PUBLISHING KSI
• ISSN 2720 - 9644 (print)
• ISSN 2721 - 0877 (online)
IJESSS
INTERNATIONAL JOURNAL OF ENVIRONMENTAL, SUSTAINABILITY AND SOCIAL SCIENCE
Indexed by : sinta 3, Crossref, GARUDA, Google scholar

TEACHERS' PERCEPTIONS OF THE GROUP INVESTIGATION (GI) MODEL FOR IMPROVING LEARNING OUTCOMES AND ACADEMIC ACHIEVEMENT IN SCIENCE INSTRUCTION

Volume: 7
Number: 4
Page: 1104 - 1110

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Article History:
Received: 2026-03-22
Revised: 2026-06-19
Accepted: 2026-07-21

Abstract:
This study examines teachers' perceptions of the Group Investigation (GI) model and its potential to improve learning outcomes and academic achievement in elementary science instruction. The participants were Grade IV teachers at SD Negeri 3 Buduk, which implements the Merdeka Belajar (Freedom to Learn) curriculum. Data were collected through interviews, observations, documentation, and scoring assessments using a mixed-methods approach within a Science-Technology-Society framework. The intervention included training and a team-developed module on the fundamental concepts and implementation of GI. Assessment results showed that the Class IVA and Class IVB teacher groups achieved scores of 90 (very good) and 78 (good), respectively. Teachers perceived GI as supporting active learning, critical thinking, conceptual understanding, and the application of science and technology to everyday life. However, they also identified challenges, including unequal participation, differences in student ability, insufficient exploration of prior knowledge, and the persistence of teacher-centered practices. The study concludes that GI can strengthen science learning when supported by appropriate facilitation, structured group processes, and attention to students' initial conceptions and varying abilities.

Keywords: Group Investigation Model, Learning Outcomes, Academic Achievement, Science Instruction

INTRODUCTION

Education serves to foster a shift toward a more innovative way of life (Suastra et al., 2005). It functions not merely as a tool for developing knowledge within schools but also as a broader educational process. One educational approach utilized in the current era of globalization is the PAIKEM model. PAIKEM is an acronym standing for (Active, Innovative, Creative, Effective, and Enjoyable Learning). Furthermore, Regulation of the Minister of National Education (Permendiknas) No. 41 of 2007 regarding process standards stipulates that core learning activities must be interactive, inspiring, enjoyable, and challenging; they must motivate students to participate actively and provide sufficient scope for creativity and independence, in alignment with the students' talents, interests, and physical and psychological development.

Natural Science is one of the science subject areas most closely linked to natural phenomena and empirical formulas. In this regard, Santyasa (2004b) notes that learning Natural Science involves capabilities and skills related to physical interpretation, the transformation of quantities and units, mathematical logic, and accurate numeracy. Furthermore, the goal of Natural Science instruction is not merely to provide students with opportunities to learn established facts and theories, but also to cultivate scientific habits and attitudes that enable them to discover and refine the reasoning skills used to construct understanding (Santyasa, 2004a). Consequently, simply understanding and mastering concepts is insufficient; students must also be able to develop their own knowledge, thereby fostering a deep conceptual understanding. The objective of this study is to analyze the

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perceptions of teachers at SD 3 Buduk regarding the Group Investigation (GI) learning model in terms of enhancing learning outcomes and academic achievement.

According to Sudjana (2013), learning outcomes are the capabilities possessed by students after undergoing a learning experience. Bloom, as cited in Sudjana (2013), states that learning outcomes are categorized into three domains: cognitive, affective, and psychomotor. The cognitive domain represents intellectual learning outcomes and comprises six aspects: (1) Knowledge (C1) — though the term "knowledge" in Bloom's taxonomy is not entirely precise, as it encompasses factual knowledge alongside rote memorization (such as formulas, limits, definitions, terms, and legal articles); Comprehension (C2) — which represents a level of understanding higher than mere knowledge, though knowledge remains essential as a prerequisite for understanding; Application (C3) — the use of abstractions (such as ideas, theories, or technical guidelines) in concrete or specific situations; Analysis (C4) — the process of breaking down a unified whole into its constituent elements or parts to clarify their hierarchy and structure; Synthesis (C5) — the integration of elements or parts into a cohesive whole; and Evaluation (C6) — making judgments regarding the value of something, potentially based on objectives, ideas, operational procedures, solutions, methods, or materials. (2) The affective domain relates to attitudes and consists of five aspects: (a) receiving, (b) responding or reacting, (c) valuing, (d) organization, and (e) internalization. (3) The psychomotor domain encompasses learning outcomes related to skills and the ability to act, consisting of six aspects: (a) reflex movements, (b) basic movement skills, (c) perceptual abilities, (d) harmony or precision, (e) complex skilled movements, and (f) expressive and interpretive movements.

