Collaboration on Involvement in Improving Science Learning Outcomes through Group Investigation

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Abstract. Group Investigation (GI) is a method that emphasizes participation and student activities to find the material of the lesson to be learned through available materials and media such as textbooks, communities, internet, environment, and others. To date, group investigation has still not yet been closely investigated. Few published studies have focused on group investigation. However, no previous study has investigated group investigation in the third grade of primary schools specifically in science. The objective of the present work paper is to investigate GI and describe the process of a GI. This classroom action research uses the R&H classroom action research model. Participants in this study were third-grade students in one of the Elementary Schools in South Tangerang, Banten Province, Indonesia. Data has been collected through tests, observations, and documents. Data were analyzed using text analysis and descriptive statistics. This study has shown that GI is proven to improve elementary school students' science learning outcomes. The evidence from this study also suggests that GI is effective for encouraging students' involvement in learning, train students' higher-order thinking skills, and promote behavior collaboration to complete the task.

1. Introduction
Group Investigation (GI) enhances group cohesiveness and also influences class-wide cohesiveness. Each group takes on one aspect of a general, class-wide topic; group members are asked to ask questions for investigation and seek answers with their group mates [1]. In the context of GI, students plan, conduct, and report their research projects in depth. GI helps students recognize that research does not always follow the same series of steps but is, instead, context-dependent [2]. With GI, external rewards are suppressed and all students are responsible for the success of their learning. Students are also fully involved so that they experience a great deal of intrinsic motivation to pursue their studies [3].

The method enabled students to increase their self-confidence and teach them to feel valued. In just one year, the data obtained showed that most students were willing to become the group leader [4]. GI is learning where students are involved since planning, both in determining topics / sub-topics and ways to study investigative and this model requires students to have the ability to communicate well in the sense that GI learning is a method that emphasizes participation and student activities to find the material (informant) of the lesson to be learned through available materials and media such as textbooks, communities, internet, environment, and others.

Research [1] shows that there is a positive effect of the GI cooperative learning model on teacher effectiveness in regulating CL learning and scaffolding activities, and GI also changes students' and
teachers' views on diversity. In 2010, [3], in an experiment conducted in seventh grade (grades 13-14) in Singapore, the authors evaluated the effect of group inquiry on cooperative learning compared to the effect of traditional classroom teaching methods on student achievement and on their motivation to learn.

A study by [5] examined the effectiveness of group investigation teaching techniques in teaching the basic science level of the seventh grade 'Light' unit. This GI was carried out in two different classes in Primary school during the 2011-2012 academic year in Erzurum, Turkey. In an analysis of GI, [6] found that GI can improve the student's speaking skill of the second-grade students of Senior High School Samarinda.

To date, GI has still not yet been closely investigated. Few published studies have focused on GI, however, no the previous study has investigated GI in the third grade of primary schools, specifically in science. The objective of the present work paper is to investigate GI and describe the process of a GI. The significance of this study to accomplish this aim and to respond to a recent call for research to GI. The findings of this study will help the evidence supporting various theories to account for the effects of GI outcomes science.

2. Literature Review

2.1. Cooperative Learning type Group Investigation (GI)

Cooperative learning is now utilized in schools and universities in most parts of the world in almost all fields of study and from preschool, to graduate school and adult training programs. The use of cooperative learning encompasses education so much that, almost everywhere in the world, it is almost difficult to find textbooks on teaching methods, teacher journals, or teaching material that is not discussed cooperative learning [7]. There are many strategies in collaborative learning models, among them are discussion, reciprocal teaching, problem-solving, infographic managing, and writing. Based on the student's condition, the strategy that can be used to overcome the learning problems above is the problem-solving strategy. Specifically, the technique used in this strategy was GI [8].

According to [5], the GI teaching technique is an effective organizational medium for encouraging and guiding students' involvement in learning. Students actively share influencing the nature of events in their classrooms. This is an open-ended investigation in which students may help determine the focus of their investigation. The activity is designed to emphasize higher-order thinking skills. In 2004, [9] say the nature of group interactions that occur in a workgroup provides insight into how that group addresses its task more or less effectively. The interaction behavior of a group indicates how group members work together to complete the task successfully.

With GI, external rewards are emphasized and students are responsible for their learning [3]. According to [10] the cooperative learning model has 6 phases as follows: phase 1. explain the objectives and open the lesson; phase 2. present the information; phase 3. organize students into learning teams; phase 4. helping teamwork and learning; phase 5. test about the material; phase 6. give an award.

2.2. Science Learning Outcomes

The use of learning models is proven to improve student learning outcomes, this is shown from various studies, including, [11] shows that inquiry models can improve student learning outcomes in the Budi Pekerti unit. Furthermore, [12] showed that the use of direct teaching models was proven to improve student learning outcomes in mathematics. [13] added from his study that the use of demonstration models can significantly improve students' understanding of mathematics, and can improve students' cognitive and involvement.

