



THE EFFECT OF TEAMS GAMES TOURNAMENT (TGT) COOPERATIVE LEARNING AND QUARTET CARD MEDIA ON ELEMENTARY STUDENTS' IPAS LEARNING OUTCOMES

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Abstract

This study aimed to analyze the effect of the Cooperative Learning model of the Teams Games Tournament (TGT) type and the use of quartet card media on the learning outcomes of fourth-grade students in social science (IPAS) subjects, both partially and simultaneously. This study used a quantitative approach with a quasi-experimental design. The study population was all fourth-grade students of SD Negeri Gugus 01, Panggungrejo District, in the 2025/2026 academic year, totaling 120 students, with a sampling technique using total sampling. The experimental group consisted of 60 students who received treatment with the TGT model assisted by quartet card media, and the control group consisted of 60 students with conventional learning. The data collection instrument was an IPAS learning outcome test that had been tested for validity (r count > 0.361) and reliability ($KR-20 = 0.901$). Data analysis techniques used inferential statistical tests including normality tests, homogeneity tests, linear regression tests, and hypothesis tests with the help of SPSS 25. The results showed: (1) partially the TGT learning model had a significant effect on science learning outcomes with a regression coefficient of 1.546 and a significance value of 0.000 (< 0.05); (2) partially the use of quartet card media had a significant effect on science learning outcomes with a regression coefficient of 0.370 and a significance value of 0.000 (< 0.05); (3) simultaneously the TGT learning model and the use of quartet card media had a significant effect on science learning outcomes with a calculated F value of 48.674 ($p=0.000$) and a coefficient of determination (R^2) of 0.631, which means that both variables contributed 63.1% to science learning outcomes. The effect size (Cohen's f^2) was 1.71, indicating a very large practical impact according to Cohen's convention. The findings of this study prove that the application of a game-based cooperative learning model supported by interesting learning media can increase student involvement and science learning outcomes. Therefore, the TGT learning model assisted by quartet card media is recommended as an alternative IPAS learning strategy in elementary schools.

Keywords: Card Media, Cooperative Learning, Elementary Education, IPAS Learning Outcomes, Quartet, Quasi-Experimental Study, Teams Games Tournament

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INTRODUCTION

مقدمة

Elementary education is a crucial foundation for shaping character and developing students' potential. Natural and Social Sciences (IPAS) in elementary schools play a role in equipping students to understand the natural and social environment in an integrated manner (Wijayanti & Ekantini, 2023). Learning outcomes are an indicator of the success of the educational process, reflecting students' achievements after participating in learning (Yandi et al., 2023).

However, the reality in the field shows that IPAS learning is often monotonous and uninteresting. Teachers tend to use lecture methods without varied models and minimal utilization of learning media (Hasanah and Izzah, 2023). Similar conditions were observed for fourth-grade students at SD Negeri Gugus 01, Panggungrejo District. Based on the initial observation data, out of 120 students, 72 (59%) had not achieved the minimum completeness criteria in the IPAS subject.

To overcome these problems, learning innovation is needed. The Cooperative Learning model type, Teams Games Tournament (TGT), is one alternative that can be applied. TGT is designed as learning while playing through games and academic tournaments, in accordance with the characteristics of elementary school students who enjoy games (Adiputra and Heryadi 2021; Permadi et al. 2023). This model has proven effective in improving learning outcomes in various educational contexts (Ali et al., 2024; Ali et al., 2021; Mertayasa, 2022).

In addition to the learning model, the use of appropriate media contributes to learning outcomes. Quartet card media is a visual medium that combines images and text and can be played like card games in general (Samsiyah et al., 2021). This media has advantages: increasing interest in learning, suitable for the characteristics of students who enjoy playing while learning, easy to carry, and does not require electricity (Yaumi, 2019). Research shows that quartet card media is effective in improving understanding and learning outcomes in IPAS (Amalia et al., 2024; Giwangsa 2021).

