

# Changes in Energy Material Learning Outcomes and Their Changes through the Team Games Tournament (TGT) Cooperative Learning Model in Grade IV Elementary School Students

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**Abstract:** The curriculum of elementary education is natural science (IPA) which is a field of study related to natural phenomena systematically. The purpose of learning science courses in elementary schools is to gain understanding and knowledge about interesting science concepts that can be applied in everyday life. This is important to address the problems of lack of teacher creativity, student learning activities, and student learning outcomes. Although relevant, this is a generalization, namely how TGT addresses less than optimal learning outcomes in energy material. Involving 41 fourth grade students of Jatinegara Elementary School, East Jakarta, divided into a control class and an experimental class. 22 out of 24 students (91.7%) showed an increase in learning outcomes after participating in Team Games Tournament (TGT)-based learning, while only 2 students experienced a decrease in the control class that did not receive similar treatment, while the rest experienced an increase. The total number of students mentioned in the results (24 experimental students + X control students) is not explicitly 41. You need to make sure the total sample and distribution between the experimental and control classes are clearly and consistently stated in the methods and results sections. If the experimental class only has 24 students, then the control class only has 17 students (41-24), 22 out of 24 students (91.7%) showed an increase in learning outcomes after participating in Team Games Tournament (TGT)-based learning, while only 2 students experienced a decrease in the control class that did not receive similar treatment, while the rest experienced an increase.

**Keywords:** Elementary school science; Science literacy; Team games tournament

## Introduction

One of the important aspects of the elementary school curriculum is natural science (science), a field of study that deals with natural phenomena systematically. The purpose of learning science taught in elementary school is to gain an understanding and knowledge of

science concepts that are beneficial and can be used in daily life (Febianti et al., 2024; Hartomo et al., 2024; Sukmawati et al., 2022).

It is essential to address the problems of teachers' lack of creativity, student learning activities, and student learning outcomes. One way to overcome the problem is to apply a learning model that encourages teachers to

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become more innovative and creative (Fitria et al., 2024; Sukmawati et al., 2021a; Wahjusaputri et al., 2022). One alternative to this problem is the cooperative learning model (TGT), which combines competition groups with group learning tasks. Team Games Tournament allows students to participate in small groups to help each other understand the subject matter (Sukmawati et al., 2021b). According to Article 2 According to the Minister of Education and Culture Research and Technology Number 21 of 2022 concerning Educational Assessment Standards at Early Childhood Education, Basic Education Levels, and Secondary Education Levels, evaluation includes the evaluation of learning outcomes, teaching and learning processes, and student self-development. Thus, it is hoped that student welfare outcomes will increase (Sudarto, 2024; Hafizin, 2023).

Student learning outcomes are influenced by the learning process, which includes the understanding, abilities, and attitudes that students have about a particular topic. According to Andryannisa et al. (2023), there are many ways to measure learning outcomes, such as tests, observations, or project-based assessments. The level of achievement of learning outcomes serves as a measure of how effective instruction is and how well the learning process is in the classroom. During this process, the changes that occur in students' cognitive, affective, and psychomotor abilities are used to determine the level of educational success (Adolph, 2016). This cooperative learning model for team game tournaments provides students with the opportunity to improve their ability to think critically and solve problems. It also gives them a passion for learning and a sense of responsibility towards their fellow group members (Nurhayati et al., 2022).

The Team Games Tournament (TGT) learning model can be one of the solutions to make the classroom interactive, in line with the opinions expressed by Resti et al. (2019), this model focuses on fun learning and optimizes interaction between students so as to increase learning motivation. By integrating comic teaching media and the TGT learning model, students are expected to be more active and motivated to understand scientific concepts with animal life cycle materials in depth based on previous research that discusses the benefits of comic media in the learning process that can increase students' interest and their understanding of learning (Sukmawati, 2023; Sukmawati et al., 2021b, 2021a). However, most studies have not specifically examined teaching media and learning models, especially in science literacy learning at the elementary school level.

According to Wahab (2007), the learning model is a teaching strategy that explains the steps taken during the teaching and learning process to change the behavior of students according to expectations. The right learning

model meets the needs of students, can help students understand the material used in the learning process taught by the teacher (Jusrianto et al., 2022).

The uncondusive classroom because students do not comply in undergoing learning in an orderly manner can be caused by the lack of interest of teachers in bringing learning in the classroom (Sukmawati, 2020; Sulistiani et al., 2024). Elementary school students still believe that play is important in daily life, which causes the learning process to not go well because they do not understand what they are learning (Hazami, 2023).

