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The Effect of the Group Investigation Learning Model Assisted by Viaran on the Mathematical Reasoning Ability of Third-Grade Elementary School Students

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Abstract

Mathematical reasoning is a fundamental competency in elementary mathematics education because it enables students to understand concepts, construct logical arguments, formulate problem-solving strategies, and draw appropriate conclusions. However, preliminary observations indicate that third-grade students' mathematical reasoning ability remains relatively low, partly because classroom instruction is dominated by teacher explanations and provides limited opportunities for students to investigate and construct their own understanding. This study aims to examine the effect of the Group Investigation (GI) learning model assisted by Viaran on the mathematical reasoning ability of third-grade elementary school students. A quantitative approach with a quasi-experimental method and a nonequivalent control group design was employed. The participants comprised 62 third-grade students, with 31 students from SD Negeri Klepu 01 assigned to the experimental group and 31 students from SD Negeri Klepu 02 to the control group. Data were collected through mathematical reasoning tests, questionnaires, observations, and documentation and analyzed using descriptive statistics, normality and

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homogeneity tests, an independent-samples *t*-test, and simple linear regression. The findings revealed a significant difference in mathematical reasoning ability between the experimental and control groups. The experimental group achieved a higher posttest mean score of 90.19 than the control group, which obtained a mean score of 75.68, with a significance value of $p < .001$. Regression analysis further demonstrated a significant effect of the Viaran-assisted Group Investigation model on students' mathematical reasoning ability, with an R^2 value of .822, indicating that the model explained 82.2% of the variance in mathematical reasoning scores. These findings demonstrate that integrating Group Investigation with Viaran can foster a more active, collaborative, and meaningful mathematics learning environment while strengthening students' mathematical reasoning. This study contributes empirical evidence supporting the integration of investigation-based learning and interactive instructional media as alternative strategies for developing higher-order mathematical thinking in elementary education.

Keywords: Elementary Mathematics Education; Group Investigation; Mathematical Reasoning; Viaran; Quasi-Experimental Learning

INTRODUCTION

Elementary school education plays a fundamental role in shaping students' knowledge, skills, attitudes, and character as essential foundations for continuing their learning at higher educational levels (Anatasya & Dewi, 2021; Ninawati et al., 2025). At this stage, students are in the concrete operational development phase; therefore, learning activities should be designed according to their characteristics, learning needs, and real-life experiences to achieve optimal learning outcomes. In line with the implementation of the Merdeka Curriculum, elementary education emphasizes a student-centered learning approach that encourages meaningful, contextual, and collaborative learning experiences (Manurung & Khairiah, 2026).

Active student involvement during the learning process has an important role in improving thinking abilities and problem-solving skills. Through active participation, students are able to construct their own understanding of concepts and apply acquired knowledge to overcome various problems encountered in learning activities Hidayah & Rini (2025). This approach is designed to foster critical thinking, creativity, communication,

collaboration, and problem-solving abilities through various learning experiences that engage students directly.

In its implementation, teachers act as facilitators who create supportive learning environments that encourage students to develop knowledge independently. Students are guided to participate in activities such as observing, questioning, exploring information, discussing ideas, conducting investigations, and reflecting on their learning experiences. Therefore, elementary school learning is not merely oriented toward cognitive achievement or academic outcomes, but also focuses on developing 21st-century competencies that enable students to adapt to advances in science, technology, and future challenges.

One of the subjects that plays a significant role in achieving these educational goals is mathematics. Mathematics is a fundamental subject that contributes to the development of students' thinking abilities from the elementary school level (Nabilah et al., 2024). Mathematics learning is not merely concerned with mastering concepts and computational skills, but also aims to develop various mathematical competencies needed in everyday life and to support students' readiness for further education. These competencies include mathematical conceptual understanding, mathematical reasoning ability, problem-solving skills, mathematical communication skills, mathematical connections, and mathematical representation abilities. These interconnected abilities collectively contribute to developing students' logical, critical, systematic, and creative thinking patterns.

