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The Effectiveness of the Teams Games Tournament Learning Model Using QuARD Media to Improve Science Learning Outcomes

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Abstract: This research is motivated by the low learning outcomes of third-grade students in the subject of science at SD 2 Gondangmanis, mainly caused by the use of conventional learning models that do not actively involve students. To overcome this, the Teams Games Tournament learning model, incorporating QuARD media (Question and Action Cards), is applied. This model is designed to improve understanding of concepts and science process skills through educational games and group competitions. The purpose of this study is to analyze the differences in the average learning outcomes of students before and after the implementation of the Teams Games Tournament learning model assisted by QuARD media, and to determine the improvement in student learning outcomes after the intervention. This study employs a quantitative approach with a pre-experimental design, utilising a one-group pretest-posttest model. The subjects of the study were 22 third-grade students of SD 2 Gondangmanis. Data collection was conducted through interviews, observations, documentation, and written tests, including essays. Data analysis techniques include normality tests, paired sample t-tests, and N-Gain tests. The study's results showed a significant increase in student learning outcomes, with an average pretest score of 41.00 and a posttest score of 86.81. The t-test showed a significant difference between the pretest and posttest scores. The N-Gain value of 0.78 falls within the high category, and 96% of students achieved learning completion. It can be concluded that the Teams Games Tournament learning model, assisted by QuARD media, is effective in improving student learning outcomes in the science subject, particularly in understanding concepts and process skills.

Keywords: Learning Outcome; Teams Games Tournament; QuARD Media.

Introduction

Education is a crucial foundation for developing superior human resources that are adaptive to the challenges of the times. In the era of the Independent Curriculum, the learning paradigm no longer focuses solely on achieving material targets, but rather on a contextual, active, collaborative, and enjoyable learning process. The Independent Curriculum emphasizes the importance of strengthening literacy and numeracy competencies, and the formation of the Pancasila Student Profile through meaningful and student-centered learning. Natural Sciences and Social Sciences (IPAS) are important vehicles for developing scientific thinking skills from an early age. IPAS combines scientific and social concepts that can be directly observed in students' daily lives. In the context of IPAS learning in elementary schools, students are guided to develop an understanding of their surroundings and hone scientific process skills such as observing, questioning, analyzing, and communicating results. However, based on initial findings and supported by previous research, various problems are still found, such as low learning interest, minimal student involvement, and less than optimal conceptual understanding [1].

Based on the results of observations and interviews conducted on October 10, 2024, in Grade III of SD 2 Gondangmanis, problems were identified in the learning of Natural Sciences and Social Sciences (IPAS). The low results of IPAS learning in grade III of SD 2 Gondangmanis, with an average score of 60, which is below the KKTP of 73, indicate problems in the learning process. The results of observations and interviews show that learning is still dominated by conventional methods such as lectures, which makes students passive and less interested. Other influencing factors are low learning motivation and minimal interaction between teachers and students. This condition necessitates innovative learning models that foster active involvement, cultivate a positive learning environment, and enable students to understand science concepts and process skills in a more meaningful way.

To overcome this, learning innovations are needed that can create a fun and meaningful learning atmosphere. One of them is the Teams Games Tournament learning model, which is part of the cooperative approach. This model emphasizes learning in a team that supports each other and is interspersed with academic games or tournament activities. In the Teams Games Tournament, students are not only required to understand the material, but also to be able to work together, compete healthily, and hone critical thinking and communication skills [2] . The novelty of this research lies in the combination of two learning strategies that have been proven effective, namely cooperative learning and card media, into one integrated model applied to lower-grade science learning. In addition, this research supports the achievement of 21st-century competencies, such as critical thinking, collaboration, and communication, in real-world terms within the student learning process.