Thus, learning outcomes are the results obtained from the learning process that serve as a measure of an individual's ability to comprehend the subject matter in question. Based on this definition, it can be concluded that learning is a process of behavioral change within a person. In other words, learning entails changes in students across material, formal, and functional dimensions in general, and the intellectual dimension in particular. Learning activities give rise to various distinct forms of behavior — such as knowledge, attitudes, skills, capabilities, information, and values — and it is these diverse behaviors that are referred to as learning outcomes.

Academic achievement refers to the results students attain during the learning process, which can be measured through tests, quizzes, exams, or other forms of assessment. It reflects a student's ability to comprehend subject matter, apply concepts, and develop skills. The characteristics of academic achievement include: Measurable results (it can be assessed via tests, quizzes, exams, or other evaluations); Reflection of ability (it demonstrates a student's capacity to understand material and apply it in daily life); and Representation as numerical scores or categories (it can be expressed as specific numerical values or categories, such as A, B, C, or D).

The participants in this study were Grade IV teachers at SD Negeri 3 Buduk, a school implementing the *Merdeka Belajar* (Freedom to Learn) curriculum. Data regarding student learning outcomes and academic achievement were gathered through interviews, observations, and documentation. The interview results are categorized into two parts: those involving the lecturer and those involving the students. First, the interview with the teacher revealed issues concerning the prepared Lesson Plans (RPP) and the alignment of lesson material with actual classroom instruction; methods such as inquiry, problem-based learning, and comparative approaches were not applied, with instruction relying solely on the lecture method. Consequently, student achievement declined by the end of the lessons, and student motivation regarding the material was very low, as students continued to perceive Science (IPA) as an extremely difficult subject. Second, the interview with students revealed that one student was interested in Science primarily to

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maintain their grades, even though they found the subject more complex than Mathematics due to convoluted questions that were difficult to comprehend.

METHODS

This study employed a Science-Technology-Society approach and combined quantitative and qualitative methods. The implementation stages included identifying the target group, selecting the location, screening participants, and planning activities to address the identified problems. Participants were provided with a module prepared by the implementation team on the fundamental concepts and application of the Group Investigation (GI) model. Data were obtained through interviews, observations, documentation, and scoring assessments to examine teachers' perceptions and implementation outcomes.

RESULT AND DISCUSSION

Based on the results obtained for the group scores in the Group Investigation (GI) model, the findings for the Class IVA and Class IVB teacher groups are stated as follows.

Table 1. Scoring Assessment for the Group Investigation (GI) Model

No.	Topic	Class IVA Teacher Score	Criteria	Class IVB Teacher Score	Criteria	Completion Status
1	Water	50	Enough	70	Good	Not Completed
2	Electricity	80	Good	90	Very Good	Completed
3	Magnets	65	Enough	75	Good	Not Completed
4	Mirror	72	Good	80	Good	Completed
5	Light	40	Not enough	76	Good	Not Completed

For further details, please refer to Table 2.

Table 2. GI Criteria Table

Group	Score	Criteria
Teacher IVA	90	Very Good
Teacher IV B	78	Good

Based on the table above, the Group Investigation (GI) model implemented by the Grade IVA teacher has met the established criteria.