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## Method

The place where this research will be carried out will be held at SDN Balimester 06 Pagi Jatinegara, East Jakarta in May 2025. This study uses a quasi-experimental method, which has a control class; however, this method cannot fully affect the variables during the experiment, this method is used for homogeneous groups, namely by dividing into two observation groups, the first group receives learning the cooperative model of team game tournament (TGT) while the second group is the group that is given learning by conventional methods or lectures. (Hazami, 2023) The use of this design is due to the existence of a pre-test to determine the condition of the object before the application of the treatment, by comparing the conditions before and after the treatment, the results of the treatment can be known accurately (Saputri et al., 2024; Sukmawati et al., 2024). Quasi Experimental Design of Group Control Before and After Tests. The form of instrument questions in this study is to use 25 multiple-choice questions that contain elements of energy and changes and are given to 41 students who have been divided into a control class and an experimental class, which is intended for the wrong question to be given a number of 0 and the correct one will be given a number of 1. Validity and reliability have also been carried out and evaluated using instruments (Muthi'ah et al., 2023; Sukmawati & Wahjusaputri, 2024; Wahjusaputri et al., 2024). This method is assisted by the Winstep application as well as the test of the results of data analysis using the Stacking Test with the Rasch model. The Stacking Test with the Rasch model is a data analysis technique used to assess students' abilities before and after are given treatment according to their

respective developments, which are assisted using the Winstep application (Fauziah & Sukmawati, 2023). This study also uses a sampling technique using the Simple Random Sampling technique where this sampling is taken randomly regardless of the level in the population.

## Results and Discussion

In research this is to learn how the learning outcomes of energy materials and their changes when students participate in team game tournaments (TGT) in elementary school. The researcher wanted to find out the difference in student learning outcomes by using team game tournaments (TGT) with differences in student learning outcomes without using team game tournaments (TGT). Proving that there is an increase in science literacy in elementary schools, with good validity results but still low results of person reliability, due to a small sample, this instrument can still be used to improve student literacy is also supported by the results of analysis and comparison with control classes that are not subject to treatment using the learning model for Team Game Tournaments (TGT). (Muthi'ah et al., 2023; Sukmawati et al., 2024; Sukmawati et al., 2024; Wahjusaputri et al., 2024).

### *The Results of the Analysis of Experimental Classes with Learning Using the TGT Learning Model*

To further confirm the difference in learning outcomes between the experimental and control class, an independent samples t-test was conducted. The results indicated a statistically significant differences in gain scores between the two groups, with a Sig. (2-tailed) value of 0.01 this suggest that the intervention had a meaningful impact on improving science literacy.

**Table 1.** Groups Statistic

Class	N	Mean	Std. deviation	Std. error mean
Score posttest experiment	24	43.50	9.533	1.946
Score posttest control	21	33.33	9.987	2.179

**Table 2.** Independent Samples Test

F (levene)	Sig. (levene)	t	df	P (2-tailed)	Mean diff	95% CI lower	95% CI upper
.15	.904	-3.491	43	.001	-10.16	-16.040	-4.293
		-3480	41.606	.001	-10.16	-16.060	-4.269

From the results of the analysis of students using the Rasch model, it was seen that 22 out of 24 children had experienced improvement, this shows that the majority of participants experienced positive development after being given treatment between the pretest and posttest times (Ifdaniyah et al., 2024; Istiqomah et al., 2023; Kusnadi et al., 2023). This increase

can be interpreted as the effective result of a training or learning aimed at improving students' literacy skills.

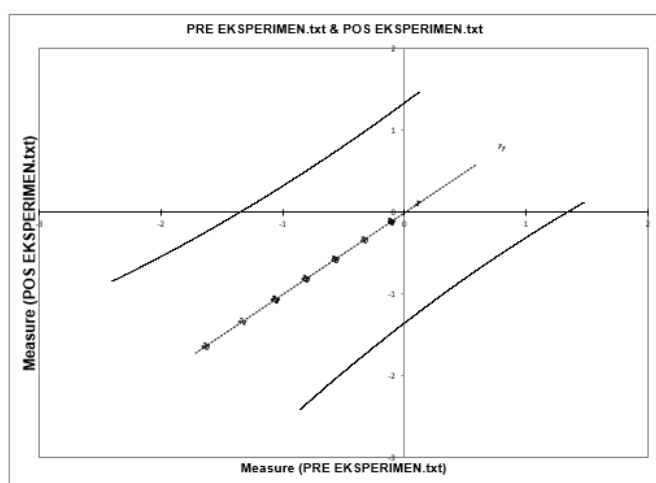
**Table 3.** Results of Pre and Post Test Analysis of Experimental Class