Among the various mathematical competencies, mathematical reasoning ability is considered one of the essential aspects that requires attention (Ariati & Juandi, 2022). Mathematical reasoning refers to students' ability to establish relationships among given information, identify patterns, formulate assumptions, justify solutions, and draw conclusions based on the mathematical concepts they have learned. This ability is crucial because it enables students to understand the connections between mathematical concepts, allowing them to solve problems accurately and logically.

However, several studies have revealed that Indonesian students' mathematical reasoning abilities remain relatively low. Based on the results of the Programme for International Student Assessment (PISA) 2022, Indonesia achieved an average mathematics score of 366, which was considerably below the OECD average score of 472. The assessment results also indicated that only approximately 18% of Indonesian students reached Level 2 or above, while around 82% of students remained below the minimum proficiency level in

mathematics. These findings suggest that many Indonesian students still face difficulties in applying mathematical concepts to reason, interpret information, and solve problems related to real-life contexts (OECD, 2023). This condition highlights the need for improvements in elementary mathematics instruction through the implementation of more innovative learning models and strategies. Such approaches are expected to enhance the quality of mathematics learning and optimize students' mathematical reasoning abilities.

This research was conducted at SDN Klepu 01 and SDN Klepu 02 in the third-grade mathematics learning context by implementing the Group Investigation learning model assisted by Viaran. The selection of these two schools was based on the results of observations and informal interviews with third-grade teachers, which indicated that students' mathematical reasoning abilities were still relatively low, particularly in understanding word problems, analyzing mathematical situations, developing arguments, and drawing logical conclusions. These conditions made both schools appropriate research settings for examining students' mathematical reasoning abilities and investigating the implementation of a learning model that was expected to support their improvement.

Furthermore, interviews with third-grade teachers revealed that many students still experienced difficulties when asked to explain the procedures used to obtain answers and often became confused when solving problems presented in different formats from previously given examples. Mathematics learning activities in the classroom generally followed a teacher-centered pattern, in which teachers explained the material, provided examples, and assigned exercises, while students mainly listened and had limited opportunities to express ideas or justify their reasoning. The instructional process was still largely dominated by lectures, question-and-answer activities, and routine exercises. In addition, group activities that had been implemented were mostly limited to ordinary group work and had not yet incorporated systematic investigation stages that encourage students to explore and analyze problems collaboratively.

Teachers also explained that the use of instructional media in mathematics learning was still limited, with learning activities generally relying only on textbooks and whiteboards. In fact, the development of creative mathematics learning media and activities can assist teachers in creating more engaging learning environments and providing meaningful learning experiences for elementary school students (Rini & Rizqi, 2023). This condition causes some students to become easily bored and less actively involved during learning activities,

particularly when they encounter difficult topics. As a result, students tend to wait for explanations from the teacher rather than independently seeking solutions to mathematical problems. The actual conditions observed in both schools indicate that the current learning process has not provided sufficient opportunities for students to optimally develop their mathematical reasoning abilities.

This finding was further supported by the results of preliminary study data obtained through mathematical reasoning tests based on five reasoning indicators, as well as questionnaire data regarding students' learning processes conducted in third-grade classes at SDN Klepu 01 and SDN Klepu 02. The results revealed that students' mathematical reasoning abilities were still below the expected achievement criteria, namely the Learning Objective Achievement Criteria (KKTP).

To support efforts to improve the quality of mathematics learning in elementary schools, several previous studies have demonstrated the effectiveness of the Group Investigation learning model. Supriyanto and Mawardi (2020) found that the Group Investigation model could improve elementary students' critical thinking skills. Furthermore, Devi et al. (2021) reported that this model contributed to improving students' mathematics learning outcomes. In addition, Hikmah et al. (2025) revealed that the Group Investigation model had a positive effect on students' collaborative skills in mathematics learning. These findings indicate that the Group Investigation model has considerable potential to enhance various aspects of student competencies.

