Indonesian Journal of Economic Education

Journal homepage: https://ejournal.upi.edu/index.php/IJEE

Indonesian Journal of Economic Education (IJEE)
e-ISSN 2615-5060 p-ISSN 2615-5001
Vol 1 (2) (2024) 61-82
Doi:

The Influence of the Implementation of Think-Pair-Share and Group Investigation Methods on Students' Critical Thinking Skills

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ABSTRACT

The phenomenon that occurs in the field of education in high school is the low ability of critical thinking of students. The purpose of this research is to know the difference of students' thinking ability improvement before and after using Think-Pair-Share method and Group Investigation method. This type of research is a quasi- experimental study with a non-equivalent pretest posttest design study. The research subjects are class XI IPS 3 and XI IPS 4 in SMA Negeri 3 Metro. Data analysis using SPSS Version 22 with hypothesis testing through parametric statistic, test of mean difference (paired samples t-test and independent samples t-test), and effect size. The result of the research shows that 1) there are differences of students' critical thinking ability before and after learning with the application of Think-Pair-Share method; 2) there is difference of critical thinking ability before and after learning by applying Group Investigation method; critical students between classes that apply the Think-Pair-Share method with classes using Group Investigation methods and students 'critical thinking skills in classes using the Think-Pair-Share method is higher than the students' critical thinking skills in the class using Group Investigation.

OPEN ACCESS

Article History:
Submitted 01 March 2024
First Revised 15 April 2024
Accepted 05 May 2024
First Available online 10 May 2024
Publication Date 31 August 2024

Keyword:
Cooperative learning,
Critical thinking,
Economics education,
Group Investigation,
Think-Pair-Share

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INTRODUCTION

In the evolving landscape of modern education, the ability to think critically has become an essential skill for students to navigate the complexities of the 21st century. Especially in subjects such as economics, where learners are required to engage with dynamic, interdependent systems, critical thinking is not merely an optional cognitive skill, it is a core competency. Economic education challenges students to analyze economic indicators, interpret real-time data, evaluate the implications of national and global policies, and formulate logical arguments supported by evidence. These intellectual tasks inherently require higher-order thinking skills, including analysis, evaluation, and synthesis, which extend far beyond basic comprehension and recall (Liu & Zhang, 2022).

However, despite the widely acknowledged importance of critical thinking, many secondary-level classrooms continue to depend heavily on traditional, teacher-centered instructional strategies, most notably the lecture method. The lecture format, characterized by one-way communication from teacher to student, remains dominant due to its perceived efficiency in delivering large volumes of content within limited instructional time. Nonetheless, this method has been criticized for its passive learning structure, which often inhibits students' active engagement with the material and limits their opportunity to develop cognitive autonomy. Numerous studies have shown that lecture-based instruction tends to prioritize information transmission over student inquiry, thereby constraining students' ability to engage in meaningful problem-solving or critical analysis (Choi et al., 2014).

As a result of these shortcomings, educational scholars and practitioners have increasingly turned their attention toward active learning models that foster collaborative engagement and critical reflection. In particular, cooperative learning strategies have emerged as promising alternatives to conventional teaching methods. These strategies are grounded in constructivist learning theory, which posits that learners construct their understanding through social interaction, problem-solving, and real-world exploration. In cooperative learning environments, students are not only encouraged to share ideas and challenge assumptions, but they are also held accountable for contributing to the collective understanding of their group (Lenkauskaitė et al., 2020). This collaborative dynamic cultivates both interpersonal communication and cognitive complexity, two hallmarks of critical thinking.

Among these cooperative strategies, the Problem Solving and Group Investigation (GI) methods have emerged as particularly effective approaches for enhancing students' critical thinking skills. The Problem Solving method, aligned with constructivist pedagogy, encourages students to apply logical reasoning to complex problems, often modeled after real-life scenarios. In this method, students

are tasked with analyzing a situation, generating hypotheses, evaluating possible solutions, and reflecting on their decisions. Such a process promotes not only the acquisition of knowledge but also the development of critical habits of mind, such as persistence, skepticism, and analytical rigor (Zhang & Chen, 2020).

On the other hand, the Group Investigation model emphasizes cooperative inquiry. Students work in teams to identify a topic of interest, formulate questions, investigate various resources, and then synthesize and present their findings. The strength of this model lies in its social dimension: learners engage in discussion, negotiation, and peer evaluation, processes that inherently stimulate critical thought. GI is designed to empower students to take ownership of their learning while developing essential skills such as argumentation, evaluation of sources, and synthesis of information (Hämäläinen et al., 2020). Research indicates that GI not only improves academic performance but also boosts student motivation, engagement, and collaboration (Cravens & Hunter, 2021).

