INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN BUSINESS & SOCIAL SCIENCES

Vol 15, Issue 11, (2025) E-ISSN: 2222-6990

Improving Mathematics Proficiency among Year 4 in Sekolah Kebangsaan to' Eman Nyabor through Cooperative Learning Methods

Siti Nursyafira, Siti Nursuhadatul Fizrianis, Siti Nurulhuda, Siti Norfatiha, Siti Kausar Zakaria*

Faculty of Education & Humanities, UNITAR International University, Malaysia

*Corresponding Author Email: sitikausar.zakaria@unitar.my

DOI Link: http://dx.doi.org/10.6007/IJARBSS/v15-i11/27020

Published Date: 19 November 2025

Abstract

This study discovers how cooperative learning can help improve mathematics proficiency among Year 4 students in a rural Malaysian primary school. The study was led as an action research project intended at outcome more attractive ways to teach mathematics. Consuming a mixed-methods method, both quantitative and qualitative data were composed to explore the effects of collaboration on students' academic performance and motivation. The Student Teams, Achievement Divisions (STAD) model was used, where students worked together in small groups to explain mathematical problems and support each other's learning. A pre-test and post-test were employed to evaluate students' improvement, and findings presented a strong enhancement in their scores after the cooperative learning sessions. Observations and questionnaires also exposed higher scores of confidences, involvement, and satisfaction among students. In general, the results propose that cooperative learning not only reinforces mathematical understanding but also shapes significant social and communication skills. This paper emphasizes the value of teamwork-constructed teaching approaches, particularly in primary classrooms where teamwork can make learning more expressive and pleasurable.

Keywords: Collaboration Method, Confidence, Involvement, Educational Strategies

Introduction

Mathematics proficiency is a significant predictor of academic accomplishment and lifetime problem-solving capability (Kandeel, 2021) However, current global assessments such as PISA show that students across both advanced and emerging countries remain struggling with engagement and conceptual understanding in mathematics. Out-dated, teacher-centred teaching repeatedly confines students' chances to discover mathematical intellectual collaboratively. Numerous young students, particularly in primary schools' mathematics, are reported frequently to become a cause of worry and disengagement. Studies display that primary problems in mathematical understanding can undesirably disturb students' self-

confidence and long-term accomplishment (Mangarin & Caballes, 2024). This encounter is predominantly apparent in rural school locations, where students may have inadequate access to quality instructional resources or exposure to collaborative learning experiences. Teachers in such settings face the continuing duty of serving students build a strong conceptual basis while keeping them inspired and confident in their capabilities (Johnson & Johnson, 1994).

In current years, educators have gradually twisted toward cooperative and student-centered learning methods as options to traditional, lecture-based teaching. Supportive learning has occurred as one of the most operative approaches for reassuring both academic success and social development (Slavin,1980; Chowdhurry, 2021). Cooperative learning permits students to work in small groups to attain collective learning aims, highlighting mutuality, communication, and cooperation. Competing with one another, students cooperate and study cooperatively, which cultivates a supportive classroom culture grounded in collective responsibility and peer encouragement (Woods & Copur-Gencturk, 2024).

In 21st-century learning skills, critical thinking, creativity and collaboration are mostly appropriate. The Malaysian Education Blueprint (2013–2025) stressed the significance of student active learning and engagement as main factors for educational change. Despite this importance, many schoolrooms still rely on traditional or teacher-centered approaches that limit student self-expression and communication (Ministry of Education Malaysia, 2013). Hence, students may expose lower levels of understanding and engagement mostly in mathematics, where higher-order thinking and conceptual reasoning are significant (Takko et al., 2021). This action research was led at Sekolah Kebangsaan To' Eman Nyabor, a rural primary school in Sarawak, Malaysia. It is to study whether cooperative learning, applied through the Student Teams Achievement Divisions (STAD) model, could expand mathematics ability among Year 4 students. The research also discovered the effects of cooperative learning on students' motivation, classroom behaviour and teamwork as compared with conventional instructional approaches.