While previous studies have separately examined the effectiveness of the Teams Games Tournament (TGT) model (Mertayasa, 2022; Nurhasanah et al., 2024) and the use of quartet card media (Giwangsa, 2021; Amalia et al., 2024) in improving elementary students' learning outcomes, very few have investigated their combined effect within the context of the Merdeka Curriculum currently implemented in Indonesia. Furthermore, existing research rarely reports the practical effect size of such interventions, making it difficult to assess their real-world educational significance. This study provides a novel contribution by: (1) integrating the TGT model with quartet card media as a unified pedagogical strategy in IPAS (Integrated Science and Social Studies) learning; (2) implementing this innovation within the framework of the Merdeka Curriculum, which emphasizes student-centered, project-based, and differentiated learning; (3) reporting Cohen's f^2 effect size (1.71) to quantify the practical impact beyond statistical significance. Unlike prior studies that focused on conventional curricula or isolated variables, this research demonstrates that the synergy between TGT and quartet card media under the Merdeka Curriculum yields a very large practical effect (63.1% contribution) on learning outcomes, offering empirical evidence for curriculum-aligned innovative teaching in elementary schools.

This study aims to analyze: (1) the simultaneous effect of the TGT model and the use of quartet card media on IPAS learning outcomes; (2) the partial effect of the TGT model on IPAS learning outcomes; and (3) the partial effect of using quartet card media on IPAS learning outcomes of fourth-grade students at SD Negeri Gugus 01, Panggungrejo District.

METHOD

منهج

Research Design

This study adopted a quantitative approach with a quasi-experimental design. The design used is The Non-equivalent Pretest-Posttest Control Group Design, where the experimental and control groups are not randomly selected (Sugiyono, 2019).

Population and Sample

The study population was all fourth-grade students of SD Negeri Gugus 01, Panggunrejo District, in the 2025/2026 academic year, totaling 120 students. Total sampling (also known as census sampling) was employed, meaning that the entire population was included as the sample because the population size was manageable and all members met the inclusion criteria (Notoatmodjo, 2018). This approach ensures representativeness and eliminates sampling bias. The experimental group consisted of 60 students (SDN Kandangsapi I, SDN Kandangsapi II, and SDN Kebonsari Class IV B) who received treatment with the TGT model assisted by quartet card media. The control group consisted of 60 students (SDN Kebonsari Class IV A, IV C, and SDN Karanganyar) with conventional learning.

Treatment Implementation Protocol

The experimental intervention consisted of six meetings (3 weeks, 2 meetings per week, each 2 × 35 minutes). The implementation protocol followed the five TGT syntaxes (Slavin, 2015) integrated with quartet card media:

Phase 1: Class Presentation (10 minutes) – The teacher delivered the core IPAS material (Topic: Indonesiaku Kaya Budaya) using video and visual aids. Students were encouraged to ask questions.

Phase 2: Team Study (20 minutes) – Students were divided into heterogeneous groups of 4–5 members (mixed academic ability and gender). Each group received a set of quartet cards containing images and short descriptions of local wisdom, traditional foods, dances, and customs from Pasuruan and other regions. Group members studied together, discussed, and helped each other master the content.

Phase 3: Games (15 minutes) – Within each group, students played a quartet card game. The goal was to collect complete sets (four related cards) by asking other members for specific cards. Each correct set earned points. The teacher monitored and facilitated.

Phase 4: Tournament (15 minutes) – Representatives from each group competed in an academic tournament using additional quartet cards and quiz questions. Students were seated at tournament tables with peers of similar ability. Points from the tournament were added to the group's total score.

Phase 5: Team Recognition (5 minutes) – The teacher announced the winning groups based on accumulated scores. Teams achieving high scores received certificates or simple rewards (e.g., praise, stickers). Positive reinforcement was emphasized to motivate all students.

The control group received conventional instruction: teacher-centered lectures, question-and-answer sessions, and individual assignments without TGT or quartet card media, following the same curriculum and time allocation.

