



Supporting Elementary Students' Science Achievement in Electrical Energy Through Student Teams-Achievement Divisions Cooperative Learning

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Abstract: This experimental research, a one-group pretest-posttest design aims to enhance third-grade students' understanding of electrical energy and their academic performance by implementing the STAD approach to cooperative learning. The initiative will focus on the study of science both before and after students acquire knowledge of electrical energy through technical cooperative learning management. Additionally, the study aims to examine students' satisfaction with the management of cooperative learning. The participants were 32 of grade 3 students in the second semester of the 2025 academic year, selected using a cluster random sampling process. Instruments used to analyze 20 science accomplishment assessments included a learning management strategy for the science subject of electrical energy. The instruments included the STAD science lesson plan and a satisfaction questionnaire regarding cooperative learning management. The results indicated that the performance in science topics post-test was statistically significantly higher than pre-test at .05. Furthermore, the satisfaction level of third-grade students with the science lesson on electrical energy, taught using the STAD cooperative learning was found to be highest level. The study can be used for teachers to leverage students' learning achievement and guide students in classroom collaborating.

Keyword : cooperative learning, STAD, satisfaction, science achievement

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How to Cite :

Introduction

Contemporary civilization has reached the epoch of globalization, characterized by unprecedented advancements in science and technology. The necessary learning skills required students to deal with working and learning through collaboration as well. Students in the elementary school can learn from peers and response to nature of science learning. They might want to have a cultivation to the maximum extent their necessary skills. Education serves as a mechanism for individual development, while individuals function as instruments for national advancement and future prosperity. Education is integral since life is a continuous journey of learning that fosters self-awareness (Marawar & Chaudhari, 2024; Ross, 2025). Consequently, science is a crucial policy for developing nations, and it should be integrated into the curriculum at all educational levels and systematically advanced throughout the science curriculum. Numerous resources exist that can impart information and comprehension, cultivate

attitudes, and enhance procedural abilities. The teaching and learning series is engaging and can enhance student learning (Sulfiani et al., 2024). The teacher will facilitate and arrange groups for students to collaborate and assist one another. Students understand how to articulate their leadership roles (Suendarti & Virgana, 2022).

The pedagogical approach to science may prioritize lectures and memorization above experiential learning, resulting in a lack of comprehension among students (Susiloningsih, et al., 2023). They exhibit a lack of enthusiasm for studying, resulting in diminished academic accomplishment. Consequently, they will acquire knowledge and enhance their cognitive abilities. This phenomenon is largely attributable to the varying teaching styles of teachers. Hence, teachers must possess effective pedagogical strategies and methodologies to engage and inspire students in their educational pursuits. Moreover, teachers must employ a diverse array of pedagogical techniques that are appropriate for the students in the classroom (Tomlinson & Imbeau, 2023). Students comprehend the material rather than merely memorizing it, and there is a dialogue between educators and students. The goal is to acquire comprehension and cultivate positive connections. Furthermore, teachers must exhibit adaptability in their pedagogical approaches, striving to enhance students' satisfaction with learning management in their academic pursuits while minimizing stress (Clarke, 2022; Swargiary, 2024).

This study investigates pedagogical method that facilitate students in enhancing their academic performance. Participatory learning management involves the structuring of educational activities wherein students are segmented into small groups and motivated to collaborate. There exist reciprocal support and shared accountability, both individual and communal. This is done to ensure that they and the other group members achieve their objectives, instead of engaging in competitive learning. In a collaborative environment, all individuals work together towards a shared objective (Maula & Khalim, 2026). Everyone possesses a role, responsibilities, and collective success. Teachers can coordinate activities for them, and students maintain a relationship. All students must comprehend their obligations and be aware of the tasks required for the group's success. Student Teams-Achievement Divisions (STAD) is a kind of cooperative learning approach. It can enhance student motivation and learning performance by incentivizing groups based on individual progress rather than absolute scores. It entails diverse teams of 4-5 members collaborating to comprehend the subject delivered by the teachers. Classrooms can be activated through interesting learning.