By implementing an action research framework, the research wanted to recognize practical classroom approaches that teachers can apply to make mathematics learning more attractive, effective and inclusive. The results contribute to a growing body of research representing that cooperative learning improves not only students' mathematical performance but also their teamwork skills and interpersonal communication (Dimatacot & Parangat, 2022). Additionally, this research offers understanding for instructors in similar rural settings seeking to make active, student centered and collaborative learning environments.

The novelty of this research lies in its focus on Year 4 students in a rural primary school in Sarawak, a cluster that is infrequently studied in present cooperative learning study. While much earlier research discovers cooperative learning among secondary or tertiary students, this study fills an important break by applying the Student Teams Achievement Divisions (STAD) model inside a real-world rural schoolroom through an action research method. By integrating cooperative learning into an setting with inadequate resources and various learner willingness, the research offers framework-specific indication that has not been broadly documented in Malaysian or international literature.

Moreover, the study's originality is supported by its usage of a mixed-methods design, combining classroom observations, student questionnaires, and pre- and post-tests to capture both social and academic conclusions. Distinct study that emphases only on test scores, this research reveals how cooperative learning impacts students' involvement, communication, motivation, and leadership. It not only establishes academic enhancement but also highpoints important interpersonal and behavioral development. This applied, classroom-based insight proposes valuable contributions for teachers and representatives looking for operative, inclusive instructional approaches in rural settings.

Literature Review

Cooperative learning is an instructional method in which students work together in small groups to attain shared learning purposes. The basis of this theory can be drawn to Vygotsky's social development theory that highlights the role of social interaction in cognitive development (Vygotsky, 1978). Learning, according to Vygotsky, happens most successfully inside a social setting, were individuals shape knowledge through collaboration and communication with others. The modern framework of cooperative learning was further developed by Johnson and Johnson (1974), who emphasized the significance of positive interdependency. It is the notion that students can only accomplish when their peers also accomplish. Their study acknowledged five key elements important for positive interdependence, individual accountability, active learning, social skills, group processing and promotive interaction. These fundamentals confirm that all members of a group are dynamically involved and pay meaningfully to the learning progression. Slavin (1980) then refined the concept by announcing specific cooperative learning models, including Student Team Achievement Divisions (STAD) and Teams Games Tournaments (TGT), that combined group activities with assessment and response instruments. Slavin's models highlighted organized teamwork where individual presentations donated to the group's collective achievement, encouraging both motivation and accountability among students.

Cooperative Learning in Mathematics Education

Investigation in mathematics education constantly supports the positive effects of cooperative learning on students' engagement, accomplishment, and problem-solving abilities. Studies in Malaysian classrooms have revealed that cooperative learning increases involvement and inspires active participation in lessons (Govindarajoo et al., 2013). Usmadi et al. (2020) described that the three steps interview cooperative model improved students' communication skills and mathematical reasoning. Likewise, In'am and Sutrisno initiate that cooperative learning pointedly enhanced students' motivation and confidence in solving mathematical problems (In'am & Sutrisno, 2021)

Additionally, Takko et al. (2020) studied the effects of the STAD model in Malaysian secondary schools and initiate that it reduced performance gaps between high and low achieving students and enhanced students' understanding of higher-order mathematical concepts. Cooperative learning also encourages emotional benefits and social such as empathy, teamwork and leadership, which are frequently overlooked in traditional teaching (Chowdhury, 2021). Furthermore, international study highlights similar consequences. Dimatacot and Parangat (2022) established that junior high students in the Philippines who learned mathematics through cooperative methods attained higher post-test scores than

those taught using traditional methods. This proposes that cooperative learning may be operative across educational settings and diverse cultures.

Research Gaps and Rationale

Though the profits of cooperative learning are well-recognized, most studies have focused on tertiary education or secondary education. There remains an absence of empirical study on how cooperative learning affects younger students in primary schools, mostly in rural environments where educational encounters such as inadequate resources and varying student proficiency levels are more distinct (Sawah & Kusaka, 2023). This study addresses these breaks by examining the efficiency of the STAD model in enlightening mathematics ability among Year 4 students in a rural Malaysian primary school. It also discovers how cooperative learning affects students' collaboration, classroom engagement and motivation, offering practical understanding for teachers looking to apply similar approaches in their own classrooms.