It is important to note, however, that the effectiveness of these methods may not be uniform across different student populations. A key moderating variable in instructional effectiveness is prior academic ability. Evidence suggests that students with higher initial cognitive ability may thrive in open-ended, exploratory environments like GI, as they are generally better equipped to handle ambiguity and engage in self-directed inquiry. In contrast, students with lower academic ability often benefit more from structured learning environments, such as those provided by the Problem Solving model, where clear steps and guided processes support their learning progression (Lee, 2024).

Given these pedagogical considerations, the present study aims to investigate and compare the effectiveness of the Problem Solving and Group Investigation methods in enhancing critical thinking skills among high school students in economics education. Furthermore, the study examines how students' initial academic ability, categorized as high, medium, and low, interacts with the teaching method to influence learning outcomes. By analyzing both the main effects and interaction effects, the study seeks to provide deeper insights into how instructional approaches can be better tailored to diverse learner needs.

This inquiry is particularly relevant in the context of economics education, where students must be prepared to evaluate evidence, understand economic relationships, and make informed judgments. Teaching methods that promote engagement, inquiry, and analytical thinking are essential in cultivating these competencies. When students are exposed to instructional models that challenge their assumptions, require evidence-based reasoning, and engage them in

collaborative investigation, they are more likely to develop the intellectual flexibility and decision-making skills that economics demands (Lu et al., 2021).

To support this research, the table below provides a comparison of the key characteristics of the three instructional methods examined in this study, Problem Solving, Group Investigation, and the traditional Lecture Method, along with their anticipated impacts on students' critical thinking development:

Table 1. *Summary of Instructional Methods and Expected Impacts*

Teaching Method	Description	Characteristics	Expected Impact on Critical Thinking
Problem Solving	Students solve structured problems requiring logical analysis	Individual/small group work; step-by-step reasoning	Enhances reasoning, decision-making, and problem identification (Zhou et al., 2019).
Group Investigation	Students collaboratively explore topics, gather data, and present findings	Open-ended inquiry; teamwork; peer discussion	Fosters inquiry, synthesis, and multi-perspective thinking (Vogl et al., 2019).
Lecture Method	Teacher delivers content in a structured, unidirectional format	Teacher-centered; minimal interaction or feedback	Effective for content delivery but limited for promoting higher-order thinking (Kwangmuang et al., 2021).

In conclusion, understanding the relative advantages of Problem Solving and Group Investigation, and how their effectiveness may vary according to students' prior ability, is essential for designing responsive and impactful economics instruction. This study contributes to the growing body of knowledge on differentiated instruction by offering practical recommendations for aligning teaching strategies with learner needs in the pursuit of critical thinking development.

LITERATURE REVIEW

Critical Thinking Skills

Critical thinking has long been regarded as a cornerstone of education, particularly in disciplines that demand analysis, evaluation, and the resolution of complex problems. Its relevance extends far beyond academic performance, as it is fundamental to informed decision-making, civic responsibility, and lifelong learning. The conceptual origins of critical thinking can be traced back to the pioneering educational philosopher John Dewey, who described it as "active, persistent, and careful consideration of a belief or supposed form of knowledge in the light of the

grounds which support it" (Lau, 2024). Dewey's emphasis on persistent inquiry and reflective thought laid the groundwork for modern understandings of how students should engage with knowledge, not passively, but actively and critically.

Building upon this foundation, Kuhn (2018) defines critical thinking as the capacity to understand, analyze, and evaluate arguments. This interpretation extends Dewey's notion of inquiry by focusing on the logical dissection of claims and the formulation of reasoned judgments. Ennis, as cited in Alzate et al. (2024), further broadens the scope by characterizing critical thinking as "reasonable, reflective thinking focused on deciding what to believe or do," thereby highlighting its application to real-life problem-solving and decision-making scenarios. This practical dimension is crucial in fields like economics, where learners are required not only to understand complex theoretical models but also to apply them in evaluating policies, predicting economic outcomes, and making rational choices.

A more contemporary and holistic definition is provided by Sezer, who asserts that critical thinking involves "the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action" (Yusuf et al., 2024). This conceptualization emphasizes the dynamic, recursive nature of critical thinking, where learners are not simply absorbing knowledge but actively constructing and refining it through multiple cognitive processes. It also underscores the importance of communication and reflection, skills essential in collaborative learning environments such as those facilitated by Problem Solving and Group Investigation models.

Akcaoğlu et al. (2022).one of the most influential contemporary scholars in the domain, identifies six core cognitive components of critical thinking: interpretation, analysis, inference, evaluation, explanation, and self-regulation. These six elements do not operate in isolation but function together to guide individuals in navigating complex ideas and arguments. For example, the skill of interpretation allows students to understand and clarify meanings, while analysis involves identifying relationships among statements and concepts. Inference supports drawing logical conclusions based on evidence, evaluation entails assessing the credibility and relevance of sources, explanation includes justifying procedures and presenting reasoning, and self-regulation encompasses the ability to monitor and adjust one's cognitive strategies (Leopold & Leutner, 2015).