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Teams, Games, and Tournaments will be more effective if supported by engaging and contextual learning media. Media QuARD (Quest and Action Card) is a card-based media containing questions and commands designed to suit learning objectives. designed visually and applicatively, so that it can help students understand the material through direct experience, group discussions, and active challenge solving [3]

Several studies have shown that game-based learning and card media can improve student motivation, engagement, and learning outcomes. However, the integration of the Teams Games Tournament model and QuARD media in science learning is still rarely optimally implemented in elementary schools. Therefore, this study aims to determine its effectiveness. Teams Games Tournament learning assisted by QuARD media to improve the science learning outcomes of grade III students at SD 2 Gondangmanis, especially on the topic "Natural and Artificial Appearances" [4].

Tournament Game Team is a form of cooperative approach that combines elements of teamwork and games in a fun, competitive atmosphere. Meanwhile, the QuARD media (Question and Action Cards) is designed to strengthen student engagement through activities such as answering questions and taking action based on the instructions on the cards. The combination of the two is considered capable of improving student learning outcomes because it stimulates conceptual understanding through discussion, direct practice, and communication between peers [5] .

Based on this background, this study aims to determine the effectiveness of the Teams Games Tournament learning model, assisted by QuARD media, in improving the science learning outcomes of grade III students at SD 2 Gondangmanis on the topic of "Natural and Artificial Appearances".

Several studies in the Pijar MIPA Journal have proven the effectiveness of the TGT model. A significant difference was found between the Teams Games Tournament model and the expository model, with the Teams Games Tournament average score (20.192) outperforming the expository model (15.308) [6]. Similarly, [7] reported a 9.28% increase in science learning outcomes using the Teams Games Tournament in junior high school students.

Additionally, [8] demonstrated the effectiveness of Wordwall-based media in a Teams Games Tournament, reporting N-Gain scores of 0.5746 (moderate category). Although their research focused on 4th-grade students, this supports the integration of interactive media in Teams Games Tournament learning. Other research has also found that traditional media, such as congklak in Teams Games Tournament, can improve critical thinking skills, with an N-Gain score of 0.32 (moderate category).

These findings support the use of QuARD media in the Team Games Tournament, indicating that this media can enhance conceptual understanding and scientific process skills in basic science learning.

Research methods

This study used a quantitative approach with a one-group pretest-posttest pre-experimental design. The pretest was conducted before the treatment was administered to test the improvement in the implementation of the assisted Teams Games Tournament learning model. QuARD media in improving science learning outcomes of grade III students of SD 2 Gondangmanis.

This research was conducted at SD 2 Gondangmanis in May 2025, academic year 2024/2025. The population in this study consisted of third-grade students from SD 2 Gondangmanis. The sampling technique in this study used the Census/Total Sampling technique. The sample in this study consisted of all third-grade students from SD 2 Gondangmanis, totalling 22 students. The instruments used in this study were observation, interviews, documentation, and tests. The test instrument used in this study was a pretest. The posttest was a written, descriptive test. The pretest was administered to students before they received the treatment, which involved implementing the Teams Games Tournament learning model with the aid of QuARD media. The posttest was administered to students before they received the treatment. treatment, namely the application of the Teams Games Tournament learning model assisted by QuARD media, with the aim of determining the science learning outcomes of grade III students. The research design framework used is as follows.

Table 1. One group pretest-posttest design

	Pretest	Treatment	Posttest
Treatment	O_1	X	O2

Source: [9]

Information:
X: There is treatment in the form of applying the model-assisted Teams Games Tournament Learning Quadrant media.
O1: Initial Test/Pre-test (before treatment is given)
O2: Post-test (after treatment is given).

The data analysis technique employed in this study utilised several statistical tests, including the normality test as a prerequisite, the Paired sample T-test, and the N-Gain test as a hypothesis test. The normality test used the Shapiro-Wilk method. Meanwhile, the T-test was used to analyze differences in learning outcome scores, and the N-Gain test was used to analyze improvements after the implementation of the Teams Games Tournament learning model assisted by QuARD media. This test used SPSS 29.

Paired Sample T-Test analysis is if sig < 0.05, then H0 is rejected, meaning there is a difference in the average value of the results of learning science. If sig ≥ 0.05, then Ho is accepted, meaning there is no difference in the pretest and posttest values from the application of the Teams Games Tournament learning model assisted by QuARD media to improve the results of learning science of grade III students of SD 2 Gondangmanis [10] . The criteria for the analysis of the N-Gain test are as follows.