Methodology

Research Design

This research used an action research strategy that integrates both quantitative and qualitative approaches to discover the effects of cooperative learning on students' mathematics performance. Action research was selected because it permits teachers to thoroughly reproduce on and expand their instructional practices while directly addressing real classroom encounters (Creswell, 2014). Researchers used a pre-test and post-test structure to evaluate students' enhancement before and after the application of cooperative learning approaches. A mixed-methods method was implemented to capture both students' personal experiences and numerical data.

Quantitative data were used to measure changes in mathematics proficiency, while open-ended survey answers and qualitative observations offered understanding into student teamwork, attitudes toward learning and engagement. The respondents involved of 15 Year 4 students (aged 10) from Sekolah Kebangsaan To' Eman Nyabor, a rural primary school situated in Kabong, Sarawak, Malaysia. The sample comprised students with various levels of mathematical capability to reproduce the variety of proficiency typically found in a primary classroom. Respondents were nominated with the agreement of the school management, and conversant consent was found from both the students' parents and the school principal prior to data collection. Small sample size permitted the researcher to perceive samples more thoroughly and offer individual response during the interference. Though limited in scale, the research offers valued understandings into supportive learning application within rural primary education locations.

Instrumentation

Three instruments were used to gather data, a questionnaire, classroom observation checklists and a mathematics test. Similar mathematics test, containing eight structured questions, was directed before and after the intervention. The pre-test established students' baseline understanding, whereas the post-test measured learning gains after cooperative learning activities. A post-intervention questionnaire collected students' responses on their experiences with cooperative learning. It contained four sections, demographic information, overall satisfaction with the learning experience and open-ended questions about group work

experiences and Likert-scale statements measuring understanding, motivation and communication skills.

Observations were conducted through the intervention using a standardized checklist. The researcher documented behaviors such as communication, leadership participation, peer interaction and teamwork. Observations offered qualitative indication that supplemented the statistical data. The intervention employed the Student Teams Achievement Divisions (STAD) model of cooperative learning established by Slavin (1980). In this model, students were distributed into small group members. Each team worked collaboratively to complete allocated mathematical tasks, discuss answers, and support one another to comprehend tough concepts. The teacher's role moved from that of a knowledge provider to a facilitator who directed monitored group dynamics, discussions, and encouraged equitable involvement. Key features of the STAD implementation included, group-based problem-solving duties, discussion of solutions, peer teaching and Group quizzes where team performance was documented collectively. Reward mechanisms for the best-acting teams to encourage healthy competition and engagement. The intervention continued for two weeks (across Weeks 7 and 8 of the school term). A pre-test was directed in Week 6, followed by the cooperative learning sessions, and a post-test and survey at the end of Week 8.

Data Analysis

Both quantitative and qualitative methods were employed to examine the data. Quantitative data from pre- and post-tests were studied using an inferential paired-sample t-test and descriptive statistics to determine whether there was a statistically significant improvement in students' mathematics scores after the intervention. Qualitative data from open-ended questionnaire responses and classroom observations were analyzed thematically. Repeated themes associated with student participation, teamwork, communication and motivation were categorized. This combination of approaches confirmed a more inclusive understanding of how cooperative learning affected students behaviorally and academically. Study followed ethical research ethics. Respondents' confidentiality and anonymity were protected, and no identifying personal data was encompassed in reports.

Finding

Quantitative Findings

To assess the impact of cooperative learning on students' mathematics proficiency, pre-test and post-test findings were investigated using descriptive statistics and a paired-sample t-test. The mean score for the traditional learning phase was 4.4, whereas the mean score after applying the cooperative learning method increased to 6.13. Variances were 7.97 and 6.84 respectively, representing consistent performance variation across both instructional methods, as shown in Table 1.