Nevertheless, studies examining the implementation of the Group Investigation model specifically to improve elementary students' mathematical reasoning abilities, particularly when supported by Viaran media, are still limited. Therefore, this study aims to investigate the effect of the Group Investigation learning model assisted by Viaran on the mathematical reasoning abilities of third-grade elementary school students, thereby contributing to and expanding previous research findings. Based on the background described above, the researcher intends to conduct a study entitled "The Effect of the Group Investigation Learning Model Assisted by Viaran on the Mathematical Reasoning Ability of Third-Grade Elementary School Students."

Research Questions

1. Is there any difference in students' mathematical reasoning abilities after implementing the Group Investigation (GI) learning model assisted by Viaran among third-grade elementary school students?

2. Does the implementation of the Group Investigation (GI) learning model assisted by Viaran have an effect on the mathematical reasoning abilities of third-grade elementary school students?

METHODs

Research Design

This study employed a quantitative approach using a quasi-experimental research method. The research design applied was the Nonequivalent Control Group Design. This design was selected because the study involved two existing classes, namely an experimental class and a control class, without random assignment of research subjects (Sugiyono, 2019). Before the treatment was implemented, both groups were administered a pretest to determine their initial conditions and measure their mathematical reasoning abilities prior to the intervention. Subsequently, a posttest was conducted after each group had received the respective learning treatments. Through this quasi-experimental design, the study aimed to identify differences in the effects of the treatment between the experimental group and the control group. Although the selection of groups was not carried out randomly, this design provides an appropriate framework for examining the influence of an independent variable on the measured outcomes and evaluating the effectiveness of the implemented learning model.

Research Variables

An independent variable refers to a variable that influences or causes changes in the dependent variable, as defined by Sugiyono (2019). In this study, the independent variable (X) was the Group Investigation (GI) learning model assisted by Viaran animated videos.

A dependent variable is a variable that is affected by the presence of an independent variable (Sugiyono, 2019). It represents the primary focus or outcome measured in a study. In this research, the dependent variable (Y) was students' mathematical reasoning ability.

Population and Sample

The population refers to the entire group of subjects possessing specific characteristics related to the research topic and objectives. The population may consist of individuals, objects, or other entities that serve as sources for data collection. In this study, the population consisted of all students at SD Negeri Klepu 01 and SD Negeri Klepu 02 during the 2025/2026 academic year.

A sample is a selected portion of the population that represents its characteristics and is used as the research subject. The participants in this study consisted of third-grade students from SD Negeri Klepu 01 as the experimental class, totaling 31 students, and third-grade students from SD Negeri Klepu 02 as the control class, also totaling 31 students.

The sampling technique used was purposive sampling. This technique was selected because the researchers intentionally selected samples based on specific criteria relevant to the objectives of the study. The selection of the experimental class was based on the results of the preliminary study, which indicated that students at SD Negeri Klepu 01 had lower mathematical reasoning abilities compared to SD Negeri Klepu 02; therefore, SD Negeri Klepu 01 was designated as the experimental class.

Data Collection Techniques and Instruments

The data collection techniques used in this study included tests, observations, interviews, and documentation. These techniques were selected complementarily to obtain comprehensive data and strengthen the internal validity of the research through a method triangulation approach.

Data Collection Instruments :

1. Questionnaire Instrument

The questionnaire was administered after students completed the learning activities to obtain information related to their learning experiences during the implementation of the instructional model.