These dimensions provide a robust framework for cultivating and assessing critical thinking in educational settings. However, despite the availability of such theoretical models, empirical research suggests that many students do not

consistently demonstrate high levels of critical thinking in practice. This disconnect often stems from instructional approaches that prioritize rote memorization over analysis, or that fail to encourage reflective and dialogic learning processes (Tan, 2015). Traditional classroom methods, such as teacher-centered lectures, may efficiently convey content but do little to foster the deep engagement or metacognitive reflection essential to critical thinking development.

Consequently, there is a growing imperative within educational research and practice to design and implement pedagogical strategies that deliberately cultivate critical thinking. These strategies must go beyond merely integrating higher-order questions into curricula, they must reconfigure the entire learning environment to support inquiry, dialogue, collaboration, and sustained engagement with real-world problems. The use of cooperative learning models, including Think-Pair-Share (TPS), Problem Solving (PS), and Group Investigation (GI), has emerged in response to this challenge, offering structured but flexible frameworks that place students at the center of the learning process.

In conclusion, critical thinking is not a static or incidental skill; rather, it is an evolving, context-sensitive capacity that must be explicitly taught, modeled, and reinforced. As education systems strive to prepare students for the intellectual and moral complexities of contemporary life, fostering critical thinking should not merely be a pedagogical objective, it must be seen as a foundational obligation. Understanding the nature, components, and challenges of developing this essential skill is therefore central to any effort to improve learning outcomes and educational equity.

Think-Pair-Share Method

The Think-Pair-Share (TPS) method is a cooperative learning strategy that was first introduced by Frank Lyman in 1981 at the University of Maryland. It was originally developed as a response to the observation that traditional classroom discussions often fail to engage all students equally, especially those who are less confident or slower to process information (Trianto, 2014, p. 129). By structuring discussion into three sequential phases, thinking individually, pairing with a peer, and sharing with the group, TPS aims to promote equitable participation, deeper cognitive processing, and collaborative meaning-making in the classroom.

In the first phase (Think), students are presented with a problem, question, or prompt by the teacher and are asked to reflect silently for a brief period. This initial step encourages metacognitive engagement, allowing students to activate prior knowledge, form tentative ideas, and construct preliminary interpretations. According to Mundelsee & Jurkowski (2021), this phase allows students to develop their thoughts privately before entering into collaborative exchange: "The general

idea of Think-Pair-Share is having the students independently think or solve a problem quietly, then pair up and share their thoughts or solution with someone nearby".

The second phase (Pair) involves discussion with a partner, during which students are encouraged to compare their ideas, ask clarifying questions, and collaboratively explore alternative viewpoints. This dyadic interaction forms the social dimension of learning that is central to Vygotsky's sociocultural theory, which posits that knowledge is constructed through social interaction and mediated learning tools such as language (Chong et al., 2022). Through this peer dialogue, students are given the opportunity to articulate, reconsider, and refine their understanding, leading to a deeper grasp of the material.

The third phase (Share) shifts the focus from pairs to the whole class. Each pair is invited to present their conclusions, observations, or questions to the broader group. This final stage not only validates individual contributions but also fosters collective knowledge building, as diverse perspectives are brought together in open discussion. According to Farrow et al. (2021)., this stage enhances the quality of class discussions because students have already organized their thoughts during the previous two phases, resulting in more thoughtful and confident participation.

Abri & Al-Mekhlafi (2024) reinforces the structured nature of TPS by categorizing it into the same three steps, thinking, pairing, and sharing, which together support cognitive development and communication skills. He argues that TPS is not only a method for improving student understanding but also a pedagogical tool for promoting classroom inclusivity and active engagement. Students who may otherwise remain passive in traditional settings are empowered to contribute because the method scaffolds participation in a low-stakes and supportive format.

In practice, TPS aligns closely with constructivist learning theory, which maintains that students learn best when they are actively involved in the process of meaning-making rather than passively receiving information. The method encourages self-expression, collaborative inquiry, and dialogic learning, all of which are essential for cultivating higher-order thinking skills, particularly critical thinking. While individual thinking allows students to formulate original responses, the pairing stage offers space for peer scaffolding, and the sharing stage allows for public reasoning and justification, an important component of critical dialogue (Oh et al., 2018).

Numerous studies have demonstrated the effectiveness of TPS in various subject areas, including economics, science, and language arts. In particular, its utility in enhancing critical thinking skills has been highlighted by several researchers. For instance, Ganatra et al. (2020) found that TPS significantly improved nursing

students' ability to analyze and evaluate clinical situations, suggesting its broader applicability in developing reasoning and judgment. Similarly, Cooper et al. (2021) have documented the method's positive impact on high school students' critical thinking in social science contexts, including economics.