Table 1
Comparison of Mean Scores

Methods	Mean Score	Interval Range
Traditional Learning (Pre-Test)	4.40	7.97-6.84

Coorperative Learning (Post-Test)	6.13

The t-test results displayed a one-tailed p-value of 0.036, which is below the significance threshold of 0.05, suggesting a statistically significant enhancement in student performance after the cooperative learning intervention, as shown in Table 2. These findings show that the Student Teams Achievement Divisions (STAD) method had a meaningful influence on students' understanding of mathematical ideas. The enhancement supports the assumption that organized peer collaboration improves comprehension and problem-solving skills in mathematics. Similar results were conveyed by Dimatacot and Parangat (2022), who observed substantial performance improvements among junior high school students exposed to cooperative learning environments. The increase of mean scores reflects not only improved comprehension of the addition of time topic but also bigger student confidence in tackling mathematics problems. Cooperative learning delivered openings for explanation, discussion, and peer feedback processes that strengthen conceptual understanding over social interaction (Vygotsky, 1978).

Table 2
Paired Sample t Test Result on the Effects of Coorparative Method on mathematic Proficiency

Statistical Test	Mean Difference	t-value	p-value (One Tailed)	Significance Level (α)	Decision	Interpretation
Paired Sample t-Test	1.73	-1.84	0.036	0.05	Significant	There is a statistically significant improvement in students' mathematics performance after implementing coorperative learning approach

Qualitative Findings

Post-intervention qualitative questionnaires taken students' perceptions of cooperative learning. Responses were analysed using descriptive statistics and thematic coding. First theme identified is interest in Mathematics. All of respondents described that they were enjoyed learning mathematics lessons under the cooperative learning method. This agreed response highlights a change in student outlooks toward the subject, saying that the collaborative nature of the intervention enlarged pleasure and inspiration. According to Harefa (2023) students with higher attention levels in mathematics are more probable to establish improved performance and persistence. Second themes identified is perceived learning benefits. Most students agreed or strongly agreed that cooperative learning enhanced their understanding of mathematical ideas, stimulated involvement, and made problem solving simpler. The average mean scores across key questionnaire items ranged from 3.87 to 4.6, demonstrating optimistic experience. Remarkably, 67% of students strongly agreed that cooperative learning made it simpler to inquire questions and share ideas. This supports with the results of Virgana (2019) who decided that cooperative environments encourage open communication and peer-to-peer learning.

Third theme identified is motivation and confidence. Though answers were largely positive,

the mean score for items associated to self-confidence (3.93) and motivation (3.87) was slightly lower than other proportions. This proposes that some students, mainly those who are more introverted, may need extra teacher provision in group work. Similar concerns were raised by Habtamu et al. (2022), who highlighted that cooperative learning is most effective when teachers vigorously facilitate group communications to confirm all opinions are heard. In general, the questionnaire data strengthen that cooperative learning donates to enhanced student enjoyment, comprehension, and engagement while highlighting areas where teacher supervision can further increase its efficiency. Classroom observations provided qualitative perceptions into how students collaborated and work together during cooperative learning sessions compared to traditional teaching and learning. Table 2 reviews the detected differences.

Table 3
Comparison Between Traditional and Coorperative Learning

Criteria	Traditional	Coorperative
Students' Interdependence	Fair	Very Good
Students' Responsibility to Peers	Poor	Excellent
Classroom Participation	Fair	Excellent
Teaamwork skills	Poor	Very Good
Group Discussion Quality	Poor	Excellent
Leadership skills	Poor	Very Good
Peer Interaction	Fair	Excellent
Teacher Students' Engagement	Good	Excellent

The observations expose clear béhavioral changes between the two learning methods. During traditional instructions, students inclined to work individually, showed inadequate communication, and depend on teacher direction. In difference, cooperative learning sessions established higher energy levels, richer peer interaction and active engagement among all students. Students who previously did not interested to join became more eager to share their thoughts and help friends. Leadership potentials appeared obviously as students took turns guiding group discussions. These results support with Chowdhury (2021) and Leskinen et al. (2020), who initiated that cooperative learning environments foster leadership, social responsibility and autonomy in group settings.

