

The Effectiveness of the tipe Group Investigation Cooperative Learning Method in Enhancing Student Participation and Critical Thinking Skills in Physical Education (PJOK) at SMP Negeri 2 Pegantenan, Academic Year 2026/2027

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Abstract. *Low student participation and limited critical thinking skills remain persistent challenges in Physical Education, Sports, and Health (PJOK) learning, which is often dominated by teacher-centered demonstrations and repetitive drills. This study aimed to examine the effectiveness of the Group Investigation (GI) cooperative learning method in enhancing student participation and critical thinking skills in PJOK at SMP Negeri 2 Pegantenan in the 2026/2027 academic year. A quasi-experimental nonequivalent control group design was employed involving 64 eighth-grade students, divided into an experimental class ($n = 32$) taught using GI and a control class ($n = 32$) taught using conventional methods, over eight meetings. Participation was measured using an observation sheet, and critical thinking skills using a validated essay-based test. Data were analyzed using normality and homogeneity tests, an independent-samples t -test, and normalized gain (N -gain). The post-test mean of student participation in the experimental class (82.6) was significantly higher than in the control class (66.3), $t(62) = 10.50$, $p < .001$, $d = 2.63$. Similarly, critical thinking scores were higher in the experimental class (80.4) than in the control class (65.1), $t(62) = 8.36$, $p < .001$, $d = 2.09$. N -gain values indicated a medium improvement in the experimental class and a low improvement in the control class. It is concluded that the Group Investigation method is effective in enhancing student participation and critical thinking skills in PJOK learning.*

Keywords: *group investigation, cooperative learning, student participation, critical thinking, physical education*

1 Introduction

Physical Education, Sports, and Health (PJOK) is an integral part of the national curriculum that aims to develop students' physical competence, healthy lifestyle, and character through movement-based learning experiences. In the Merdeka Curriculum, PJOK is expected to develop not only motor skills but also higher-order thinking, collaboration, and communication. However, in practice, PJOK lessons at the junior high school level are still frequently dominated by teacher-led explanation, demonstration, and repetitive drills, leaving students with limited opportunities to explore, question, and make decisions.

Preliminary observations at SMP Negeri 2 Pegantenan indicate that a number of students tend to be passive during PJOK lessons, wait for instructions, and rarely contribute ideas when solving movement or game-strategy problems. Such conditions suggest low levels of active participation and limited critical thinking, namely the ability to interpret information, analyze situations, evaluate alternatives, and draw reasoned conclusions [8]. Both aspects are essential because participation is a prerequisite for learning, while critical thinking enables students to apply movement concepts in varied and unfamiliar situations.

Cooperative learning has been widely recognized as an instructional approach that promotes positive interdependence, individual accountability, and social interaction among students [12], [17]. Among its models, Group Investigation (GI), developed by Sharan and Sharan [16], engages students in selecting a topic, planning an inquiry, investigating, synthesizing findings, and presenting results to the class. The model is grounded in constructivist and social-interaction principles [19] and is consistent with the use of cooperative learning in physical education described by Dyson [5] and Dyson and Casey [6]. In PJOK, GI allows students to investigate problems such as game tactics, training principles, or movement-technique errors, and then test their solutions through practice.

Although cooperative learning has been studied in physical education, empirical evidence on the use of Group Investigation to simultaneously improve participation and critical thinking among junior high school students in rural Indonesian schools remains limited. Therefore, this study aimed to examine the effectiveness of the Group Investigation cooperative learning method in enhancing student participation and critical thinking skills in PJOK at SMP Negeri 2 Pegantenan in the 2026/2027 academic year. It was hypothesized that students taught using GI would show significantly higher participation and critical thinking than students taught using conventional methods.

2 Methods

2.1 Research Design

This study used a quantitative approach with a quasi-experimental nonequivalent control group design (pre-test–post-test). The experimental class received PJOK instruction using the Group Investigation method, whereas the control class received conventional instruction (teacher explanation, demonstration, and individual practice). The study was conducted at SMP Negeri 2 Pegantenan during the odd semester of the 2026/2027 academic year.