The STAD (Student Teams Achievement Divisions). A technique is a method of cooperative learning that facilitates effective learning by grouping students with varying academic abilities and genders. Each group has individuals possessing diverse abilities (Rorimpandey et al., 2022; Zurweni et al., 2022; Fauziyyah et al., 2024). The purpose of the research aims to study the academic achievement of science subjects in electrical energy, to compare the achievement of science before and after learning about electrical energy, and to study students' satisfaction with the STAD cooperative learning management. Every individual engages in the learning process, highlighting the collective achievement of the group. There is a reciprocal interchange of ideas, facilitating the sharing of educational resources and fostering mutual encouragement.

Individuals proficient in academic support for the disadvantaged implement a rotation of responsibilities that designates tasks to group members, fostering both ethical conduct and social competencies.

Research Methodology

This study utilized experimental research, specifically a one-group pretest and posttest design. The participants were 32 third-grade students from Anuban Mahasarakham School, a public school which located in Mahasarakham Province, Thailand. This school, an urban school provided teaching and learning service based on basic education curriculum. Students registered the science course in the second semester of the 2025 academic year. This study utilizes various methodologies, including 1) a STAD cooperative learning management plan, 2) four multiple-choice achievement assessments comprising twenty items, and 3) ten satisfaction questionnaires pertaining to learning management. The results of the study aim to assess the effectiveness of the STAD cooperative learning approach on students' academic performance and their overall satisfaction with the course. The researchers obtained the data by adhering to the prescribed data-collection protocol. A pretest was administered before the classroom session to assess student comprehension of the material. Through STAD cooperative learning management with students, the researchers elucidated the objectives, assessed academic achievement, and gained insights into learning management. After concluding the instructional content, the researchers conducted a post-test using a scientific achievement examination for the students. The learning satisfaction was subsequently examined and analysed. The statistics employed in this investigation were percentage, mean, and standard deviation. The researchers assess the results by computing the average score across the highest, high, medium, low, and lowest levels together. This comprehensive approach allowed the researchers to identify contributions to the existing body of knowledge and provided practical recommendations for enhancing educational strategies.

Result and Discussion

Learning achievement

According to the study, the academic achievement score before experimentation was 8.03 and the average academic achievement score after experimentation was 16.03. It indicates that the posttest score is higher than pretest score, with a significantly differences at .05 level of statistics (Table 1).

Table 1. Academic Achievement of Grade 3 Students

Test	Full score	Mean	SD	df	t
Pre	20	8.03	1.56	31	23.52*
Post	20	16.03	2.52		

*Statistical significantly differences at .05

Table 1 illustrates the comparison of grade 3 students' academic achievement between before and after they had learned through STAD cooperative learning. The average pre-test score was 8.03 out of 20, but the average post-test score rose to 16.03

out of 20. The t-test analysis findings ($t = 23.52$, $df = 31$) demonstrated that the difference between pre-test and post-test scores was statistically significant at the .05 level. These results suggest that the STAD cooperative learning method effectively enhances learning outcomes. Future studies may explore the long-term retention of knowledge gained through this approach.

According to cooperative learning theory, especially the Student Teams-Achievement Divisions model by Robert E. Slavin, this improvement can be explained by three key ideas in the method. STAD shows positive interdependence, individual accountability, face-to-face engagement, collaborative competencies, and group processing (Johnson et al., 1994; Jacobs & Renandya, 2019). These features encourage collaborative efforts among students toward common objectives while maintaining individual accountability for their academic results.

Initially, positive interdependence probably encouraged students to assist each other in comprehending the material. In STAD, students collaborate in small, diverse groups, where the success of the team relies on the advancement of each individual member (Tiantong & Teemuangsai, 2013; Rahman, 2025). This framework encourages peer tutoring, concept elucidation, and clarification, all of which are known to improve understanding and retention. The significant rise from a mean of 8.03 to 16.03 indicates that collaborative interactions enhanced students' knowledge construction more effectively than traditional education alone.

Secondly, individual accountability – an integral aspect of STAD – guarantees that each student is responsible for their performance on exams or evaluations. Team scores are determined by individual progress (Rad et al., 2022). Students are motivated to engage actively and attain mastery of the content. This process may elucidate the statistically significant improvement in post-test performance.

Third, cooperative learning is consistent with social constructivist concepts, which assert that learning transpires through social interaction and collaborative meaning-making. Engaging in group discussions and problem-solving undoubtedly enhanced students' conceptual comprehension, resulting in improved success results.

