existing questions. This situation is

supported by the learning process in the experimental class that uses the Group Investigation Type Cooperative learning model with LKPD, which helps students work on existing problems in groups and can also guide students in the investigative process so they can gain new knowledge or information and can provide conclusions about the material. That has been discussed. Using LKPD, students can accelerate understanding, share information, and increase shared knowledge in groups; students can also be guided to make processes and solve existing problems in stages.

The Group Investigation Model provides the widest possible opportunity for students to be directly and actively involved in the learning process, starting from planning to how to understand a topic through investigation, so when the learning process takes place, each group member is required to find their information about the material. Related because students are required to play an active role in increasing group success, which is point 3 in the advantages of Group Investigation so that it builds the character of independent students who can work in groups simultaneously. After completing their investigation and making conclusions regarding related material, they plan to present their discussions' results.

The Group Investigation learning model is student-centered so that in the learning process, students are more active than teachers; the teacher is only a facilitator. As described above, the Group Investigation learning model is carried out in groups, making it easier for students to collaborate and exchange information/opinions. Meanwhile, direct learning is centered on the teacher; students only receive from the teacher, and there needs to be more reciprocity between teacher and student. Therefore, the learning outcomes of students taught with the Group Investigation learning model are higher than those taught with the direct learning model.

The description above can be supported by the opinions of previous researchers, including Ida Nursanti, 2016 who concluded that "Through the application of an investigative learning model, students' attitudes can become motivated and skilled in solving given mathematical problems," Bana Kartasasmita, 2017 which also concluded that "The group investigative learning model can be used as an alternative to improve students' mathematical problem-solving abilities," which refers to the development of student character. There is also an opinion from Cut Mauliza Nurza, in 2019 which supports this research, where Cut Mauliza Nurza's research concluded that "Student learning outcomes using the Group Investigation learning model are better than student learning outcomes using conventional learning models on material equations of lines straight in class VIII MTsN 8 Aceh Besar.", which is in line with



the opinion of Lulu'il Maknum, in 2013 who found an increase in student learning outcomes. From the results of the evaluation, there is an increase in student learning outcomes.

Thus, it can be concluded that the learning outcomes using the Group Investigation (GI) Cooperative learning model are higher than the learning outcomes using the direct learning model; this is in line with the results of research from previous researchers.

## CONCLUSION

Based on the results of research conducted by researchers, it can be concluded that the average learning outcomes of students who are taught using the Group Investigation Type Cooperative learning method are higher than the average learning outcomes of students who are only taught using direct learning models on Straight Line Equations material in class VIII SMP Negeri 6 Tondano.

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