Instrument and Data Collection

The data collection instrument was an IPAS learning outcome test (20 multiple-choice questions) that was tested for validity and reliability. Validity testing used product-moment correlation with an r table of 0.361 ($N=30$). All 20 items were declared valid ($r > 0.361$). Reliability testing using the KR-20 formula obtained a value of 0.901 (very high). In addition to the test, questionnaires were used to measure the implementation of the TGT model and the use of quartet card media.

Data Analysis

Data analysis techniques included: (1) prerequisite tests (normality, linearity, multicollinearity, heteroscedasticity); (2) hypothesis testing using simple and multiple linear regression with the help of SPSS 25 at a significance level of 0.05. To assess the practical significance of the findings, effect size (Cohen's f^2) was calculated using the formula: $f^2 = R^2 / (1 - R^2)$. According to Cohen (1988), $f^2 \geq 0.02$ indicates a small effect, $f^2 \geq 0.15$ a medium effect, and $f^2 \geq 0.35$ a large effect.

RESULT | نتائج

Descriptive Statistics

The results of the descriptive analysis showed an increase in learning outcomes in both groups. The average pretest score of the experimental group was 58.50, which increased to 82.17 in the posttest. The control group increased from 55.31 to 70.56% after the intervention. The increase in the experimental group was greater than that in the control group.

Table 1. Pre-test and Post-test Score Comparison

Group	Pretest Mean	Posttest Mean	Gain
Experimental	58,5	82,17	+23.67
Control	55,31	70,56	+15.2

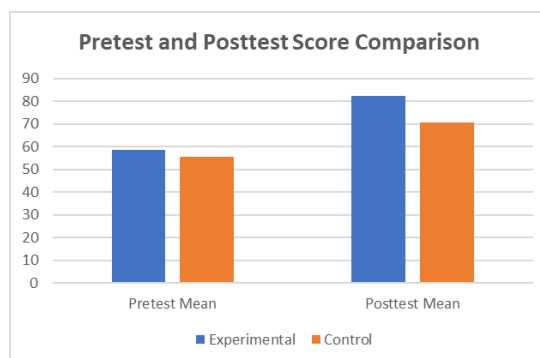


Figure 1. Prtest and Post-test Score Comparison

Questionnaire Results: Implementation Fidelity

Table 2. Frequency Distribution of TGT Model Implementation

Criterion	Frequency (f)	Percentage (%)	Estimated Number of Students (N=60)
Never (TP)	0	0%	0
Rarely (JR)	4	0.67%	0
Sometimes (KD)	47	7.83%	5
Often (SR)	221	36.83%	22
Always (SL)	328	54.67%	33
Total	600	100%	60

*Note: Total frequency (600) = 10 items × 60 students. Percentages calculated per item response. *

The majority of students perceived the TGT model as being implemented "Often" (36.83%) or "Always" (54.67%). Only 7.83% reported "Sometimes," and virtually none reported "Rarely" or "Never." This indicates high implementation fidelity across all five TGT phases (class presentation, team study, games, tournament, team recognition).