Entry	Measure Pretest	Measure Posttest	Measure posttest-pretest	Information
1	-0.57	-0.57	1.05	Increase
2	-1.63	-1.63	2.19	Increase
3	0.11	0.11	0.36	Increase
4	-0.11	-0.11	0.58	Increase
5	-0.57	-0.57	1.05	Increase
6	-0.11	-0.11	0.58	Increase
7	0.11	0.11	0.36	Increase
8	-0.81	-0.81	1.31	Increase
9	-0.33	-0.33	0.81	Increase
10	-0.33	-0.33	0.81	Decreased
11	0.8	0.8	-0.31	Increase
12	-1.06	-1.06	1.57	Increase
13	-0.11	-0.11	0.58	Increase
14	-0.11	-0.11	0.58	Increase
15	-1.06	-1.06	1.57	Increase
16	-0.57	-0.57	1.05	Increase
17	-0.11	-0.11	0.58	Increase
18	-0.57	-0.57	1.05	Increase
19	-0.81	-0.81	1.31	Increase
20	-1.63	-1.63	2.19	Increase
21	-1.06	-1.06	1.57	Increase
22	-0.81	-0.81	1.31	Increase
23	-1.06	-1.06	1.57	Increase
24	-1.33	-1.33	1.86	Increase

Based on the table above, it shows that the increase in student learning outcomes about energy materials and their changes. Based on data analysis, as many as 22 out of 24 students (91.7%) showed an increase in learning scores after participating in Team Games Tournament (TGT-based) learning, while only 1 student (8.3%) experienced a decrease in scores. This indicates that the learning approach used is able to significantly increase students' understanding and mastery of concepts. The decline in learning outcomes in a small percentage of students may be caused by external variables that were not controlled in this study, such as psychological conditions, health, or concentration disorders during the posttest (Fitria et al., 2022; Novianti et al., 2023; Ramadhani et al., 2022). However, the dominance of improving learning outcomes shows that in general, the TGT model can be relied on as a useful learning method to improve students' cognitive learning outcomes.

Based on the results of the table above, the results of the pretest and posttest analysis in the experimental class are shown. According to the data shown in the table of the results of the analysis of the pretest and posttest of the experimental class, it can be seen that 22 out of 24 students (91.7%) experienced an increase in the

value of learning outcomes after participating in the Team Games Tournament (TGT) cooperative learning and only 2 students (8.3%) experienced a decrease in scores. The graph, which was interpreted, supported the finding that most of the students showed positive progress in the learning outcomes of energy materials and their changes after being treated with the Team Games Tournament (TGT) model (Sukmawati, 2023; Sukmawati et al., 2021a). This improvement shows the effectiveness of the TGT learning model in significantly improving students' understanding and mastery of concepts. This data analysis was carried out using the Winstep application and the Stacking Test with the Rasch model, which is used to assess student performance before and after treatment (Fauziah et al., 2023; Nurliana et al., 2023; Wati Sukmawati et al., 2023).



**Figure 1.** Results of pre and post test analysis of experimental class

#### *Results of Control Class Analysis with Conventional Learning*

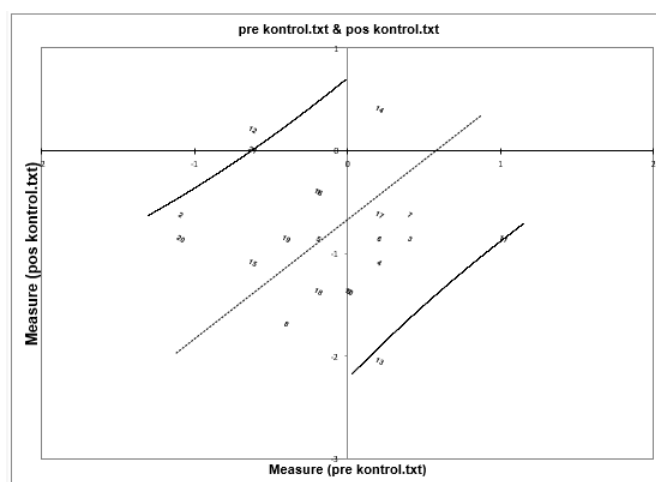
The results of the students' analysis showed that in the control class there was also an improvement, but not as optimal as the class that was subjected to treatment (Fitria et al., 2024; Sukmawati, 2020; Sulistiani et al., 2024; Wahjusaputri et al., 2022). There are some students who still have abilities and there are some students who also decline.