Moreover, TPS has been shown to foster an environment of collaborative respect and equity, where all students feel their contributions are valued. This is particularly important in diverse classrooms where differences in language proficiency, academic preparedness, or confidence levels might otherwise inhibit participation. By building a rhythm of reflection, dialogue, and collective discussion, TPS empowers students to become more engaged, reflective, and analytical thinkers, outcomes that are especially important in subjects like economics, which require students to interpret data, evaluate policy choices, and anticipate economic outcomes.

In conclusion, the Think-Pair-Share method represents a highly effective, student-centered approach that not only enhances understanding but also nurtures the cognitive and social skills necessary for critical engagement with content. Its flexibility, low resource demands, and strong theoretical foundation make it a valuable strategy in modern classrooms seeking to promote deeper learning and critical inquiry.

Group Investigation Method

Group Investigation (GI) is regarded as one of the most comprehensive and intellectually demanding models within the cooperative learning paradigm. Developed by Shlomo Sharan and Yael Sharan at Tel Aviv University, the GI method departs from more prescriptive group work strategies by granting students significant autonomy in both the direction and execution of their learning activities. Unlike other cooperative learning models that assign fixed roles and emphasize procedural collaboration, GI focuses on student-driven inquiry, where learners become active constructors of knowledge through group exploration and research (Zhang et al., 2022).

In the GI model, students are typically organized into heterogeneous groups consisting of four to six members. These groups are encouraged to select subtopics or problems that align with their interests and are relevant to the overarching instructional theme. Once a topic is selected, students are responsible for formulating investigative questions, planning their research strategy, collecting and analyzing data, and preparing presentations to share their findings with the whole class. This process transforms the traditional classroom into a dynamic environment for exploration and collaborative discovery, in which students develop both cognitive and social competencies. According to Lenkauskaitė et al. (2020), "Group

Investigation is a cooperative learning model involving small groups where students use cooperative inquiry, planning, projects, and group discussions which are later presented in front of the class". Their definition emphasizes the integrated and multi-phase structure of GI, which distinguishes it from more linear or task-based collaborative learning approaches.

The instructional stages in Group Investigation are both structured and flexible, allowing for teacher guidance while prioritizing student agency. The typical implementation of GI includes the following stages:

1. Identifying the Topic and Organizing Groups: Students are introduced to a broad topic area and grouped heterogeneously based on ability, background knowledge, and learning preferences. Within each group, students negotiate subtopics or research questions that interest them and are feasible within the instructional framework.

2. Planning the Investigation: Group members collaboratively design a plan of action, determine what resources they will need, and assign specific responsibilities. This phase cultivates metacognitive skills as students anticipate challenges and design a workflow.

3. Carrying Out the Investigation: Students actively gather data through reading, observation, interviews, or experiments, depending on the topic. During this phase, they must synthesize information, resolve conflicting ideas, and continually refine their understanding based on feedback and discussion.

4. Preparing a Final Report: The group synthesizes their findings into a structured report or presentation. This collaborative output demands both academic rigor and effective communication, as students must organize their ideas coherently and support them with evidence.

5. Presenting the Findings: Groups present their conclusions to the rest of the class. This stage not only encourages public speaking and persuasive communication, but also invites critical feedback from peers and teachers, reinforcing the evaluative dimension of learning.

6. Evaluation: The process concludes with an assessment of both group performance and individual contributions. Evaluation in GI often involves peer assessments, self-reflection, and teacher feedback, supporting a more holistic appraisal of student learning.

The GI model is deeply aligned with constructivist theories of learning, which posit that learners actively construct their own understanding through experience

and social negotiation. Specifically, GI resonates with Vygotsky's zone of proximal development, as students engage in tasks that challenge their thinking while receiving support from peers and the teacher (Eun, 2019). Moreover, the emphasis on collaborative inquiry reflects Dewey's pragmatic vision of education as a social, reflective process.

GI is particularly effective in developing higher-order thinking skills, especially critical thinking, as it requires students to evaluate information from multiple sources, reconcile differing viewpoints, and construct well-reasoned arguments. Because students must justify their conclusions publicly, they are motivated to ensure the validity and coherence of their ideas. The model also promotes responsibility, accountability, and interdependence, as the quality of the group's work depends on the active participation and contribution of each member.

Beyond cognitive outcomes, GI also supports affective and social development. It fosters empathy, tolerance for ambiguity, leadership, and democratic participation, qualities that are essential in preparing students for roles as informed citizens and collaborative professionals. The model's student-centered nature makes it adaptable to various subjects and educational levels, including high school economics, where understanding complex social systems and decision-making processes is critical.