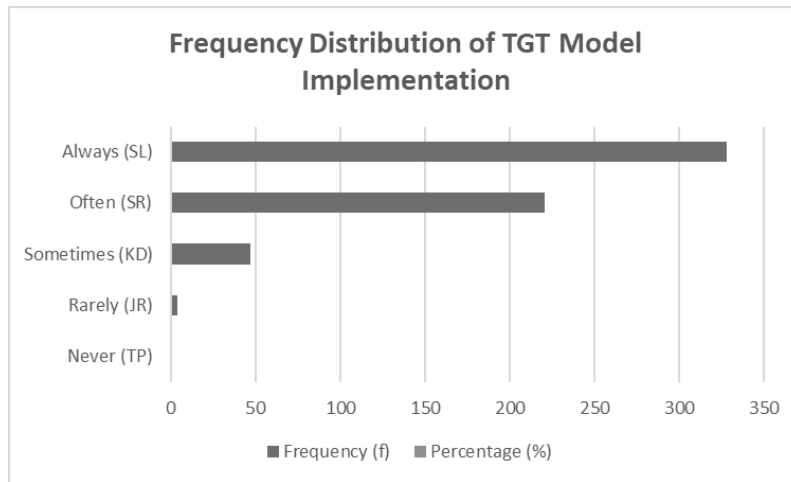


Figure 2. Frequency Distribution of TGT Model Implementation

Table 3. Frequency Distribution of Quartet Card Media Implementation

Criterion	Frequency (f)	Percentage (%)	Estimated Number of Students (N=60)
Strongly Disagree (STS)	1	0.10%	0
Disagree (TS)	4	0.42%	0
Neutral (N)	56	5.83%	4
Agree (S)	371	38.65%	23
Strongly Agree (SS)	528	55.00%	33
Total	960	100%	60

*Note: Total frequency (960) = 16 items × 60 students. *

For quartet card media, 93.65% of responses were in the "Agree" or "Strongly Agree" categories. Only 0.52% were negative, and 5.83% were neutral. This overwhelmingly positive reception confirms that students found the cards engaging, helpful for understanding, and easy to use.

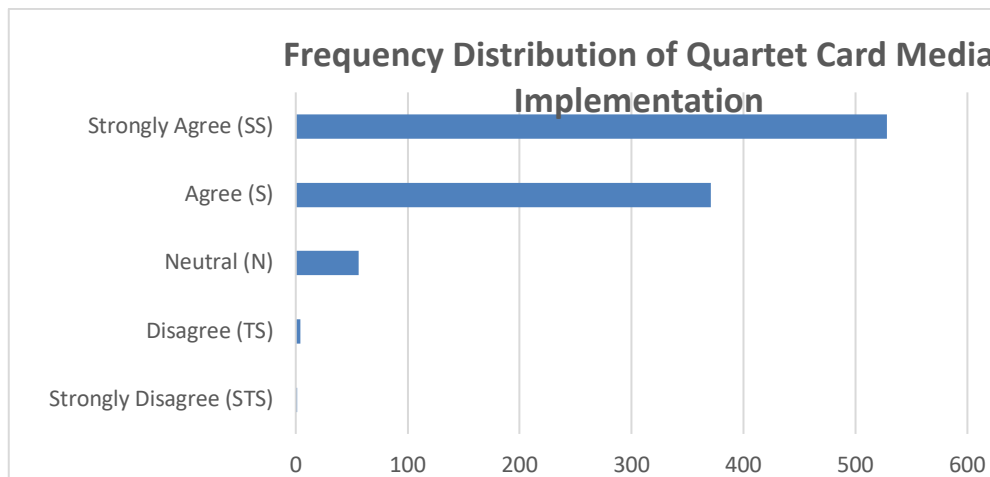


Figure 2. Frequency Distribution of Quartet Card Media Implementation

Interpretation

The high percentage of "Always" (54.67% for TGT) and "Strongly Agree" (55.00% for quartet cards) responses indicates that the intervention was delivered as designed and well-received by students. The very low rates of negative or neutral responses suggest that both the cooperative learning structure and the visual media were appropriate for fourth-grade students. These

findings strengthen the internal validity of the study, as high implementation fidelity supports the attribution of learning gains to the intervention rather than to inconsistent delivery.

Prerequisite Test Results

The normality test using the Kolmogorov-Smirnov test showed a significance value of 0.200 (>0.05); therefore, the data were normally distributed. The linearity test obtained an F lack-of-fit value of 1.237 (sig. 0.289 >0.05), indicating a linear relationship between the variables. The multicollinearity test showed a tolerance value of 0.643 and a VIF of 1.554 (<10), indicating no multicollinearity. The heteroscedasticity test showed significance values of 0.180 for the TGT variable and 0.289 for the quartet card media variable (>0.05), indicating no heteroscedasticity.