Table 2. N-Gain Score Criteria

N-Gain	Criteria
$0.70 \leq g \leq 100$	Tall
$0.30 \leq g \leq 0.70$	Currently
$0.00 \leq g \leq 0.30$	Low

Source: [11]

Table 2 shows the distribution of N-Gain scores. N-Gain scores above 0.7 are considered high, while scores between 0.3 and 0.7 are considered moderate. N-Gain scores below 0.3 are considered low.

Table 3. Percentage N-Gain Effectiveness

Percentage %	Interpretation
< 40	Ineffective
40 - 45	Less Effective
56 - 75	Quite Effective
>76	Effective

Source: [11]

Table 3 contains an interpretation of N-Gain effectiveness. An N-Gain percentage value of less than 40 is categorized as ineffective. An N-Gain percentage value between 40 and 55 is categorized as less effective. A value of 56-75 is categorised as quite effective, and an N-Gain percentage value of more than 76 is categorised as effective.

Results and Discussion

The results of this study support the findings of previous research. Students taught using the Teams Games Tournament model achieved significantly higher learning outcomes compared to those who used the expository method [9]. This finding aligns with the results of this study, which showed an average posttest score of 88.3, significantly higher than the average pretest score.

In addition, other opinions emphasize the improvement of student cooperation and learning achievement through the Teams Games Tournament. In this study, students also showed increased collaborative behavior during games and tournaments, which had a positive impact on learning [10]. In line with other opinions, the integration of digital media, such as Wordwall, in Teams Games Tournament aims to increase student engagement. Although this study used QuARD as a card-based media, the interactive and visual nature of both types of media contributed to a deeper understanding [11]. Other opinions also describe how traditional game-based media can foster critical thinking. Similarly, the use of QuARD cards in this study challenged students to analyze, evaluate, and create, which contributed to higher-order thinking skills [12].

Based on the results of research conducted with 22 students in Grade III of SD 2 Gondangmanis in May 2025, the research was conducted. The following is the research activity schedule.

Table 4. Research Implementation Schedule

No	Activity	Date	Time
1	Meeting 1 (pretets)	May 16, 2025	09.00-09.45
2	Meeting 2	May 19, 2025	09.00-10.10
3	Meeting 3	May 20, 2025	09.00-10.10
4	Meeting 4	May 23, 2025	09.00-10.10
5	Meeting 5 (Posttest)	May 24, 2025	09.00-09.45

The data in this study represent the results of science learning completed by students during the pre-test and post-test stages. The following data are the results obtained. Based on the results of the data analysis above, the application of the Assisted Teams Games Tournament model, combined with the use of QuARD media, can be seen to improve the learning outcomes of class III students at SD 2 Gondangmanis, as indicated by the students' pretest results. showed the lowest value of 27 and the highest value of 69, with an average value of 41.0. while the *posttest* showed the lowest value of 56 and the highest value of 98, with an average value of 86.7.