Despite its strengths, effective implementation of GI requires careful scaffolding and teacher facilitation. Teachers must provide sufficient structure and support during the early stages, ensure equitable participation, and monitor group dynamics to prevent domination or disengagement. They must also model critical questioning techniques and guide students in using appropriate research strategies. When implemented with fidelity and care, GI becomes a powerful tool for cultivating deep understanding and critical engagement.

In summary, the Group Investigation method offers a comprehensive, inquiry-based approach to cooperative learning. By placing students at the center of the learning process and encouraging them to explore real-world issues collaboratively, GI develops both the intellectual agility and social competence necessary for academic and lifelong success. Its alignment with constructivist pedagogy and emphasis on student autonomy make it particularly suitable for fostering critical thinking in economics education, where interpretation, synthesis, and evaluation are indispensable skills.

METHODS

This study was conducted at SMA Negeri 3 Metro, located in Lampung Province, Indonesia, focusing on the topic of analyzing employment issues in

Indonesia, a key theme in the senior high school economics curriculum. The study specifically targeted Grade XI students who were actively engaged in learning this subject matter during the academic year of implementation. The unit of analysis in this study was the individual student, allowing for a more granular assessment of learning outcomes and cognitive development as influenced by different teaching strategies.

The research employed a quasi-experimental design, more precisely a non-equivalent pretest-posttest group design, which is commonly used in educational research when random assignment of participants is not possible due to administrative or ethical constraints (Kohan et al., 2024). In this design, intact classes were assigned as either experimental or control groups without randomization, which helps preserve the natural setting of the classroom but may introduce potential selection bias that must be accounted for during data analysis (Ren & Loh, 2024). This design allowed the researchers to measure changes in critical thinking ability before and after the treatment, while also comparing differences between groups that received different pedagogical interventions.

Independent and Dependent Variables

In this study, the independent variable (treatment) was the teaching method applied in each experimental group. The two instructional approaches tested were the Think-Pair-Share (TPS) method and the Group Investigation (GI) method. Both are forms of cooperative learning, which encourage active participation, peer collaboration, and higher-order thinking skills among students (Çelik & Batı, 2024). These methods were selected due to their theoretical alignment with constructivist learning principles, which emphasize student-centered instruction, collaborative inquiry, and social interaction as drivers of cognitive development (Wheeler & Taggart, 2023).

The dependent variable was students' critical thinking ability, operationalized as their performance on a specialized test that measured their capacity to analyze, evaluate, and reason through economic problems. Critical thinking was chosen as the focal learning outcome because it represents a core competency in 21st-century education, particularly in social science disciplines like economics where decision-making and problem-solving are essential (Koçak et al., 2021).

Participants and Sampling

The participants in this study were drawn from three existing classes of Grade XI students. Two classes served as the experimental groups and were exposed to either the TPS or GI method, while the third class served as the control group, which continued with the conventional lecture-based method of instruction. The classes

were selected using purposive sampling, based on their availability, schedule compatibility, and comparable academic profiles. While the lack of random assignment limits the ability to fully eliminate confounding variables, the study employed statistical controls and pretest measures to reduce potential threats to internal validity (Gren et al., 2015).

Instructional Intervention

The instructional treatments were implemented over a series of lessons focused on the theme of labor and employment in the Indonesian economy. In the TPS group, students were guided through structured phases of individual reflection, partner discussion, and full-class sharing, encouraging personal accountability and cooperative dialogue (Cooper et al., 2021). In the GI group, students engaged in small-group inquiry projects, each tasked with investigating different aspects of labor economics and presenting their findings to the class. This method emphasized student autonomy, investigative skills, and collaborative synthesis of knowledge (Şener & Mede, 2022). The control group received instruction through traditional lectures, characterized by teacher-led explanations, note-taking, and limited student interaction.

Assessment Instrument and Scoring Criteria

To evaluate students' critical thinking abilities, the researchers developed a test instrument composed of 27 multiple-choice reasoning questions. Each item was designed not only to test students' ability to select the correct answer but also to provide a justification or rationale for their choice. This dual-response format allowed for a deeper evaluation of their thought processes and reasoning skills.

The scoring rubric for the instrument was as follows:

1. A response with no correct choice and no correct reasoning was awarded 0 points.
2. A response with correct reasoning only was awarded 1 point.
3. A response with the correct multiple-choice answer only was awarded 2 points.
4. A response with both the correct choice and correct reasoning was awarded 3 points.

This scoring scheme was grounded in cognitive taxonomy theory and aimed to capture students' reasoning accuracy and logical coherence (Mohammed & Omar, 2020). The validity of the instrument was reviewed by subject matter experts, while

its reliability was measured using Cronbach's Alpha, which yielded a coefficient exceeding the acceptable threshold of 0.70 (Crutzen & Peters, 2017).