RESULTS

Differences in Students' Mathematical Reasoning Ability Before and After the Implementation of the Group Investigation Learning Model Assisted by Viaran

1. Pretest Data of Mathematical Reasoning Ability

Table 1. Average Pretest Results of the Experimental and Control Classes

Group Statistics					
Pretest	Kelas	N	Mean	Std. Deviation	Std. Error Mean
	Eksperimen	31	75.81	3.049	.548
	Kontrol	31	73.32	4.392	.789

Based on Table 1, it can be seen that both the experimental class and the control class consisted of 31 students. The analysis results showed that the experimental class obtained a pretest mean score of 75.81 with a standard deviation of 3.049, while the control class achieved a mean score of 73.32 with a standard deviation of 4.392. Descriptively, the average pretest score of the experimental class was higher than that of the control class, with a difference of 2.49 points. Meanwhile, the score distribution in the control class was more varied compared to the experimental class.

These findings indicate that the initial mathematical reasoning abilities of both classes were relatively similar before the treatment was implemented. However, to determine whether the observed difference was statistically significant, an Independent Samples t-Test was conducted.

2. Posttest Data of Mathematical Reasoning Ability

Table 2. Posttest Results of the Experimental and Control Classes

Group Statistics					
Posttest	Kelas	N	Mean	Std. Deviation	Std. Error Mean
	Eksperimen	31	90.19	3.351	.602
	Kontrol	31	75.68	3.506	.630

Based on Table 2, it was found that both the experimental class and the control class consisted of 31 students. The analysis results indicated that the experimental class obtained a posttest mean score of 90.19 with a standard deviation of 3.351, while the control class obtained a mean score of 75.68 with a standard deviation of 3.506. Descriptively, the average posttest score of the experimental class was 14.51 points higher than that of the control class. These results indicate that after the treatment was implemented, students in the experimental class achieved better learning outcomes compared to students in the control class.

Table 3. Results of the Students' Mathematical Reasoning Ability Questionnaire

Class	Meeting	Total	Criteria
Experimental Class	1	88.39%	Very Good
	2	92.47%	Very Good
	3	93.76%	Very Good
Average of Experimental Class		91.54%	Very Good
Control Class	1	90.32%	Very Good
	2	90.32%	Very Good
	3	92.90%	Very Good
Average of Control Class		91.18%	Very Good

Based on the results of the students' mathematical reasoning ability questionnaire, the researchers distributed questionnaires to identify students' mathematical reasoning abilities during the learning process. The analysis showed that the average questionnaire score of the experimental class was 91.54%, categorized as Very Good, while the control class obtained an average score of 91.18%, also categorized as Very Good. The difference in average scores between the two classes was 0.36%. Therefore, it can be concluded that students' mathematical reasoning abilities in both classes were categorized as Very Good, with the experimental class achieving a slightly higher average score than the control class.

Table 4. Observation Results of Students' Mathematical Reasoning Ability

Class	Meeting	Total	Criteria
Experimental Class	1	91.56%	Very Good
	2	95.05%	Very Good
	3	95.70%	Very Good
Average of Experimental Class		94.91%	Very Good
Control Class	1	95.16%	Very Good
	2	94.57%	Very Good
	3	95.00%	Very Good
Average of Control Class		94.10%	Very Good

Based on the observation results of students' mathematical reasoning abilities, the researchers conducted observations throughout the learning process using an observation sheet developed based on five indicators of mathematical reasoning ability. The observed indicators included: (1) students' ability to present mathematical statements through written forms, pictures, sketches, or diagrams; (2) students' ability to formulate assumptions or conjectures regarding given problems; (3) students' ability to provide reasoning or justification for possible solutions; (4) students' ability to verify the validity or accuracy of

answers; and (5) students' ability to draw conclusions or generalize based on the obtained results.

The observations were conducted during group discussions, the completion of Student Worksheets (LKPD), answering questions, and presenting group work results.