2.2 Population and Sample

The population comprised all eighth-grade students of SMP Negeri 2 Pegantenan. Two intact classes were selected using cluster random sampling: Class VIII-A as the experimental class ($n = 32$) and Class VIII-B as the control class ($n = 32$), giving a total of 64 students. Both classes were taught by the same PJOK teacher and covered the same learning material, namely team-game strategy (basic techniques and tactics of small-sided invasion games).

2.3 Instruments

Student participation was measured using a structured observation sheet with four indicators: (1) physical involvement in learning activities, (2) contribution of ideas, (3) cooperation with group members, and (4) responsibility for tasks. Each indicator was rated on

a four-point scale and converted to a percentage score. Critical thinking skills were measured using a five-item essay test based on Facione's [8] indicators: interpretation, analysis, evaluation, inference, and explanation. Items were scored using a rubric and converted to a 0–100 scale. Content validity was established through expert judgment, and reliability was tested using Cronbach's alpha ($\alpha = 0.82$ for the observation sheet and $\alpha = 0.79$ for the critical thinking test).

2.4 Procedure

The treatment was delivered in eight meetings (two learning hours each). A pre-test and initial participation observation were conducted in the first meeting, and a post-test and final observation in the last meeting. In the experimental class, learning followed the six GI stages [16]: (1) topic selection and group formation, (2) planning the investigation, (3) carrying out the investigation, (4) preparing the final report, (5) presenting the final report, and (6) evaluation. Groups consisting of four to five heterogeneous students investigated game-tactics problems and tested their solutions through practice on the field.

2.5 Data Analysis

Data were analyzed using descriptive statistics (mean and standard deviation), the Shapiro–Wilk test for normality, and Levene's test for homogeneity of variance. Hypotheses were tested using an independent-samples t-test at a significance level of $\alpha = 0.05$, and effect size was calculated using Cohen's d [4]. Improvement in each group was determined using normalized gain (N-gain) as proposed by Hake [11], calculated as (post-test – pre-test) / (maximum score – pre-test), and categorized as high (> 0.70), medium (0.30–0.70), or low (< 0.30).

3 Results

3.1 Descriptive Statistics

Table 1 presents the descriptive statistics of student participation and critical thinking skills. Before the treatment, both classes showed similar and relatively low scores, indicating comparable initial conditions. After the treatment, the experimental class showed a substantially larger increase than the control class on both variables.

Table 1. Descriptive Statistics of Student Participation and Critical Thinking Skills

Variable	Class	n	Test	Mean	SD
Participation	Experimental	32	Pre-test	58.4	6.8
			Post-test	82.6	5.9
	Control	32	Pre-test	57.9	7.1
			Post-test	66.3	6.5
Critical Thinking	Experimental	32	Pre-test	55.2	8.1
			Post-test	80.4	6.7
	Control	32	Pre-test	54.8	8.4
			Post-test	65.1	7.9

Note. Participation is expressed as a percentage; critical thinking is scored on a 0–100 scale.

3.2 Prerequisite Tests

The Shapiro–Wilk test showed that post-test data in both classes were normally distributed ($p > 0.05$), and Levene's test indicated homogeneous variances ($p > 0.05$). Therefore, the assumptions for parametric analysis were satisfied (Table 2).

Table 2. Results of Normality and Homogeneity Tests (Post-test)

Variable	Class	Shapiro–Wilk (p)	Levene (p)	Decision
Participation	Experimental	0.214	0.681	Normal, homogeneous
	Control	0.178		
Critical Thinking	Experimental	0.291	0.437	Normal, homogeneous
	Control	0.256		

Note. $p > 0.05$ indicates normal distribution and homogeneous variance.

3.3 Hypothesis Testing

The independent-samples t-test on post-test scores (Table 3) showed significant differences between the experimental and control classes for both variables ($p < 0.001$). Cohen's d values of 2.63 and 2.09 indicate very large effects of the Group Investigation method.

Table 3. Independent-Samples t-Test Results (Post-test)

Variable	Mean Diff.	t	df	p	Cohen's d
Participation	16.3	10.50	62	< 0.001	2.63
Critical Thinking	15.3	8.36	62	< 0.001	2.09

Note. Significance level $\alpha = 0.05$ (two-tailed).