Discussion

The combination of quantitative, qualitative, and observational data approves that cooperative learning affects both cognitive and social dimensions of learning. The statistically significant enhancement in test scores proposes that working collaboratively improves understanding of mathematical concepts through peer description and group intellectual reasoning. Beyond academic outcomes, the cooperative model developed indispensable social skills such as shared accountability, communication and teamwork. These capabilities bring into line with the aims outlined in the Malaysian Education Blueprint (2013–2025), which underlines developing students who are confident, collaborative, and critical thinkers (Ministry of Education Malaysia, 2013).

Though, while cooperative learning encourages engagement and inclusivity, it also gives challenges. Unequal involvement within groups can occasionally decrease overall success, as noted in students' explanations such as "some group members did not cooperate." These results repeat those of Puccio et al. (2018), who detected that role distribution and group

dynamics meaningfully impact cooperative success. So, teachers play a vital role in facilitating interactions, constructing groups and ensuring equitable participation. In general, this study reveals that integrating the STAD model into mathematics instruction can pointedly increase students' classroom experience and academic performance. By shifting the focus from teacher-centered teaching to cooperative learning, instructors can produce a more interactive environment and supportive to benefit diverse learners.

The "Discussion" section of a research paper provides a comprehensive analysis and interpretation of the study's results in the context of existing knowledge in the field. It is an opportunity for the researchers to delve deeper into the implications and significance of their findings, compare them with previous studies, and explore possible explanations for the observed outcomes. As the results are presented, make sure to cite references that justify, support, explain, or contradict the data evaluated and found in this study. The authors critically evaluate their results in the discussion section, highlighting strengths and weaknesses, addressing any discrepancies or unexpected findings, and providing potential explanations or hypotheses. They may also discuss the limitations of the study, such as methodological constraints or potential sources of bias, and propose avenues for future research to elucidate the topic further. The discussion section often includes a synthesis of the key findings, relating them back to the research questions or objectives outlined in the Introduction.

Conclusion

The results visibly prove that cooperative learning offers social benefits and significant academic as compared to traditional teaching instruction. Quantitative analysis showing a notable increase in students' post-test scores, confirming that structured collaboration benefits students understand mathematical concepts more intensely. Qualitative data further maintained these outcomes. Observations displayed that cooperative learning improved students' leadership skills, teamwork, and communication while questionnaire answers specified high levels of satisfaction and engagement. Students not only accomplished better but also established a stronger sense of accountability toward their peers as an important attribute for lifelong learning. The study supports with Malaysia's educational objectives of nurturing communication skills, collaboration and critical thinking as highlighted in the Malaysian Education Blueprint (2013–2025) (Ministry of Education Malaysia, 2013). By transforming classrooms into collaborating communities of learning, cooperative approaches permit both students and teachers to involve more meaningfully in the educational process. Though, the research also recognised trials, such as uneven involvement and the need for constant teacher assistance to confirm all students contribute similarly. Speaking these matters requests targeted teacher training and continuous supervising of group dynamics.

Longitudinal analysis is required in measuring long term preservation of mathematical notions after cooperative learning interventions could offer greater understanding into constant learning outcomes. Incorporation with digital tools would explore technology such as online group platforms or collaborative learning apps as align with 21st-century digital education trends. Another way is cross subject application would extending cooperative learning approaches to other fundamental subjects like science and language, so it could expose additional affective and cognitive benefits. Finally, cooperative learning offers a powerful and practical way to make mathematics education more equitable, collaborative, and enjoyable for young learners. When implemented successfully, it not only increases academic attainment but

also promotes the cooperative mindset indispensable for success in modern education.Insert text (Calibri font, size 10, and single-line spacing).

The conclusions section serves as the culmination of the research findings and provides a concise summary of the key outcomes and implications of the study. In this section, the researchers present their final thoughts and insights based on the analysis and interpretation of the data. It is an opportunity to address the research objectives and hypotheses and determine whether they were supported or contradicted by the findings. The conclusions should be supported by evidence from the results and discussion sections, highlighting the significance and novelty of the research outcomes. Additionally, this section may also discuss the limitations of the study and suggest potential areas for future research. The "Conclusions" section aims to tie together all the threads of the research and provide a clear and coherent summary of the main findings, ultimately contributing to the broader understanding of the research field and potentially influencing future scientific endeavors.