Table 5. Results of Student Worksheets (LKPD) in the Experimental and Control Classes

Class	Meeting	Average	Criteria
Experimental Class	1	93.33%	Very Good
	2	91.67%	Very Good
	3	91.67%	Very Good
Average of Experimental Class		92.22%	Very Good
Control Class	1	90.00%	Very Good
	2	91.67%	Very Good
	3	91.67%	Very Good
Average of Control Class		92.11%	Very Good

Based on Table 5, the researchers provided Student Worksheets (LKPD) through group activities in each meeting to examine the development of students' mathematical reasoning abilities during the learning process. The analysis results showed that the average LKPD score of the experimental class was 92.22%, categorized as Very Good, while the control class obtained an average score of 92.11%, also categorized as Very Good. The difference in average LKPD scores between the two classes was 0.11%. Therefore, it can be concluded that the LKPD results of both classes were included in the Very Good category.

The Effect of the Group Investigation Learning Model Assisted by Viaran on the Mathematical Reasoning Ability of Third-Grade Elementary School Students

Table 6. Regression Variables Entered

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3266.129	1	3266.129	277.727	<.001[b]
	Residual	705.613	60	11.760		
	Total	3971.742	61			

a. Dependent Variable: Posttest

b. Predictors: (Constant), Kelas

The table above presents the results of the regression analysis, showing an F-value of 277.727 with a significance value of < 0.001. Since the significance value is lower than

0.05, the regression model is considered statistically significant. Therefore, the treatment variable (class) has a significant effect on the mathematical reasoning abilities of third-grade elementary school students.

Based on the Coefficients table, the significance value obtained was < 0.001. This value is lower than 0.05 (< 0.001 < 0.05), indicating that there is a significant relationship between the tested variables. Furthermore, the t-test results showed that the calculated t-value was -16.665. The absolute value of the calculated t-value (16.665) was greater than the t-table value, indicating that H_0 was rejected and H_a was accepted. Thus, it can be concluded that the Group Investigation learning model assisted by Viaran has a significant effect on the mathematical reasoning abilities of third-grade elementary school students.

The results of the simple linear regression analysis produced the regression equation Y = 104.710 − 14.516X. This equation indicates that the constant value of 104.710 represents the predicted mathematical reasoning ability score when the learning model variable is zero. Meanwhile, the regression coefficient of -14.516 indicates that each one-unit change in the class variable is associated with a 14.516-unit change in students' mathematical reasoning ability.

Furthermore, the coefficient of determination obtained from the simple linear regression analysis showed an R Square (R^2) value of 0.822. This means that the Group Investigation learning model assisted by Viaran contributed an influence of 82.2% on the mathematical reasoning abilities of third-grade elementary school students, while the remaining 17.8% was influenced by other factors outside the scope of this study.

DISCUSSION

Differences in Students' Mathematical Reasoning Ability Before and After the Implementation of the Group Investigation Learning Model Assisted by Viaran

The results of this study indicate that there was a difference in students' mathematical reasoning abilities between the experimental class that implemented the Group Investigation learning model assisted by Viaran and the control class that applied the Group Investigation learning model without Viaran assistance. Based on the results of the Independent Samples t-Test, the experimental class obtained an average posttest score of 90.19, while the control class achieved an average score of 75.68. The difference between the two classes was 14.51

points, with a significance value of Sig. (2-tailed) < 0.001, indicating that H_0 was rejected and H_1 was accepted. These findings demonstrate that the implementation of the Group Investigation learning model assisted by Viaran had a significant effect on students' mathematical reasoning abilities.

The improvement in learning outcomes observed in the experimental class occurred because the Group Investigation model assisted by Viaran positions students as active participants in the learning process through a student-centered learning approach. During the learning activities, students were encouraged to understand the problems presented, engage in group discussions, explore various possible solutions, and present the results of their discussions. These activities provided opportunities for students to develop analytical skills, establish connections between mathematical concepts, and draw conclusions based on the problem-solving processes they conducted.

In contrast, learning activities in the control class were still more dominated by teacher explanations, resulting in fewer opportunities for students to independently construct mathematical concepts and actively develop their reasoning abilities.