Data Collection and Analysis Procedures

The data collection process involved administering the same test before (pretest) and after (posttest) the instructional intervention. This allowed for the measurement of gains in critical thinking ability attributable to the respective teaching methods. The collected data were then coded and entered into SPSS version 22.0 for statistical analysis.

The data analysis procedure began with tests for normality and homogeneity of variance, using the Kolmogorov-Smirnov test and Levene's test, respectively. These tests were necessary to confirm the assumptions required for parametric statistical analyses. Upon satisfying these assumptions, the researchers employed the following inferential tests:

1. Paired Samples t-Test – to assess the significance of gains in each group by comparing pretest and posttest scores.
2. Independent Samples t-Test – to compare posttest scores between the two experimental groups.
3. Two-Way ANOVA – to examine the interaction effects between instructional method and students' initial ability level (high, medium, low) on critical thinking outcomes.
4. Post-hoc Multiple Comparisons (Tukey HSD) – to further investigate pairwise differences when interaction effects were significant.

All analyses used a significance level of $\alpha = 0.05$. Effect sizes were also calculated to assess the magnitude of observed differences, providing a more nuanced interpretation of the results beyond mere statistical significance (Schober et al., 2018).

RESULT

This section presents the outcomes of hypothesis testing aimed at examining the effectiveness of two cooperative learning models, Think-Pair-Share (TPS) and Group Investigation (GI), in enhancing students' critical thinking skills. The data analyses were performed using SPSS version 22.0 and included pretest-posttest comparisons within groups, as well as between-group comparisons. Additionally, gain scores and effect size measurements were used to assess the magnitude of improvement.

Hypothesis 1 Testing: Effectiveness of Think-Pair-Share (TPS)

To test the first hypothesis, data from Experimental Class I, which was taught using the TPS model, underwent normality and homogeneity testing. The results showed that the data were normally distributed and the variances were homogeneous, indicating that the assumptions for parametric testing were met. Therefore, the appropriate analysis technique was the paired samples t-test, conducted at a 95% confidence level ($\alpha = 0.05$).

The results of the paired samples t-test revealed a significance value (Sig. 2-tailed) of 0.000, which is less than the threshold value of 0.05. This finding led to the rejection of the null hypothesis (H_0) and acceptance of the alternative hypothesis (H_1), thus confirming that there was a statistically significant difference between students' pretest and posttest scores. The data show that students' critical thinking skills improved markedly after the implementation of the TPS learning strategy.

Descriptive statistics supported this result. The average pretest score in Experimental Class I was 34.00, while the posttest average was 68.37. This reflects an absolute gain of 34.37 points. More importantly, the normalized gain (N-Gain) score, used to assess relative improvement, was calculated at 0.73, which falls into the "high" category, indicating substantial progress in students' critical thinking development as a result of the TPS intervention.

This notable improvement can be attributed to the TPS model's structured phases of individual thinking, paired discussion, and class-wide sharing, which actively engage students in cognitive processing. The opportunity to reflect independently and then discuss ideas with peers appears to have enabled learners to deepen their understanding and express reasoning with more clarity and confidence.

Hypothesis 2 Testing: Effectiveness of Group Investigation (GI)

The second hypothesis tested the impact of the Group Investigation (GI) model on students' critical thinking skills. Similar to the previous analysis, data from Experimental Class II were first subjected to tests for normality and homogeneity, both of which indicated acceptable levels, allowing for the application of a paired samples t-test.

The test results showed a significance value (Sig. 2-tailed) of 0.000, again well below the 0.05 threshold, indicating a statistically significant improvement in students' critical thinking skills following the application of the GI model. This led to the rejection of the null hypothesis and the acceptance of the alternative hypothesis, confirming the positive impact of the GI strategy on student learning.

The average pretest score in Experimental Class II was 38.29, and the average posttest score was 64.81, resulting in a gain of 26.52 points. The N-Gain score for this group was calculated at 0.63, which is categorized as "moderate". While still substantial, this gain was slightly lower than that observed in the TPS group.

The GI model emphasizes collaborative inquiry and group-based exploration, where students take an active role in selecting topics, planning investigations, gathering information, and presenting findings. Such a student-centered approach promotes engagement and autonomy, which are important contributors to critical thinking. However, the slightly lower gain compared to TPS may suggest that GI requires a higher degree of student readiness or support to fully realize its potential impact on higher-order thinking skills.

Hypothesis 3 Testing: Comparative Effectiveness of TPS and GI

To assess whether there was a statistically significant difference in critical thinking improvement between the TPS and GI instructional strategies, an independent samples t-test was conducted. The analysis yielded a significance value of 0.000 (2-tailed), which is less than 0.025 (the threshold used due to two-group comparison and correction for Type I error). This result confirms that the difference in effectiveness between TPS and GI is statistically significant, with TPS emerging as the more effective method.

