



## The Implementation of the STAD Cooperative Learning Model to Improve Long Division Skills Among Sixth-Grade Students at SDN Dlemer 1

Lailatul Khomariyah<sup>1</sup>, Lailiatur Riefa'ah<sup>2</sup>, Sailir Rohmah<sup>3</sup>, Sri Rahmawati<sup>4</sup>, Nur Hasunah<sup>5</sup>, Andika Adinanda Siswoyo<sup>6</sup>

<sup>1,2,3,4,5,6</sup> Universitas Trunodjoyo Madura

Correspondence E-mail: [240611100052@student.trunojoyo.ac.id](mailto:240611100052@student.trunojoyo.ac.id)

ABSTRACT	ARTICLE INFO
<p><i>This study aims to improve the long multiplication skills of sixth-grade students at SDN Dlemer 1 through the application of the Student Teams Achievement Division (STAD) cooperative learning model supported by instructional media. This study employed the Classroom Action Research (CAR) method, conducted over two cycles, with 32 sixth-grade students as the research subjects. Each cycle included the planning, implementation, observation, and reflection stages. Data collection techniques were conducted through observation, achievement tests, interviews, and documentation. The data were analyzed using quantitative descriptive methods by calculating the percentage of learning activities and student achievement in each cycle. The results of the study indicate that the implementation of the STAD Cooperative Learning model supported by learning media is effective in enhancing student learning activities and outcomes. Student learning activities improved across various aspects, such as attention, engagement, cooperation, participation, presentation skills, comprehension, and independent learning. Additionally, the rate of mastery of learning outcomes increased from 56% in Cycle I to 72% in Cycle II. This improvement occurred because the STAD model encourages students to learn collaboratively through group discussions and individual responsibility, while the learning media helps students understand the steps of long multiplication as applied to calculating the volume of a cube in a more concrete way. Thus, the STAD-type Cooperative Learning model, supported by learning media, can serve as an effective alternative for teaching mathematics to enhance the engagement and learning outcomes of elementary school students.</i></p> <p>© 2026 Kantor Jurnal dan Publikasi UPI</p>	<p><b>Article History:</b> Submitted/Received 20 Apr 2026 First Revised 10 Jun 2026 Accepted 14 Jun 2026 First Available online 17 Mar 2026 Publication Date 30 Jun 2026</p> <hr/> <p><b>Keyword:</b> Cooperative Learning; STAD; Instructional materials; Column multiplication; Mathematics learning outcomes</p>

## 1. INTRODUCTION

Mathematics instruction in elementary school plays a crucial role in developing students' logical and systematic thinking skills, as well as their problem-solving abilities. One of the fundamental skills students need to master is multiplication, particularly vertical multiplication, as this skill forms the foundation for solving various mathematical problems, including those involving cubes. However, in reality, many students still struggle to understand the steps involved in multi-digit multiplication, which results in low mathematics achievement. Additionally, low motivation to learn is another factor that affects students' ability to understand mathematics concepts (Mutiarah et al., 2023).

Difficulties with multiplication are still commonly found among elementary school students. Leby et al. (2023) explain that students often make mistakes in understanding the steps of mathematical operations, lack precision in the calculation process, and are not yet able to apply mathematical concepts accurately. Their research results indicate that most students struggle during the problem-solving process and in determining the final answer due to a lack of understanding of the basic concepts of mathematical operations. This situation indicates that students' computational skills remain relatively low, necessitating more active and targeted instruction to help them better grasp the concept of multiplication.

In line with this, the results of observations and initial interviews conducted in the sixth-grade class at SDN Dlemer 1 revealed that some students still struggle with vertical multiplication. Several students continue to make basic errors, such as adding numbers that should be multiplied, and lack precision in their calculations. Furthermore, although students appeared active during the lesson, their ability to collaborate in groups was not yet optimal, as some students tended to work alone without involving other group members. These conditions indicate that the learning process still requires innovations capable of enhancing both conceptual understanding and student collaboration in group learning.

Success in mathematics learning is influenced not only by students' abilities but also by their level of engagement during the learning process. Active students tend to understand the material more easily because they are directly involved in learning activities, whether through discussion, asking questions, or group work. Sihaloho et al. (2021) state that student engagement and interest in learning influence students' mathematics learning outcomes. Therefore, a learning model is needed that can increase students' active engagement so that the learning process becomes more meaningful and is not solely teacher-centered.