Hypothesis Testing

Table 4. Results of Partial and Simultaneous Regression Tests

Variable	Regression	Coefficient	t count	Sig.	Description
TGT (X1)	1.546	9.844	0.000		Significant
Quartet Card Media (X2)	0.370	4.850	0.000		Significant
F Test	F count =	48.674	0.000		Significant
R Square		0.631			

Source: Primary data processed, 2026

The partial test results show that the TGT model has a significant effect on IPAS learning outcomes, with a regression coefficient of 1.546 and a significance value of 0.000 (<0.05). The use of quartet card media also had a significant effect, with a regression coefficient of 0.370 and a significance value of 0.000 (<0.05).

Interpretation a regression coefficient

For every 1 unit increase in the TGT variable, the Y variable (e.g. learning outcomes, performance, or other dependent variables) will increase by 1.546 units, assuming the other variables in the model remain constant (*ceteris paribus*).

The simultaneous test results (F Test) obtained an F count of 48.674 $>$ F table 3.1588 with a significance of 0.000 (<0.05). This shows that the TGT model and quartet card media together have a significant effect on IPAS learning outcomes.

The coefficient of determination (R^2) of 0.631 indicates that the TGT model and quartet card media contribute 63.1% to IPAS learning outcomes, while the remaining 36.9% is influenced by other variables outside this study's scope.

DISCUSSION

مناقشة

Theoretical Mechanisms Underlying the Effects

The significant effects of the TGT model and quartet card media on IPAS learning outcomes can be explained through three interconnected theoretical mechanisms: cognitive elaboration, social interdependence, and dual coding.

First, cognitive elaboration (Webb, 2009) occurs when students explain concepts to peers during team study. In TGT, group members must articulate their understanding of IPAS material—such as the causes of cultural diversity or the function of local wisdom in environmental conservation—to ensure their team succeeds in the tournament. This process forces students to reorganize and deepen their knowledge, moving from passive reception to

active construction. Quartet cards serve as cognitive scaffolds, providing visual and textual cues that reduce cognitive load and facilitate elaboration.

Second, social interdependence theory (Johnson & Johnson, 2009) posits that positive interdependence (i.e., "sink or swim together") creates promotive interaction. In TGT, each student's tournament score contributes to the team total, creating mutual responsibility. This structure encourages helping behaviors, peer tutoring, and academic discussion—mechanisms that are often absent in conventional, individualistic classrooms. The quartet card game further reinforces interdependence because players must request specific cards from teammates, fostering communication and negotiation.

Third, dual coding theory (Paivio, 1986) explains the advantage of quartet card media. IPAS material often involves both verbal (e.g., definitions, historical facts) and non-verbal (e.g., maps, cultural artifacts) information. Quartet cards present information through two channels—visual (images of traditional houses, dances, tools) and verbal (short descriptions). This dual representation creates two mental traces, enhancing encoding, storage, and retrieval. Students in the experimental group reported that the cards helped them "remember the material more easily" (mean 4.68), consistent with dual coding predictions.

Addressing Specific Challenges of IPAS Learning in Elementary Schools

IPAS (Ilmu Pengetahuan Alam dan Sosial) as an integrated subject in the Merdeka Curriculum presents unique challenges that the TGT-quartet card combination effectively addresses.

Challenge 1: Abstract and Cross-Domain Concepts – IPAS requires students to connect natural phenomena (e.g., weather patterns, ecosystems) with social phenomena (e.g., how communities adapt to their environment). For example, understanding why certain local wisdom (such as Petik Laut in Pasuruan) exists requires linking ecological knowledge (fish migration, tides) with cultural practices. Conventional lectures often present these domains separately. TGT with quartet cards bridges this gap: cards can include both scientific facts (e.g., "Overfishing reduces fish populations") and social facts (e.g., "Petik Laut is held to express gratitude and request safety"). During team discussions and tournaments, students actively integrate these two dimensions, mirroring the integrated nature of IPAS.