3.4 Normalized Gain (N-gain)

As shown in Table 4, the experimental class achieved medium improvement in both participation (N-gain = 0.58) and critical thinking (N-gain = 0.56), while the control class achieved only low improvement (0.20 and 0.23, respectively).

Table 4. Normalized Gain (N-gain) of Participation and Critical Thinking

Variable	Class	Pre-test	Post-test	N-gain (Category)
Participation	Experimental	58.4	82.6	0.58 (Medium)
	Control	57.9	66.3	0.20 (Low)
Critical Thinking	Experimental	55.2	80.4	0.56 (Medium)
	Control	54.8	65.1	0.23 (Low)

Note. Categories follow Hake (1998): high > 0.70; medium 0.30–0.70; low < 0.30.

3.5 Results by Indicator

Table 5 shows that the experimental class outperformed the control class on every indicator of participation and critical thinking. The largest gaps appeared in idea contribution (17.7 points) and analysis (15.5 points).

Table 5. Post-test Mean Scores by Indicator

Indicator	Experimental	Control	Difference
Participation: Physical involvement	84.6	69.8	14.8
Participation: Idea contribution	79.8	62.1	17.7
Participation: Cooperation	84.5	68.4	16.1
Participation: Responsibility	81.5	64.9	16.6
Critical thinking: Interpretation	82.0	67.2	14.8
Critical thinking: Analysis	79.5	64.0	15.5
Critical thinking: Evaluation	78.6	63.1	15.5
Critical thinking: Inference	80.9	65.4	15.5
Critical thinking: Explanation	81.0	65.8	15.2

Note. Participation is expressed as a percentage; critical thinking is scored on a 0–100 scale.

4 Discussion

The findings confirm that the Group Investigation method was effective in enhancing both student participation and critical thinking skills in PJOK. Figure 1 illustrates that, although both classes began at almost identical levels, the experimental class improved by approximately 24 to 25 points, whereas the control class improved by only 8 to 10 points. Cohen's *d* values above 0.80 are classified as large effects [4]. This direction of results is consistent with the meta-analysis by Kyndt [13], which reported positive effects of face-to-face cooperative learning on learning outcomes, and with the review by Casey and Goodyear [3], which concluded that cooperative learning has the potential to achieve physical education outcomes in the physical, cognitive, social, and affective domains.

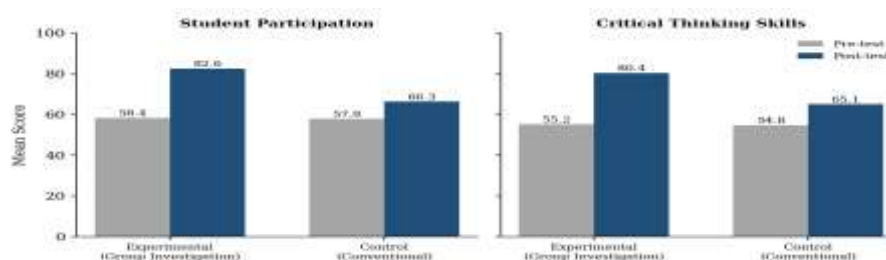


Figure 1. Comparison of Pre-test and Post-test Mean Scores of Participation and Critical Thinking

The higher participation in the experimental class can be explained by the structure of GI itself. Because every student holds a role in the investigation and must contribute to the group report, passive attitudes are discouraged, in line with the principles of positive interdependence

and individual accountability in cooperative learning [12], [17]. Slavin [18] explained that group work succeeds because of motivational incentives and cognitive elaboration when students explain ideas to peers, and Gillies [10] likewise emphasized that structured interaction increases student engagement. When participation is viewed as engagement comprising behavioral, emotional, and cognitive dimensions [9], GI promotes all three at once, as students move, discuss, and share responsibility for group outcomes. Similar benefits of cooperative structures for student engagement in physical education have been reported by Dyson [5] and Dyson and Casey [6], while Bailey [1] indicated that physical education holds considerable potential for students' social development when lessons are appropriately designed.