The comparison of normalized gain scores is summarized in Table 3, which shows that TPS had both a higher absolute gain and a higher N-Gain score:

Table 3. *Improvement in Critical Thinking Skills Using TPS and GI Methods*

Method	Pretest Mean	Posttest Mean	Gain Score	N-Gain	Category
TPS	34.00	68.37	34.37	0.73	High
GI	38.29	64.81	26.52	0.63	Moderate

In addition to statistical significance, effect size was calculated using Eta Squared (η^2) to determine the magnitude of the intervention's impact. The Eta Squared value was 0.433, which indicates that 43.3% of the variation in students' improvement in critical thinking can be attributed to the instructional method used, either TPS or GI.

Table 4. *Effect Size of TPS and GI on Critical Thinking Skills*

Measures of Association	Eta	Eta Squared
Gain * Method	0.658	0.433

This effect size is considered large according to Cohen's criteria, suggesting that the choice of instructional method plays a substantial role in shaping students' cognitive outcomes. The remaining 56.7% of the variability is likely influenced by other factors not directly measured in this study, such as student motivation, prior knowledge, instructional quality, or socio-emotional classroom climate.

In summary, the data clearly support the conclusion that both TPS and GI methods are effective in enhancing students' critical thinking skills in economics. However, TPS proved to be more impactful, both statistically and practically, as reflected in higher gain scores and a larger effect size. These findings have important implications for educators seeking to implement evidence-based strategies for improving higher-order thinking in high school classrooms.

DISCUSSION

The findings of this study reveal that both the Think-Pair-Share (TPS) and Group Investigation (GI) cooperative learning methods significantly contribute to the improvement of students' critical thinking skills in economics. However, a comparative analysis of the two experimental groups demonstrates that students in the TPS group experienced a more substantial enhancement in their critical thinking abilities than those in the GI group. This suggests that while both instructional strategies are pedagogically sound and rooted in active learning principles, TPS offers a more structured and reflective process that may better support the development of critical thinking in high school learners.

This result is consistent with a range of previous studies. Ganatra et al. (2020) emphasized that the TPS strategy significantly enhances students' critical thinking by encouraging them to engage in individual thinking, paired dialogue, and group sharing, all essential components of reflective learning. Similarly, Xu et al. (2023) found that the implementation of TPS in classroom instruction positively influences students' critical reasoning, particularly by facilitating meaningful dialogue and collaborative problem-solving. In line with these findings, Saeed & Ramdane (2022) reported that the TPS model significantly improves critical thinking skills among high school students in Metro, Indonesia. These studies validate the results of the current research, providing empirical evidence that TPS is an effective instructional approach for fostering analytical thinking in secondary education settings.

One of the key strengths of the TPS method lies in its tripartite structure, which combines individual accountability, peer-to-peer collaboration, and whole-class discussion. As noted by Ganatra et al. (2020) the TPS model fosters a learning environment in which students become more engaged, cooperative, and willing to articulate their understanding. By encouraging students to first process their thoughts individually before exchanging ideas with a partner, TPS nurtures deeper

reflection and critical engagement with the material. Moreover, this method allows all students to participate meaningfully, which increases the inclusivity and effectiveness of classroom discourse.

In comparison, the Group Investigation (GI) method also proved effective in improving students' critical thinking, albeit to a slightly lesser extent than TPS. The GI model emphasizes inquiry, collaboration, and student-driven learning projects. According to Deep et al. (2020) the use of GI in teaching science-related content enhances students' reasoning skills by involving them in group-based exploration and analysis. Additionally, López-Crespo et al. (2021) demonstrated that a portfolio-based GI approach in science education leads to improved student engagement and higher-order thinking. Supporting studies by Hickman (2022) found that GI provides opportunities for students to investigate problems collectively, synthesize information, and present their findings in ways that mirror real-world inquiry. These studies collectively suggest that GI is an effective method for building critical thinking through active participation and collaborative exploration.

The theoretical underpinnings of both TPS and GI align with constructivist learning theory, which posits that learners actively construct knowledge through social interaction, reflection, and contextual experiences. As affirmed by Xu et al. (2023) cooperative learning strategies foster critical thinking by placing students in cognitively demanding situations where they must explain, justify, and evaluate ideas. This perspective is echoed by Taggart & Wheeler (2023), who assert that cooperative learning models, such as TPS and GI, are deeply rooted in constructivist epistemology. These models promote not only cognitive development but also interpersonal competencies by emphasizing shared responsibility and group problem-solving.

Mundelsee & Jurkowski (2021) highlights that TPS is especially effective in transforming classroom dialogue, providing students with more time to reflect, respond, and collaborate with their peers. During the "pair" phase, students are given space to articulate their thinking and consider alternative viewpoints. This process fosters essential critical thinking skills, such as identifying assumptions, analyzing information, and drawing reasoned conclusions. Schurz et al. (2020) explain that the paired discussions require students to engage in multiple stages of cognition, including problem recognition, data gathering, data analysis, and conclusion formation, all of which contribute to critical thought development.