In addition to the right instructional model, the use of instructional media also plays a crucial role in helping students understand the material being studied. Instructional media serves as a tool for conveying educational messages, thereby helping students grasp the material more easily and effectively (Hasan et al., 2021). According to Pagarra et al. (2022), instructional media acts as an intermediary that helps teachers deliver content and enables students to have more concrete and engaging learning experiences. The use of instructional media can enhance students' attention, interest, and motivation to learn, thereby making the learning process more engaging and meaningful (Fadilah et al., 2023). In addition, learning media can also help concretize abstract concepts, making it easier for students to understand the learning material (Saleh et al., 2023). Therefore, the use of learning media is considered to support the application of the STAD type of Cooperative Learning model in helping students better understand the concept of multi-digit multiplication.

Various studies indicate that cooperative learning models can help improve elementary school students' arithmetic skills. Research by [Ningsih et al. \(2025\)](#) shows that the implementation of the STAD model has an impact on students' multiplication and division skills. Meanwhile, [Anitra \(2021\)](#) explains that the Jigsaw cooperative learning model can increase student engagement in mathematics learning through interdependent group learning activities. These findings are supported by [Sari et al. \(2025\)](#), who demonstrated that the Jigsaw cooperative learning model is effective in improving students' multiplication skills, while [Saila et al. \(2023\)](#) showed that the NHT cooperative learning model can enhance elementary students' mathematical problem-solving skills through the active participation of every group member in learning discussions. These findings are reinforced by [Nuboba and Imron \(2024\)](#), who state that the NHT model has a positive impact on student learning outcomes because it encourages individual participation and responsibility within the group. Nevertheless, each cooperative learning model has distinct characteristics. The Jigsaw model requires students to master a specific portion of the material as "experts" before explaining it to other group members. This model is more suitable for material that can be divided into several distinct subtopics. Meanwhile, the NHT model places greater emphasis on individual readiness to answer questions posed by the teacher through group discussions. Unlike these two models, STAD places students in heterogeneous groups that collaborate to study the same material, help one another understand concepts, and conclude with individual assessments ([Wulandari & Kunci, 2022](#)). These characteristics are considered more suitable for the students of Grade 6 at SDN Dlemer 1, who still struggle with the basic concepts of long division and demonstrate varying academic abilities. In long division, students require step-by-step practice, peer guidance, and repeated concept reinforcement to prevent procedural errors such as adding numbers that should be multiplied. Therefore, the STAD model was chosen because it allows students with stronger abilities to help their groupmates understand the steps of columnar multiplication, while still providing individual accountability through individual assessment so that each student's understanding can be measured more effectively.

Although various studies have demonstrated the effectiveness of cooperative learning models in improving students' mathematics achievement, there are still research gaps that require further investigation. Previous studies have generally focused on the impact of cooperative learning models on overall mathematics achievement or computational skills across different grade levels and subject matter. Furthermore, most studies have emphasized improving learning outcomes without linking them to the specific challenges students face during the process of performing multi-step multiplication. In fact, students' difficulties in understanding the steps of multi-step multiplication require learning strategies that not only improve learning outcomes but also facilitate peer interaction in building conceptual understanding gradually. Therefore, this study focuses on the application of the STAD Cooperative Learning model to improve the long multiplication skills of sixth-grade students at SDN Dlemer 1, who demonstrate fairly good learning engagement but still struggle with the basic concepts of long multiplication. This study is expected to provide empirical evidence regarding the effectiveness of STAD in addressing students' procedural difficulties in long multiplication material related to learning the volume of a cube.

The Cooperative Learning Model is a learning model that emphasizes collaboration among students in small groups to achieve shared learning objectives. Through cooperative learning, students are not only responsible for their own learning success but also help other group members achieve the same learning objectives. Interaction among students within the

group can enhance participation, communication, and conceptual understanding through discussions and collaborative problem-solving.

One type of cooperative learning widely used in mathematics education is the Student Teams Achievement Division (STAD) model. According to [Wulandari and Kunci \(2022\)](#), the STAD model consists of several stages: the teacher's presentation of the material, the formation of heterogeneous groups, team-based learning activities, individual quizzes or assessments, and group rewards. The main principles of the STAD model are positive interdependence among group members, individual accountability, face-to-face interaction, and group rewards that encourage students to help one another in understanding the learning material. Through these principles, students with higher abilities can guide peers who are still struggling, making the learning process more active and collaborative.