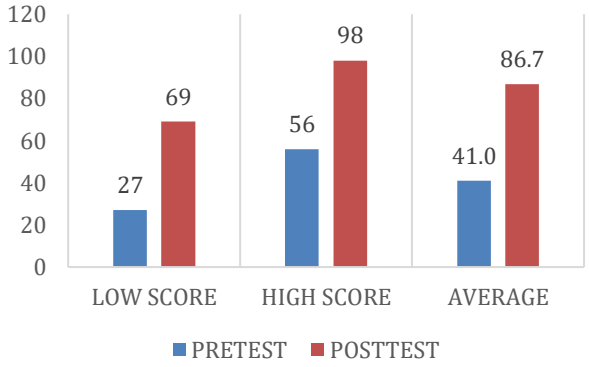

Figure 1. Data from Scientific Understanding Research Results

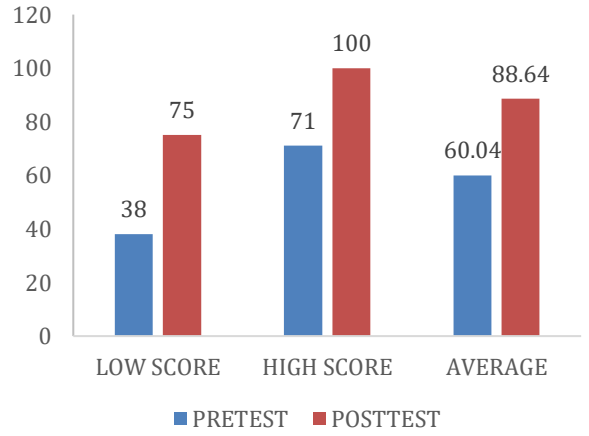

Figure 2. Data from Process Skills Research Results

Based on the results of the analysis above, the application of the teams games tournament model assisted by QuARD media to improve the learning outcomes of grade III students of SD 2 Gondangmanis can be seen from the results of the students' pretest and posttest scores which showed the lowest pretest score of 38 and the highest score of 75 with an average of 60.04, while in the posttest the lowest score was 71 and the highest score was 100 with an average of 88.64.

Table 5. Results of the Normality Test for Understanding of Natural Sciences (Shapiro-Wilk)

	Statistics	df	Signature.
Pretest	.930	22	.120
Posttest	.937	22	.175

Source:[1]

Table 5 shows the results of the normality test. The pretest significance value was 0.120 > 0.05, indicating a normal distribution of the data. Meanwhile, the posttest significance value was 0.175 > 0.05, indicating a normal distribution of the data as well. Furthermore, to analyse the differences in student learning outcomes after implementing the Teams Games Tournament learning model assisted by quad media, the Paired Sample T-Test analysis method was used with the SPSS Statistics 29 program. The following is the output of the analysis results.

The Paired sample t-test above shows that the pretest and posttest results of students' science learning outcomes have a significance value of 0.00 < 0.05, which means H0 is rejected and H1 is accepted. Based on these results, it can be concluded that there is a difference in the average pretest and posttest scores of students' science learning outcomes when the Teams Games Tournament learning model is applied, assisted by QuARD media. Furthermore, to analyze the improvement in student learning outcomes after implementing the Teams Games Tournament learning model with assistance from QuARD media, the analysis used the N-Gain test using SPSS 29. The following is the output of the analysis results.

The test in Tables 6 and 7 shows an increase in the average understanding of science among grade III students after the application of the Teams Games Tournament learning model, with the assistance of QuARD media, at 0.78, within the range of $0.70 \leq g \leq 1.00$, meeting high criteria. The effectiveness level falls within the percentage range of 56% to 76%, indicating quite effective criteria. Based on these results, the science learning outcomes of third-grade students have improved significantly, meeting high criteria. The application of the Teams Games Tournament learning model, assisted by QuARD media, has been quite effective in enhancing the science learning outcomes of third-grade students.

Table 6. Paired Sample T-Test Results

Paired Sample T-Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Division	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pretest-Posttest	- 45.81818	8.22676	1.75395	- 49.46572	- 42.17064	- 26.123	21	0.000

Table 7. Results of the N-Gain Test of Understanding of Science

Descriptive Statistics					
	N	minimum	Maximum	Mean	Standard Deviation
NGain_Score	22	0.57	0.97	0.7837	0. 11361
NGain_Percent	22	56.72	96.55	78.3681	11.36136
Valid N (listwise)	22				

Table 8. Analysis of Scores for Each Indicator of Understanding of Science

No.	Indicators of Understanding of Science Concepts	Pretest	Posttest	N-Gain	Criteria
1 and 2	C1 Remembering	62.50	84.50	0.59	Currently
3 and 4	C2 Understanding	40.00	73.50	0.56	Currently
5 and 6	C3 Applying	52.50	78.00	0.54	Currently
7 and 8	C4 Analyze	41.50	79.50	0.65	Currently
9 and 10	C5 Evaluate	18.00	75.50	0.70	Tall
11 and 12	C6 Create	2.00	67.00	0.66	Currently

Based on the analysis of learning outcomes related to understanding science, it is evident that after learning with the assisted tournament team game model using QuARD media, the percentage of students' posttest scores is higher than their pretest scores. The results of the analysis of the values of each indicator show that the highest indicator of scientific understanding in both the pretest and posttest is the fifth indicator, namely evaluating, while the lowest indicator is the sixth indicator, namely understanding.