The improvement in critical thinking is consistent with the inquiry-based nature of GI. Stages such as planning the investigation, analyzing game situations, and presenting and defending findings require students to interpret information, analyze problems, evaluate alternatives, and justify conclusions, which correspond to the core skills described by Facione [8]. Ennis [7] emphasized that critical thinking develops when students are given opportunities to reason and decide what to believe or do, conditions that seldom arise in demonstration-based lessons. The result also aligns with evidence that active and collaborative learning outperforms teacher-centered instruction [15]. From a social constructivist perspective [19], group dialogue enables students to build understanding through interaction with more capable peers within their zone of proximal development. Within the framework of instructional models for physical education, GI also positions students as problem solvers rather than mere executors of instructions [14].

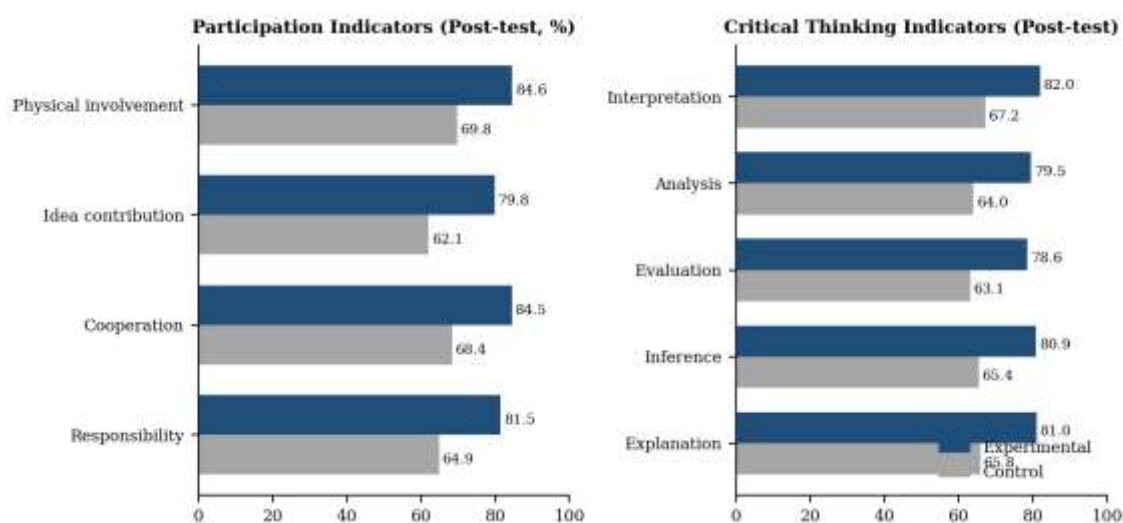


Figure 2. Post-test Mean Scores by Indicator of Participation and Critical Thinking

Figure 2 shows that the experimental class led on all indicators. The largest difference in idea contribution suggests that GI created space for students, including those who were usually quiet, to express opinions in small groups, as expected from the framework of Sharan and Sharan [16]. The relatively strong gains in analysis and inference indicate that investigating real game problems helped students connect observation, reasoning, and decision-making. In contrast, the conventional method, which emphasizes teacher demonstration and individual drills, provided

fewer opportunities for such interaction, which explains the low N-gain in the control class according to Hake's [11] categories.

Several limitations should be acknowledged. The quasi-experimental design did not allow full randomization of individuals, so threats to internal validity, such as initial differences between classes, cannot be entirely ruled out [2]. The study was also limited to one school and one topic (team-game strategy), and participation was assessed through observation, which may involve rater subjectivity. Future studies are recommended to involve multiple schools, different PJOK topics, longer intervention periods, and to examine retention and its effect on motor-skill outcomes.

5 Conclusion

Based on the results, it can be concluded that the Group Investigation cooperative learning method is effective in enhancing student participation and critical thinking skills in PJOK at SMP Negeri 2 Pegantenan in the 2026/2027 academic year. Students taught using GI achieved significantly higher post-test scores in participation and critical thinking than those taught using conventional methods, with very large effect sizes and a medium level of improvement. PJOK teachers are therefore encouraged to adopt Group Investigation, particularly for topics involving game strategy and problem solving, and to provide clear group roles and structured investigation guidelines to optimize its implementation.

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