Challenge 2: High Memorization Load – IPAS at the elementary level involves remembering numerous names (traditional dances, foods, houses), locations (provinces), and functions. Rote memorization is ineffective and demotivating. The quartet card game transforms memorization into a meaningful, playful activity. Students repeatedly encounter the same information while trying to complete a set (e.g., four cards of traditional houses from four provinces). This spaced repetition within a game context enhances retention without drudgery.

Challenge 3: Low Engagement with Local Wisdom – Students often perceive local cultural material as irrelevant or boring. The quartet cards used in this study prominently featured local wisdom from Pasuruan (Petik Laut, Praonan, Bipang Jangkar, Pencak Silat Kuntu Mancilan), making the curriculum personally meaningful. The competitive tournament element increased excitement and personal investment. The questionnaire results (84–86% positive) confirm that students found the material engaging.

Challenge 4: Heterogeneous Student Abilities – IPAS classrooms include students with varying prior knowledge and reading levels. TGT's heterogeneous grouping ensures that stronger students tutor weaker ones, while the quartet cards' visual component supports struggling

readers. The tournament tables are designed to match students of similar ability, so every student has a fair chance to contribute, preventing discouragement.

Limitations of the Study

Despite the robust findings, this study has several limitations that should be acknowledged.

First, non-random assignment – Although total sampling was used, the quasi-experimental design (non-equivalent pretest-posttest control group design) did not randomly assign students to conditions. Thus, unmeasured confounding variables (e.g., differences in teacher enthusiasm, classroom climate, or prior exposure to cooperative learning) might have influenced the results. Randomization was not feasible due to existing class structures, a common constraint in school-based research.

Second, short intervention duration – The treatment was implemented over only six meetings (three weeks). While the effect size was very large ($f^2 = 1.71$), it remains unknown whether the effects are sustained over a full semester or academic year. Longitudinal studies are needed to assess retention and decay of learning gains.

Third, limited generalizability – The study was conducted in one school cluster (Gugus 01) in Pasuruan, East Java, with a specific cultural context. The local wisdom content was tailored to Pasuruan. Replication in other regions with different cultural materials and in urban vs. rural settings is necessary before broad generalization.

Fourth, reliance on self-report for implementation – The implementation fidelity questionnaires were completed by students, not independent observers. Although student perceptions are valuable, they may be influenced by social desirability or lack of comparative experience. Future studies should include classroom observations or video recordings with structured fidelity checklists.

Fifth, outcome measures focused on cognitive domain only – This study measured only cognitive learning outcomes (knowledge and comprehension). IPAS also aims to develop affective outcomes (appreciation of diversity, environmental awareness) and psychomotor skills (e.g., creating cultural products). Future research should include multiple outcome types to capture the full impact of TGT and quartet card media.

Sixth, no control for teacher effects – Although the same teacher (first author) delivered instruction in both groups to maintain consistency, this introduces potential experimenter bias. Replication by independent teacher's blind to the study hypotheses would strengthen causal claims.

Seventh, potential novelty effect – The large effect size may partly reflect students' excitement about a new, game-based approach rather than the intrinsic effectiveness of TGT or quartet cards. A longer-term study with repeated measures could disentangle novelty from genuine pedagogical value.

Simultaneous Effect of TGT Model and Quartet Card Media on Learning Outcomes

The research results prove that the application of the TGT model combined with quartet card media has a significant effect on IPAS learning outcomes. This finding aligns with the research by Azizatul Nisaak et al. (2023), who stated that the integration of the TGT model with quartet card media creates active and participatory learning. Cooperative learning encourages social interaction and teamwork, while quartet card media helps visualize material, making it easier to understand.

The contribution of 63.1% shows that the combination of both variables optimizes learning outcomes. This is consistent with constructivism theory, which emphasizes the active role of students in building knowledge through experience and social interaction (Agustyaningrum & Pradanti, 2022). The TGT model provides space for discussion and healthy competition, while quartet card media presents material according to the characteristics of elementary school students (Permadi et al., 2023).