Based on the scores for each indicator of learning outcomes in natural sciences understanding, it can be seen that there was an increase in all aspects after learning. In the remembering indicator (C1), students experienced an increase in scores from 62.50 in the pretest to 84.5 in the posttest.

The understanding indicator (C2) also showed an increase, from 40.00 in the pretest to 73.50 in the posttest. Furthermore, in the applying indicator (C3), students' scores increased from 52.50 to 78.00. The analyzing indicator (C4) increased from 41.50 to 79.50. Meanwhile, in the evaluating indicator (C5), students obtained a pretest score of 18.00 and increased to 75.50 in the posttest. Finally, in the creating indicator (C6), there was an increase from a score of 2.00 to 67.00. Based on these data, it can be concluded that students demonstrated a significant increase in understanding after participating in the learning process, as reflected in the posttest scores, which are higher than the pretest scores on all indicators.

Based on the analysis, it appears that students' science learning outcomes scores during the posttest increased compared to the pretest. Each learning outcome indicator showed an increase in achievement, indicating that students gained a deeper understanding of the material after participating in the learning process. This is because during the learning process, students were more actively involved in group discussions and academic games utilizing QuARD media. The activities in the tournament, along with the use of question cards and challenges, made it easier for students to understand the concepts of natural and artificial features. The understanding students gained was not only based on memorization but also strengthened through critical thinking, collaboration, and active problem-solving. This approach has proven to be more effective than the traditional learning model, because it is able to build a more meaningful understanding in an efficient learning time [12] .

Science learning using the Teams Games Tournament model, assisted by QuARD media, makes a real contribution to improving students' process skills. The

science process skills in the Independent Curriculum encompass six indicators: observing, asking and predicting, planning and carrying out investigations, processing and analyzing information, evaluating and reflecting, and communicating results. All of these indicators are reflected in the integrated learning activities that utilise the syntax and implementation of TGT in the classroom.

The first indicator is observation, which is evident from the early stages of learning, especially in the presentation of class syntax. The teacher delivers material on natural and artificial characteristics through visual media, video screenings, and image-based explanations. Media QuARD also participates in and role-plays by presenting picture question cards and action cards, which show real examples that appear in the surrounding environment. Students are asked to note down things they observe, both from media and real experiences, so that their observation skills develop effectively. gradually [2].

The second indicator is asking and predicting; this indicator is seen when in a syntax group. In heterogeneous groups, students are actively involved in discussions, asking questions about material that is not yet understood, and predicting the types of questions that will arise in the tournament session. As stated by [13] This discussion process encourages students to think more critically and develop curiosity about the science material being studied, in accordance with the principles of student-centered learning.

The third indicator, namely planning and implementing investigations, begins to develop when students engage in activities within the game's syntax. Through the QuARD card game, they not only answer questions but also carry out instructions in the form of actions such as drawing appearances, explaining the characteristics of objects, or compiling simple data. This activity encourages students to organize small investigative steps, collect information, and make initial conclusions based on their experiences. The improvement of these skills is strengthened by the role of QuARD media, which is designed to stimulate active participation through applicable and contextual questions and activities. Card-based media can help students organize information, work together, and take real actions during the learning process [14].

The fourth indicator, namely processing and analyzing information, is seen when students enter the tournament stage. At this stage, students are challenged to select and provide the best answers to questions given based on the results of previous group discussions. Students must sort out important information from the material and process it into logical answers. The presence of random questions during the tournament also encourages students to think quickly and carefully in analyzing data or formulating questions. This activity is strongly supported by the use of QuARD media, which presents a combination of factual questions, comprehension questions, and questions about cause and effect and grouping [15].