In the table 4, it can be seen that there are some students who have increased their abilities after the posttest but there are also students who have not increased their abilities and there are also 2 students who have decreased, this case is different from the class that was given treatment. 67% of students, namely in numbers (2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21) experienced an increase in the posttest, it can be said that the student has quite good literacy skills, this is analyzed with the help of the researchers' observations in the classroom. Some participants also experienced

quite consistent improvements, although not too drastic (Febianti & Sukmawati, 2024; Hartomo & Sukmawati, 2024; Lestari et al., 2024).

**Table 4.** Results of Pre and Post Test Analysis of Experimental Class

Entry	Pretest	Measure Posttest	Measure posttest-pretest	Information
1	-0.19	-0.4	-0.21	Decreased
2	-1.09	-0.62	0.47	increase
3	0.41	-0.85	0.08	increase
4	0.21	-1.09	0.3	increase
5	-0.19	-0.85	0.68	Increase
6	0.21	-0.85	0.28	Increase
7	0.41	-0.62	0.06	Increase
8	-0.4	-1.68	0.98	Increase
9	0.01	-1.37	0.53	Increase
10	0.01	-1.37	0.53	Increase
11	1.02	0.85	-0.53	Decreased
12	-0.62	0.21	1.07	Increase
13	0.21	-2.05	0.43	Increase
14	0.21	0.41	0.24	Increase
15	-0.62	-1.09	1.13	Increase
16	-0.19	0.4	0.65	Increase
17	0.21	-0.62	0.26	Increase
18	-0.19	-1.37	0.73	Increase
19	-0.4	-0.85	0.89	Increase
20	-1.09	-0.85	1.58	Increase
21	-0.62	0.01	1.07	Increase



**Figure 2.** Results of pre and post test analysis of control class

In the control class there were 2 students, namely in numbers 1 and 11 who showed a significant increase from low pretest scores to higher posttest scores, indicating the effectiveness of the Team Games Tournament model in improving their understanding, this from the researchers' observation may be due to students who lack science literacy, the questions are not in accordance with the target level, and also the student's understanding.

With the description above, it can be seen that there is a significant difference between the class that received treatment and the class that studied conventionally, although both showed increased ability, but the improvement that occurred in the control class based on the observation of the researcher that the student already had a high cognitive factor compared to other friends, and there were still students whose ability remained at the beginning before the pretest (Aulia et al., 2024; Latifah et al., 2024; Sukmawati, 2021; Sukmawati et al., 2024).



**Figure 3.** Implementation procedures in experimental (TGT learning model)



**Figure 4.** Implementation procedures in control class conventional learning

## Conclusion

Based on the results of data analysis which aims to analyze changes in energy material learning outcomes and their changes in grade IV elementary school students through the cooperative learning model (TGT). This study uses a quantitative method with a design Quasi Experiment Control Group Pretest-Posttest, involving 41 students in grade IV of elementary school, consisting of a control class and an experimental class. The research method consisted of 25 multiple-choice questions about energy and its changes that were analyzed with the Winstep application and the Test Stacking model Rasch. The results of the study show that the TGT cooperative learning model helps students learn better. As many as 22 out of 24 students (91.7%) in the experimental class showed an increase in learning outcomes after participating in TGT-based learning. The decline in scores only occurred in 2 students in the

control class who did not receive similar treatment. This improvement indicates that the TGT model is able to significantly improve students' understanding and mastery of concepts. Although the control class also showed improvement, the improvement was not as optimal as the treated class, and some students in the control class showed no improvement or even experienced a decrease. A Team Games Tournament (TGT) cooperative learning model can help students learn better, especially on materials that require an understanding of concepts and applications such as energy and its changes.

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## Author Contributions

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## Conflicts of Interest

The author states that there is no conflict of interest in the research until the writing of this article. The author also guarantees that there are no circumstances or personal interests that can be considered a reprentry or interpretation of the results of the research reported accurately.

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