Acknowledgement
Authors would like to thank UNITAR International University for funding this publication.

References

Chowdhury, T. A. (2021). Fostering learner autonomy through cooperative and collaborative learning. Shanlax Int. J. Education, 10(1). 89–95.

Creswell, J. W. (2014). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. 4th ed. Thousand Oaks, CA: SAGE Publications.

Dimatacot, G. T. & Parangat, D. K. (2022). Effectiveness of cooperative learning on academic performance in mathematics, Int. J. Computer Engineering in Research Trends. 9(2). 51–58.

Govindarajoo, V. M., Aboudahr, S. & Yee, C. Y. (2023). A Case Study on The Implementation of Collaborative Learning in The Malaysian Lower Secondary Classroom, IJARPED, 12(2). 438-455 . doi: 10.6007/IJARPED/v12-i2/16826.

Habtamu, S. B., Mulugeta, A. A. & Mulugeta, W. G. (2022). The effect of cooperative problem-solving method on students' motivation toward learning algebra. Pedagogical Research. 7(2).

Harefa, D. (2023). The relationship between students' interest in learning and mathematics learning outcomes. AFORE J. Pendidikan Matematika. 2(2). 112–122.

In'am, A. & Sutrisno, E. S. (2021). Strengthening students' self-efficacy and motivation in learning mathematics through cooperative learning. Int. J. Instruction, 14(1). 395–410.

Johnson, D. W & Johnson, R. T. (1994). Learning Together and Alone: Cooperative, Competitive, and Individualistic Learning, Allyn & Bacon.

Kandeel, R. (2021). Learners' mathematics proficiency levels on pisa 2018: A comparative study. International Journal of Instruction, 14. 393–416. doi: 10.29333/iji.2021.14323a.

Leskinen, J., Kumpulainen, K., Kajamaa, A., & Rajala, A. (2020). The emergence of leadership in students' group interaction. Eur. J. Psychology of Education. 36(4).1033–1053.

Mangarin, R., & and Caballes, D. (2024). Difficulties in Learning Mathematics: A Systematic Review. International Journal of Research and Scientific Innovation, XI. 401–405. doi: 10.51244/IJRSI.2024.1109037.

Ministry of Education Malaysia (2013). Malaysia Education Blueprint 2013–2025 (Preschool to Post-Secondary Education). Putrajaya, Malaysia.

Puccio, G. J., Burnett, C., Acar, S., Cabra, J. F., & Yudess, J. A. (2018). Creative problem solving in small groups: The effects of creativity training. J. Creative Behavior. 54(2). 453–471.

Sawah, K. O., & Kusaka, S. (2023). Analysing teachers' perception of discovery learning processes in Vanuatu. Int. J. Educational Methodology. 9 (1). 123–138.

Slavin, R. E. (1980). Cooperative learning: Theory, Research, and Practice. Prentice Hall.

Takko M. 2022). Enhancing higher-order thinking skills through cooperative learning (STAD) module, Int. J. Learning, Teaching and Educational Research, 19(7). 204–224.

Takko, M., Jamaluddin, J, Kadir, S. A., Ismail, N., Abdullah, A., & Khamis, A. (2020). Enhancing higher-order thinking skills among home science students: The effect of cooperative learning STAD module, Int. J. Learning, Teaching and Educational Research. 19(7). 204–224.

Usmadi, U., Hasanah, H., & Ergusni, E. (2020). The impact of three-step interview cooperative learning model in mathematics. J. Math. Learning. 3(1).

Virgana, V. (2019). Understanding of mathematical concepts through cooperative learning and learning styles. J. Education and Learning (EduLearn). 13(2). 212–218.

Vygotsky, L. S. (1978). Mind in Society: The Development of Higher Psychological Processes. Harvard Univ. Press.

Woods, P. J., & Copur-Gencturk, Y. (2024). Examining the role of student-centered versus teacher-centered pedagogical approaches to self-directed learning through teaching, Teaching and Teacher Education, 138. 104415. doi: 10.1016/j.tate.2023.104415.