Discussion

The implications of the Group Investigation (GI) model are as follows: First, prior to the learning process, students already possess initial knowledge that varies from individual to individual. In this state, learners tend to cling to their existing conceptions and find it difficult to change them. If an initial conception aligns with the scientific conception, a process of assimilation occurs, reinforcing the existing concept and making it more robust. Transforming an alternative conception into a scientific one involves introducing a new concept through a process characterized by dissatisfaction, intelligibility, plausibility, and fruitfulness. Second, the new conception must meet four criteria to effectively engage learners who hold misconceptions: 1) dissatisfaction, 2) intelligibility, 3) plausibility, and 4) fruitfulness. Successfully navigating these four stages indicates that the student has undergone the process of accommodation.

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The new conception must foster the realization that the initial, erroneous conception is inadequate for explaining the subject matter, thereby generating dissatisfaction with that initial view. Third, the new concept must be clear, easily understood (intelligible), and meaningful to the student. Upon experiencing dissatisfaction with their existing conception, students enter a state of disequilibrium. In this state, they become willing to alter their initial conception if the new one is supported by strong, credible evidence. Fourth, students must perceive the presented new concept as logical (plausible) and factually accurate (truthful), fostering belief in the new concept within their cognitive structures. Consequently, the new concept must be consistent and interconnected with other concepts when explaining a phenomenon, thereby appearing logical. Fifth, students must be convinced that the new conception is beneficial (fruitful). The new concept must effectively solve problems that the old concept could not, allowing students to increasingly appreciate the utility of the new concept.

Students' conceptions of learning outcomes always differ from those held by physicists. Physicists' conceptions are generally more complex and intricate, involving a greater number of inter-concept relationships than those of students. If a student's conception aligns with a simplified version of a physicist's conception, it cannot be deemed incorrect; however, if it contradicts the physicist's conception, it is classified as a misconception. Students construct their conceptions through informal processes of interpreting everyday experiences—often referred to as prior knowledge or preconceptions (Cakir, 2008). Naturally, when attempting to understand a subject, each child (student) brings a unique initial conception—which may be scientifically accurate or constitute a misconception—to the learning process (Küçük et al., 2005). Thus, it is evident that the occurrence of misconceptions among students is a normal part of the knowledge-building process for individuals at the learning stage.

The misconceptions students experience during learning vary depending on their origins. Research by Sadia (2004) reveals that student misconceptions can stem from errors in prior learning experiences that persist over time. Furthermore, misconceptions occur regardless of the learner's age; despite age differences, learners often share similar misconceptions regarding scientific topics (Balci, 2004). Additionally, Suparno (2005) identifies five factors contributing to student misconceptions: the students themselves, teachers, textbooks, context, and teaching methods.

The partner's contribution to the implementation of the Group Investigation (GI) model lies in their ability to apply the PAKEM method. PAKEM is an acronym for *Pembelajaran Aktif, Kreatif, Efektif, dan Menyenangkan* (Active, Creative, Effective, and Enjoyable Learning). PAKEM is a learning model implemented within the refined curriculum under the guidance of UNESCO's MBE (School-Based Management) initiative; in practice, it fosters critical thinking, creativity, and problem-solving skills.

The PAKEM method is a preferred instructional model for implementing the KTSP (Education Unit Level Curriculum) in the classroom. This is because PAKEM serves as a foundational pillar of KTSP, alongside school management and community participation (PSM). PAKEM is an instructional approach that enables students to engage in diverse activities to develop skills, attitudes, and understanding—emphasizing "learning by doing"—while teachers utilize various resources and aids, including the surrounding environment, to make learning more engaging, enjoyable, and effective.

Implementing this model fosters active learning that appeals to students; active learning is closely linked to learning motivation due to the reciprocal relationship between the two: strong motivation is required for active learning, while successful and enjoyable active learning

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experiences, in turn, boost motivation. Increased motivation empowers students to make positive decisions. According to Mulyasa, active learning is an approach that prioritizes student involvement in accessing information and knowledge for discussion and analysis during classroom instruction, thereby providing experiences that enhance their understanding and competence. This is realized through the application of the PAKEM approach.