The findings of this study were also supported by additional data obtained from questionnaires, observations, and Student Worksheets (LKPD). Based on the results of the mathematical reasoning ability questionnaire, both classes achieved the **Very Good** category, with scores of 91.54% in the experimental class and 91.18% in the control class. Similarly, the learning observation results showed an average score of 94.10% for the experimental class and 94.91% for the control class. Meanwhile, the LKPD results indicated that the experimental class obtained an average score of 92.22%, while the control class achieved 91.11%, with both categorized as **Very Good**.

Although the control class obtained slightly higher average scores on several supporting instruments, the differences between the two classes were relatively small. These instruments primarily describe the implementation of learning activities and students' involvement during the learning process. Meanwhile, the effectiveness of the learning model in improving mathematical reasoning abilities is more accurately determined through posttest results analyzed using statistical tests.

The results of this study support the theoretical perspective that the Group Investigation learning model can improve higher-order thinking skills because students learn through problem-solving activities related to real-life situations. Through the stages of

problem orientation, learning organization, investigation, presentation of findings, and evaluation, students gain meaningful learning experiences that enable them to develop mathematical reasoning abilities more effectively.

These findings are also consistent with the research conducted by H. C. Putri et al. (2025), which stated that the Group Investigation model could improve students' critical thinking and problem-solving abilities through a student-centered learning process. Furthermore, Ndoa et al. (2024) reported that the implementation of Group Investigation enhanced students' learning engagement and academic achievement because students were directly involved in the problem-solving process.

Based on all research findings, it can be concluded that the Group Investigation learning model has a positive effect on students' mathematical reasoning abilities. This conclusion is supported by the higher average posttest score obtained by the experimental class compared to the control class, as well as the results of the Independent Samples t-Test, which revealed a significant difference between the two classes after the treatment was implemented. Therefore, the Group Investigation model can be considered an alternative mathematics learning approach for improving students' mathematical reasoning abilities.

The Effect of the Group Investigation Learning Model Assisted by Viaran on the Mathematical Reasoning Ability of Third-Grade Elementary School Students

Based on the results of the study, the implementation of the Group Investigation learning model assisted by Viaran was found to have a significant effect on the mathematical reasoning abilities of third-grade elementary school students. This finding was supported by the results of the simple linear regression analysis, which showed a significance value of < 0.001, lower than the significance level of 0.05. Furthermore, the F-test results obtained an F-value of 277.727 with a significance level of < 0.001, indicating that the regression model used in this study was statistically significant.

The t-test results also showed a calculated t-value of -16.665, with its absolute value exceeding the t-table value. Therefore, H_0 was rejected and H_a was accepted. These results indicate that the implementation of the Group Investigation learning model assisted by Viaran has a significant effect on the mathematical reasoning abilities of third-grade elementary school students.

The simple linear regression analysis produced the equation Y = 104.710 − 14.516X. This equation indicates that changes in the treatment variable are followed by changes in students' mathematical reasoning abilities. Furthermore, the coefficient of determination (R^2) value of 0.822 indicates that the implementation of the Group Investigation learning model assisted by Viaran contributed 82.2% to students' mathematical reasoning abilities, while the remaining 17.8% was influenced by other factors not examined in this study.

The coefficient of determination value demonstrates that the learning model implemented in this research has a substantial contribution to improving students' mathematical reasoning abilities.

The influence of this learning model is closely related to the characteristics of the Group Investigation learning model, which positions students as the center of the learning process. Throughout the learning activities, students do not merely receive information from the teacher; instead, they actively participate in identifying problems, conducting investigations, gathering relevant information, discussing ideas with group members, presenting investigation results, and formulating conclusions based on the data obtained. These learning activities train students to think logically, systematically, and critically when solving mathematical problems.

Furthermore, a student-centered learning approach provides opportunities for students to express their opinions, provide rational justifications for the solutions they propose, and evaluate arguments presented by other group members. Such activities encourage the development of students' mathematical reasoning abilities through meaningful and active learning experiences.