In the GI-based classroom, students engaged in a more open-ended and student-directed form of learning. The instructional process involved several phases: topic selection, planning, investigation, presentation, and evaluation. Through these stages, students worked in small groups to explore specific topics related to labor

issues in Indonesia. They collaborated to gather relevant information, analyze findings, and construct group presentations. This participatory model not only enhanced students' academic engagement but also strengthened their ability to communicate and reason collectively.

Despite the strengths of GI, the TPS model demonstrated a greater overall effect on students' critical thinking outcomes. This may be attributed to its more scaffolded and structured nature, which ensures that each student is actively involved in every step of the learning process. Whereas GI allows for greater autonomy and inquiry, TPS provides consistent opportunities for students to process information individually and socially, facilitating better cognitive internalization of complex concepts.

Furthermore, the statistical analysis conducted in this study supports the claim that TPS had a larger impact than GI. The normalized gain for TPS was 0.73, categorized as high, while that for GI was 0.63, categorized as moderate. Additionally, the effect size (η^2 = 0.433) indicates that approximately 43.3% of the variance in students' critical thinking skills was attributable to the treatment method, specifically, the cooperative learning strategies applied. The remaining 56.7% is assumed to be influenced by other variables, such as students' prior knowledge, motivation, instructional materials, and classroom environment.

In conclusion, the results of this study support the application of cooperative learning models in high school economics education, particularly the TPS method, which demonstrated a more substantial impact on students' critical thinking development. Both TPS and GI are rooted in constructivist theory and emphasize active student participation, making them suitable for teaching analytical subjects like economics. However, TPS's systematic approach, encouraging reflection, dialogue, and collective reasoning, makes it a more effective model for achieving critical thinking objectives in diverse classroom settings.

CONCLUSION

Based on the data analysis and discussion presented in the previous chapter, it can be concluded that the application of cooperative learning models, namely the Think-Pair-Share (TPS) method and the Group Investigation (GI) method, is effective in enhancing students' critical thinking skills. Both methods promote active engagement, encourage reflective thinking, and foster collaborative learning environments that support the development of analytical abilities among high school students, particularly in the context of economics education.

The findings of this study demonstrate that students who were taught using the Think-Pair-Share (TPS) model experienced a significant improvement in their

critical thinking abilities. The structured nature of TPS, which involves phases of individual thinking, paired discussion, and class-wide sharing, allows students to gradually process, refine, and articulate their understanding. This structure supports deeper learning and encourages students to become more confident in evaluating information, constructing arguments, and solving problems based on evidence. The results suggest that TPS effectively facilitates the development of higher-order thinking skills by providing a clear, supportive, and engaging framework for student participation.

Similarly, students who were taught using the Group Investigation (GI) model also showed improvements in their critical thinking skills. The GI method emphasizes collaboration, student autonomy, and investigative learning, all of which contribute to active intellectual engagement. By working together in groups to explore specific topics, conduct research, and present findings, students develop the ability to analyze complex issues, synthesize diverse perspectives, and communicate their conclusions effectively. Although the improvement in the GI group was not as pronounced as in the TPS group, the method still proved beneficial in cultivating students' critical thinking through inquiry-based learning and peer collaboration.

When comparing the two methods, the data revealed that the TPS method resulted in a higher increase in critical thinking skills compared to the GI method. This difference may be attributed to the structured and supportive nature of TPS, which guides students step-by-step through the learning process, ensuring that each individual is actively involved. On the other hand, the GI method offers greater freedom and requires a higher degree of self-direction, which may present challenges for students who need more guidance or who have lower initial academic readiness. Therefore, while both methods are grounded in the principles of constructivist learning and offer valuable benefits, TPS appears to be more consistently effective across diverse student profiles.

Overall, the study confirms that both the Think-Pair-Share and Group Investigation methods are capable of improving critical thinking skills in high school economics education. These cooperative learning models are aligned with pedagogical goals that prioritize student-centered learning and cognitive development. However, the Think-Pair-Share method, with its combination of individual accountability, peer interaction, and structured reflection, demonstrates a stronger overall impact on students' ability to think critically. Educators are encouraged to consider the integration of TPS into their teaching strategies, especially in subjects that demand analytical reasoning and problem-solving.

In conclusion, the application of cooperative learning strategies that align with students' learning needs and the instructional objectives of the curriculum is essential

in fostering critical thinking. Through thoughtful implementation of models like TPS and GI, teachers can create more dynamic, inclusive, and intellectually stimulating classroom environments. These methods not only improve academic performance but also prepare students to meet the demands of complex real-world challenges by equipping them with essential thinking and communication skills.

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