The statistically significant difference at the .05 level reinforces the notion that the STAD cooperative learning technique effectively improved academic success among students. The findings demonstrate that the use of STAD cooperative learning enhances students' academic achievement. This method fosters active participation and collaboration abilities (Hayati et al., 2023). Future studies should investigate the long-term retention of information and analyze how cooperative learning influences additional factors, including motivation, attitudes toward learning, and the development of social skills.

Learning Satisfaction

This study examines the level of learning satisfaction in relation to STAD cooperative learning management. The learning activities are fun and interesting, and the teacher uses various teaching methods and media. The average score was 5.00, followed by teachers who gave students opportunities. Teachers encourage students to work together in groups and individually. Teaching and learning activities are in line with the objectives, and teachers encourage students to be creative and discuss together (Table 2).

Table 2. Students' Satisfaction with the STAD Cooperative Learning

Item	Mean	SD	Level of satisfaction
1. Teacher prepare in what his/her teach	4.94	0.24	Highest
2. The classroom atmosphere is conducive to teaching and learning	5.00	0.00	Highest
3. The content taught is modern and practical	4.88	0.33	Highest
4. Teacher clearly stated the purpose of the learning	5.00	0.00	Highest
5. Teaching and learning activities are in line with the teaching and learning objectives	4.94	0.24	Highest
6. Teacher encourage students to work together in groups and individually	4.97	0.17	Highest
7. Teacher encourage students to be creative and cooperative in discussion	4.94	0.24	Highest
8. Fun and interesting learning activities	5.00	0.00	Highest
9. Teacher gives students the opportunity to ask questions	4.97	0.17	Highest
10. Teacher use a variety of teaching methods and media	5.00	0.00	Highest

Table 2 reveals that students' overall satisfaction with the administration of learning activities utilizing the Student Teams–Achievement Divisions (STAD) cooperative learning method was at its peak. The average ratings for all categories varied from 4.88 to 5.00, indicating exceptionally favorable attitudes among students. The highest mean ratings (5.00) were seen in numerous critical domains, including the classroom environment, the clarity of educational objectives, engaging and stimulating activities, and the implementation of diverse pedagogical approaches and media. The results indicate that the STAD technique effectively established a supportive and engaging educational atmosphere. An optimal classroom environment is essential for cooperative learning since it promotes positive interdependence, mutual respect, and active engagement among participants.

The findings suggest that the instructional design was meticulously organized and aligned with the principles of STAD, which prioritize explicit objectives, systematic collaboration, and collective accountability for educational results. When students comprehend the aims and expectations, they are more inclined to participate meaningfully in group assignments. In addition, students demonstrated significant consensus that educators promoted both collaborative and independent tasks (Mean = 4.97) and facilitated chances for inquiries (Mean = 4.97). These elements exemplify the fundamental traits of the STAD paradigm, which harmonizes personal responsibility with collective cooperation. The integration of collaborative dialogue with individual accountability seems to bolster students' confidence, engagement, and sense of accomplishment.

The implementation of the STAD cooperative learning method yielded exceptionally high levels of student satisfaction. The organized collaboration, engaging activities, nurturing classroom environment, and diverse teaching methods

combined fostered beneficial learning experiences (Kusuma et al., 2024). These experiences not only enhanced academic performance but also cultivated essential social skills among peers (Johnson et al., 1994; Saputra et al., 2025). As students worked together, they developed a deeper understanding of the subject matter, which further solidified their learning outcomes.

Conclusion

The STAD cooperative learning enhances academic achievement and supports students to engage in a supportive and motivating learning environment. The alignment between instructional objectives and activities, combined with structured cooperation, fostered both cognitive and affective development. Students benefited academically while simultaneously developing social skills such as communication, cooperation, and responsibility. This learning approach proved to be highly effective in improving students' academic achievement and satisfaction. The method promotes active participation, collaborative skills, and meaningful learning experiences. Future research may further investigate long-term knowledge retention and explore the impact of cooperative learning on other variables, such as motivation, attitudes toward learning, and social skill development. By discovering more about the learning approach, teachers can more effectively tailor their teaching strategies to create a more inclusive and engaging learning atmosphere.

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