The findings of this study are consistent with the perspective of Hia et al. (2022), who explained that Group Investigation is a cooperative learning model that places students as the main subjects in the learning process. Through this model, students act as researchers who collaborate with group members to investigate and solve problems through systematic investigation stages. This type of learning process provides meaningful experiences that support the development of students' thinking skills and reasoning abilities.

In addition to the implementation of the learning model, the use of Viaran media also contributed to the success of the learning process. This media presents mathematical materials through animated videos, making abstract mathematical concepts easier for students to understand. The visual and engaging presentation of learning materials can attract

students' attention during the learning process and improve their understanding of the concepts being studied. This condition helps students establish connections between mathematical concepts and the problems they encounter, enabling them to provide more logical explanations and formulate accurate conclusions.

These findings are consistent with the opinion of Rachmavita (2020), who stated that the use of animated videos in learning can improve students' attention, motivation, and understanding because the materials are presented in an interactive and engaging manner. Therefore, the utilization of Viaran as an animated video-based learning medium can assist students in understanding mathematical concepts more effectively, thereby optimizing the development of their mathematical reasoning abilities.

The findings of this study also strengthen the results of previous research. Paramita and Rini (2023) found that the implementation of the Guided Inquiry learning model assisted by animated videos had an effect on elementary school students' mathematical critical thinking abilities. Although the learning model applied was different, the study shares similarities with the present research, particularly in the use of animated video media as a tool to develop students' higher-order thinking skills.

Furthermore, this study is supported by the research of D. K. Putri et al. (2019), which stated that mathematical reasoning ability is closely related to problem-solving ability. Students with strong reasoning skills tend to be better able to understand problems, determine appropriate solution strategies, provide justifications for their answers, and draw logical conclusions from the problem-solving process. These findings reinforce the results of the present study, indicating that learning activities that provide opportunities for students to investigate and solve problems can contribute to improving mathematical reasoning abilities.

Overall, the results of this study demonstrate that the implementation of the Group Investigation learning model assisted by Viaran has a significant effect on the mathematical reasoning abilities of third-grade elementary school students. This conclusion is supported by statistical test results indicating a significant influence, as well as reinforced by students' highly positive responses and the excellent implementation of learning activities. Therefore, the Group Investigation learning model assisted by Viaran can be considered an effective alternative learning approach for developing elementary school students' mathematical reasoning abilities.

CONCLUSION

Based on the analysis and discussion regarding the implementation of the Group Investigation learning model assisted by Viaran on students' mathematical reasoning abilities, the following conclusions can be drawn:

1. There was a difference in mathematical reasoning abilities between the experimental class and the control class. The results showed that students who received learning through the Group Investigation model assisted by Viaran demonstrated better mathematical reasoning abilities compared to students who participated in conventional learning activities. Based on the hypothesis testing results, the significance value obtained was < 0.001, which was lower than the significance level of 0.05 (< 0.001 < 0.05). Therefore, H_0 was rejected and H_a was accepted. This indicates that the implementation of the Group Investigation learning model assisted by Viaran was effective in improving the mathematical reasoning abilities of third-grade elementary school students.

2. The Group Investigation learning model assisted by Viaran had a significant effect on the mathematical reasoning abilities of third-grade elementary school students. This effect was demonstrated through the results of the simple linear regression analysis, which showed a significance value of < 0.001 and a calculated t-value of -16.665, resulting in the rejection of H_0 and acceptance of H_a. Furthermore, the coefficient of determination (R Square) was 0.822, indicating that the Group Investigation learning model assisted by Viaran contributed 82.2% to students' mathematical reasoning abilities, while the remaining 17.8% was influenced by other factors outside the scope of this study. Thus, the Group Investigation learning model assisted by Viaran was proven to have a significant influence on improving the mathematical reasoning abilities of third-grade elementary school students.

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