A learning environment also may affect the opportunity to learn, such as the experience of teachers or the education level of parents, which are recognized and controlled for in models though not directly explored [14]. The current learning outcomes on Physics subject courses that the students have are still far from expectations, even though there have been many efforts to improve the students’ learning achievement in many areas, such as: revising the curricula, providing seminars and workshops for the lecturers, providing supporting learning media and infrastructures, and many others [15].
3. Method
The researchers chose a practical action research method [16] to examine a particular situation (i.e., the group investigation of student learning outcomes) to gain collaboration and student involvement. The R&H classroom action research Model is used in this study, which consists of 4 stages, namely the exploration, planning, action and observation, and discussion. Classroom action research (CAR) is part of the main task of a teacher [17]. Classroom action research activities are complex and difficult to complete by some elementary school teachers [18].

![Figure 1. The R&H Classroom Action Research Model [19]](image)

The chosen research subject is science, on units, changes in the nature of objects. This classroom action research involved thirty third-grade students, fourteen male students, and twenty female students. The study was conducted at one of the elementary schools in South Tangerang, Banten, Indonesia. Data were collected qualitatively and quantitatively, through observation and tests.

Observation of individual behavior is made by selecting an instrument (or using a behavioral protocol) on which to record behavior, observing individuals for that behavior, and checking points on a scale that reflect the behavior (behavioral checklists) [16], and use test interpretation (of scores about the concept or construct that the test is assumed to measure). Data analysis techniques used in the study are text analysis and descriptive statistics.

To validate the data, researchers used triangulation.[17] states that triangulation is used to overcome validity issues and to confirm results by limiting the biases that come from using a single source [17].

4. Results and Discussion
4.1 Pre-Cycle
Data obtained in the pre-cycle shows that of all students (34 people), 19 of them (55.9%) have not received a minimum score of completeness in learning science set by the school = 65, and only 15 students (44.1%) have completed minimal mastery learning. Therefore, teachers need to take corrective actions to improve student learning outcomes in cycle 1 through the application of GI.

![Figure 2. Percentage of student learning outcomes in the pre-cycle.](image)

4.2 Cycle 1
In cycle 1, researchers used the GI type of cooperative learning model, in which students' were involved in the collaboration. The data obtained, from 34 students, 15 of them (44.12%) have not received a minimum learning completeness score, and nineteen students (55.88%) have obtained a minimum learning completeness score. Where the lowest score of 30 was obtained by one student, and
the highest score of 100 was obtained by one student, with the acquisition of an average grade of class = 68.82. Because the percentage of student learning outcomes that succeed is still low, then corrective actions in cycle 2 need to be taken. Figure 3 shows the results of observations on the teaching actions of the teacher and student learning outcomes in cycle 1.

4.3 Cycle 2

Cycle 2 data shows that out of 34 students, there is one student (2.94%) who has not yet received a minimum learning completeness score, and 33 students (97.6%) have obtained a minimum learning completeness score = 65. In cycle 2, students were formed into six GI groups with investigative media prepared by the teacher. The final result shows, the lowest score is only obtained by one student = 60, and the highest score = 100 is obtained by twelve students, while the average grade is 87.35. Figure 4 shows the observations of the teacher's teaching actions and students' science learning outcomes in cycle 2.

Table 1. Student mathematics learning outcomes in pre-cycle, cycle 1, and cycle 2.

| Percentage is complete | Pre-Cycle | Cycle 1 | Cycle 2 |
|------------------------|-----------|---------|---------|
| Percentage is complete | 44.1 %    | 55.88 % | 97.06 % |
| Percentage is incomplete | 55.9 %    | 44.12 % | 2.94 % |

Table 1 shows that completeness of student learning outcomes in the pre-cycle of 44.1%, in cycle 1 increased to 55.88%, in cycle 2 increased again to 97.06%. Figure 4 shows the comparison of observations on teacher teaching actions and student learning outcomes in the pre-cycle (pre-test), cycle 1 (post-test 1), and cycle 2 (post-test 2).
Figure 5. Percentage of student learning outcomes in pre-cycle, cycle 1, cycle 2, and the results of observations of the teaching actions of teachers in pre-cycle, cycle 1, and cycle 2.

Based on Figure 5, obtained observational data on the completeness of teaching actions of teachers in cycle one = 72.70%, while in cycle 2 it increased to 100%. These results indicate that the GI type of cooperative learning model has been shown to improve elementary school student science learning outcomes, increase collaboration, and student involvement in investigations.

This is supported by [8] study which reveals that the application of collaborative learning models of group investigation can improve the learning process and learning outcomes in physics learning. This research was supported by [5] who said that this method would be beneficial for students’ academic achievement and it would make students more active in lessons. Also, research [21] shows that group inquiry and individual effectiveness are equally effective in developing integrated science inquiry skills overall for students. Research [22] shows that the cooperative learning model is proven to be able to improve student mathematics learning outcomes, helping students obtain academic content and skills to discuss the goals and objectives of important social and human relations. Interest in learning directly also affects student achievement [23]. Likewise, the learning environment directly influences student learning assessments [24].

5. Conclusion
This study has shown that cooperative learning type group investigation is proven to improve elementary school students’ science learning outcomes. The evidence from this study also suggests that cooperative learning type group investigation is effective for encouraging students’ involvement in learning, train students’ higher-order thinking skills, and promote behavior collaboration to complete the task.

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