In this instructional setting, the teacher acts primarily as a facilitator who manages the flow of the lesson, having first outlined the objectives and competencies to be achieved. Meanwhile, students play an active and significant role in the learning process. As the center of learning, students must actively engage in activities to build specific understandings, skills, and attitudes or behaviors. Student activity is crucial because learning is fundamentally an active process in which students use their minds to construct understanding (the constructivism approach). This active learning process enables students to develop innovative and creative thinking skills.

Creating a creative learning environment entails a process where teachers must motivate and elicit students' creativity during lessons by employing diverse methods and strategies—such as group work, role-playing, and problem-solving. Consequently, teachers are expected to stimulate students' creativity regarding both their thinking skills and their actions. Instruction is considered effective if it provides new experiences, fosters student competence, and optimally guides students toward their desired learning objectives. This can be achieved by involving all students in the planning of the learning process. Effective learning demands active student participation, as students are the focal point of learning activities and competence development. Such learning also requires a supportive atmosphere and environment; therefore, teachers must effectively manage the learning space, the students, the learning activities, the content or subject matter, and the learning resources.

However, teacher perceptions in this context can be quite pronounced; during the Group Investigation (GI) learning process, the disparity between high-ability and lower-ability students becomes clearly visible, which can subsequently undermine the confidence of those with lower abilities.

Students who fall behind during the Group Investigation (GI) learning process tend to remain behind and struggle to catch up; this is because success in this model relies on individual initiative and effort, meaning students who successfully engage with the lessons do not wait for peers who are struggling or lagging. Not every student can easily adapt to or develop their abilities using the Group Investigation (GI) model. Students possess varying capabilities; those with high intellectual aptitude who struggle to articulate their ideas verbally may face difficulties, as the GI model emphasizes the development of soft skills over purely intellectual ones. Consequently, the knowledge acquired by students varies and is unevenly distributed. The teacher's role appears less prominent, as they act merely as a facilitator and guide—since the model demands that students be active, seek information independently, observe facts, and discover new knowledge firsthand. Several obstacles were identified prior to the implementation of the Group Investigation (GI) process. First, at the start of the lesson, students' prior knowledge was not optimally explored; thus, the teacher remained unaware of whether the students held accurate concepts or harbored misconceptions. This contradicts constructivist theory, which posits that students enter the classroom with existing knowledge regarding the subject matter—whether in the form of preconceptions, misconceptions, or scientifically accurate concepts. Second, the learning process remained teacher-centered rather than student-centered, resulting in minimal student engagement. Although small groups were formed, the lecture method persisted, and heavy teacher intervention remained evident; this hindered the teacher's ability to monitor whether students were developing

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productive thinking habits. Third, the physical significance of the material was not effectively conveyed. Questionnaire results revealed that most students found physics difficult and tedious, associating the subject primarily with the rote memorization of numerous, complex formulas. Interviews with the students revealed that they felt compelled to study physics solely to achieve good grades and avoid remedial work; in reality, however, all the students reported poor physics grades, as they consistently required remediation whenever tests were administered.

CONCLUSION

The conclusions drawn are as follows: The implementation of the Science-Technology-Society (Group Investigation/GI) learning model emphasizes student engagement in technology-assisted science learning. Specifically: (1) The learning process within this model does not expect students to merely receive information but rather to actively seek out and discover knowledge for themselves; (2) Understanding this model encourages students to present science concepts by utilizing real-world applications of science and technology and relating them to societal life. This is crucial because connecting discovered material to real-life experiences ensures the information is deeply ingrained in students' memories, making it less likely to be forgotten; (3) The model encourages students to apply their learning to today's technology-driven world; it aims not only for comprehension of the material but also for the science content to shape students' daily behaviors. In this context, learning material is not meant to be stored in the mind and subsequently forgotten, but rather to serve as a foundation for navigating real life; (4) The model aims to move beyond rote memorization, fostering a genuine understanding of scientific concepts; (5) It emphasizes the development of students' interests and experiential learning; (6) The Group Investigation (GI) model aims to train students in critical thinking and knowledge processing, enabling them to discover and create things that are beneficial to themselves and others; (7) It seeks to make learning more productive and meaningful; and (8) It engages students in activities that link academic material to the context of their daily lives.

The recommendation offered is that the Group Investigation (GI) model be implemented in instructional activities and applied in daily life.

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