The fifth indicator, namely evaluating and reflecting, emerged through experiences during the group discussion process and after the tournament. Students were given the opportunity to review their answers, compare their group's strategies with those of other groups, and express their opinions regarding the learning process they had undergone. This reflection was guided directly by the teacher through questions and answers, so that students were able to recognize the strengths and weaknesses of their learning methods [16].

The final indicator is communicating results, which is reinforced in two stages, namely during the tournament and when the teacher gives appreciation for the team's introduction of syntax. Students practice delivering answers orally in front of friends, listening to responses, and explaining the reasons for their answers. At the end of the lesson, students are also asked to convey the conclusions or content of the learning they have done using their own Indonesian [17].

Thus, students' process skills develop holistically through active involvement in each learning syntax. Team Game Tournament Model, assisted by QuARD Media, not only enhances conceptual understanding but also, in effective practice, educates participants to observe, think critically, investigate, analyze, reflect, and communicate their knowledge in a fun and competitive learning atmosphere.

Based on the analysis of the overall results, the application of the Team Games Tournament learning model assisted by the QuARD learning media has been proven to improve science learning outcomes for Grade III students at SD 2 Gondangmanis, both in terms of understanding and process skills. This improvement is evident from the significant difference in scores between the pretest and posttest, as well as the average N-Gain score, which is in the high category for understanding and quite effective for process skills.

In general statistics, the results of the normality test using the Shapiro-Wilk test indicated that the pretest and posttest data were normally distributed, with pretest significance values of 0.120 and posttest significance values of 0.175 ($p > 0.05$). Furthermore, the results of the paired sample t-test showed a significance level of $0.000 < 0.05$, indicating a statistically significant difference between the pretest and posttest scores. This increase was reinforced by the results of the N-Gain test, which showed an average score of 0.76 for understanding science, placing it in the high category. This shows that the Teams Games Tournament model was assisted by QuARD media. effective media in improving student learning outcomes.

Learning is designed through the syntax TGT. With a gradual peer-to-peer method, participants are educated actively, collaboratively, and critically. Tournament-based academic game activities provide a space for participants to educate and develop design understanding through fun learning experiences, as well as involving scientific thinking skills such as observing, investigating, analyzing, and communicating ideas. Activities in games and tournaments encourage participants to educate, discuss, answer challenges, and express opinions that directly contribute to improving science process skills [18], [19].

Students' process skills develop across all indicators, from observing during class presentations, to asking questions and predicting when working in teams, to planning investigations during games, to analyzing, evaluating, and communicating results in tournaments and team introductions. Quart's visual presentation of issues and challenges is highly effective in stimulating students' active and critical thinking.

This finding is supported by research, which states that the media-based Teams Games Tournament model can improve students' science learning outcomes because it creates a competitive yet enjoyable learning environment [18]. In addition, Interactive visual learning media, such as Quarter Cards, are effective in increasing student engagement and facilitating a meaningful and contextual understanding of design [20], [21], [22].

Thus, the Team Games Tournament learning model, assisted by Quart Media, has not only proven effective in improving science learning outcomes but also significantly encourages the holistic development of students' process skills, in accordance with the characteristics of 21st-century learning and the principles of the Independent Curriculum.

Conclusion

Based on a study of 22 third-grade students at SD 2 Gondangmanis, the implementation of the Teams Games Tournament learning model, assisted by QuARD media, has proven effective in improving science learning outcomes. This is indicated by an increase in the average pretest score from 41.00 to 86.81 posttest, with the t-test results showing a significance of 0.000 < 0.05 and an average N-Gain of 0.78 in the high category, and an effectiveness of 76% (considered quite effective). In addition to improving conceptual understanding, this model also has a positive impact on students' science process skills, which include six indicators of scientific skills. The active and collaborative learning approach, facilitated through team tournaments and QuARD media, makes the learning process more meaningful. Therefore, this model is recommended as an alternative to fun and effective science learning at the elementary school level.

Author Contribution

Putri Khoirotun Nikmah: Collected data and compiled the article; Yuni Ratnasari: Responsible person; Siti Masfuah: Responsible person.

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