Effect of TGT Model on Learning Outcomes

The TGT model is proven to have a significant effect on IPAS learning outcomes. The application of this model encourages students to learn actively through group work and structured academic games. Each member is responsible for the group's success, resulting in more equitable learning participation. The competition situation in tournaments increases learning motivation (Yoga Amanda et al., 2024; Slavin, 2015).

This finding supports the research results of Mertayasa (2022) showing an increase in social studies learning outcomes through TGT assisted by media, as well as Nurhasanah et al. (2024) who found a positive effect of TGT on IPAS learning outcomes. The TGT model creates a fun yet challenging learning atmosphere, develops teamwork, and enhances concept understanding (Rahmawati, 2018; Agusdianita et al., 2025).

Effect of Quartet Card Media on Learning Outcomes

The use of quartet card media has a significant effect on IPAS learning outcomes. This media helps students understand material through visualization and engaging game activities. Information presented in card form makes it easier to remember concepts and important terms. Card playing activities encourage active learning without feeling burdened (Samsiyah et al., 2021; Arsyad, 2019).

This result aligns with research by Giwangsa (2021) stating that quartet card media is effective for elementary school students, and research by Wijayanti et al. (2023) proving increased learning outcomes through quartet cards. This media functions to attract attention, arouse motivation, facilitate cognitive understanding, and accommodate students with visual learning styles (Karsono, 2014; Trianto, 2022).

The integration between game-based cooperative learning models and engaging visual media creates meaningful learning experiences. Students do not just receive information but build knowledge through group interaction and educational games. This aligns with the objectives of IPAS learning which integrates understanding of the natural and social environment holistically (Amini et al., 2023; Febriani, 2021).

CONCLUSSION | خاتمة

This study provides empirical evidence that the Cooperative Learning model type Teams Games Tournament (TGT) and quartet card media, implemented within Indonesia's Merdeka Curriculum, significantly improve elementary students' IPAS learning outcomes. The TGT model alone ($B = 1.546$, $p < 0.001$) and quartet card media alone ($B = 0.370$, $p < 0.001$) each have a significant positive effect. Their simultaneous use explains 63.1% of learning outcome variance ($R^2 = 0.631$), with a very large practical effect (Cohen's $f^2 = 1.71$). Students perceived the implementation positively (84–86% of maximum scores), confirming feasibility and acceptance.

Looking forward, these findings suggest that game-based cooperative learning integrated with visual media can serve as a scalable, low-cost strategy to address persistent challenges in IPAS: abstract concepts, high memorization load, low engagement with local wisdom, and heterogeneous student abilities. The Merdeka Curriculum's emphasis on student-centered, contextualized learning provides an ideal policy environment for broader adoption.

However, this study also identifies critical gaps. The short intervention duration, non-random assignment, single-site context, and exclusive focus on cognitive outcomes limit generalizability and causal inference. Future research must move beyond replication toward systematic, multi-site, longitudinal designs that address these gaps while exploring under-investigated dimensions.

To advance knowledge in this area, future research should pursue several targeted directions: First, replication with stronger causal designs using cluster-randomized controlled trials involving at least 10–15 schools per condition to minimize selection bias, employing waitlist control or crossover designs so all students eventually receive the intervention, addressing ethical concerns while strengthening causal claims. Second, longitudinal and retention studies measuring learning outcomes at three time points (immediate posttest, 3-month follow-up, and 6-month follow-up) to assess knowledge retention and decay curves, investigating whether the large effect size ($f^2 = 1.71$) diminishes over time without booster sessions. Third, implementation fidelity and process evaluation using independent classroom observers with structured fidelity checklists to quantify implementation quality, conducting video analysis of selected lessons to identify which TGT components (e.g., team discussion, tournament) contribute most to learning gains, and interviewing teachers and students to understand barriers and facilitators to adoption (e.g., time constraints, card durability, classroom management).

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