The principles of the STAD model are considered relevant for addressing students' difficulties with long multiplication. Common mistakes made by students such as a lack of understanding of the multiplication steps, carelessness during calculations, and procedural errors in determining the final result require ongoing guidance and gradual practice. Through group discussions in the STAD model, students can receive help from their peers to understand each step of the multi-digit multiplication process, thereby minimizing conceptual errors. Additionally, the inclusion of individual assessments ensures that each student remains responsible for understanding the material independently.

The implementation of the STAD model in mathematics instruction has been shown to improve student learning outcomes. [Ningsih et al. \(2025\)](#) explain that the STAD model influences elementary school students' multiplication and division skills because it encourages students to be more active in discussing and solving mathematical problems with their groups. These findings are supported by [Sefila and Kamal \(2023\)](#), who, through a meta-analysis, found that the implementation of the STAD Cooperative Learning model has a positive effect on the learning outcomes of elementary school students across various subjects. Additionally, [Masyhudah and Widayarsi \(2024\)](#) state that the STAD model can enhance student engagement and mathematics learning outcomes through group collaboration and individual responsibility in the learning process.

In addition to the STAD model, there are other cooperative learning models such as Jigsaw and Numbered Heads Together (NHT). [Anitra \(2021\)](#) explains that the Jigsaw model enhances student engagement by assigning responsibility for specific content to each group member as an "expert." These findings are supported by [Harefa et al. \(2022\)](#), who state that the Jigsaw model can improve students' conceptual understanding through peer-teaching activities among group members. Meanwhile, [Saila et al. \(2023\)](#) explain that the NHT model can enhance students' mathematical problem-solving skills because each group member is required to be prepared to answer questions posed by the teacher. These findings are reinforced by [Nuboba and Imron \(2024\)](#), who state that the NHT model has a positive impact on student learning outcomes through increased participation and individual responsibility within the group. Nevertheless, the STAD model is considered more suitable for use with multi-step multiplication problems because all group members study the same material and help each other understand the steps to solve the problems gradually before taking an individual assessment.

In addition to instructional models, mathematics learning outcomes are also influenced by students' motivation and engagement. [Mutiara et al. \(2023\)](#) explain that low motivation to learn mathematics can lead to students being less active and having difficulty understanding the material. Meanwhile, [Sihaloho et al. \(2021\)](#) state that engagement and interest in learning

have an impact on students' mathematics learning outcomes. Therefore, the use of interactive learning models supported by learning media can help improve students' attention, engagement, and understanding in the mathematics learning process. Thus, the implementation of the STAD-type Cooperative Learning model supported by learning media is expected to improve students' learning outcomes in the topic of multi-digit multiplication.

## 2. RESEARCH METHODOLOGY

This study employed a quantitative approach using Classroom Action Research (CAR) to improve students' ability to solve multi-digit multiplication problems through the implementation of the STAD Cooperative Learning model. The research subjects were all 32 sixth-grade students at SDN Dlemer 1. The study was conducted during the second semester of the 2025/2026 academic year and consisted of two cycles. Each cycle consisted of the planning, implementation, observation, and reflection stages.

During the planning phase, the researcher developed instructional materials, including teaching modules, student worksheets (LKPD), student activity observation sheets, interview guidelines, and learning outcome assessment instruments. During the implementation phase, instruction was conducted using the STAD model of Cooperative Learning. Cycle I was implemented by applying the STAD steps through material delivery, group discussions, individual quizzes, and group rewards. Based on the reflections from Cycle I, improvements were made in Cycle II through more intensive mentoring and the use of learning media aids to help students understand the steps of multi-step multiplication related to the topic of cube volume. The observation phase was conducted to monitor student activities during the learning process, while the reflection phase was used to evaluate the results of the interventions in each cycle as a basis for improving instruction in the subsequent cycle.

The research instruments used included student activity observation sheets, achievement tests, interview guidelines, and documentation. The observation sheets were used to observe students' learning activities, including attention, engagement, cooperation, participation, presentations, accuracy of responses, comprehension, and independent learning. The achievement test was used to measure students' ability to solve multi-step multiplication problems related to the topic of cube volume. The interview guide was used to gather information regarding students' initial learning conditions and the difficulties they experienced, while documentation served as supporting data for the research.

Before being used in the study, the instruments which included observation sheets, learning outcome tests, and interview guidelines were first validated through expert judgment by the supervising lecturer to ensure the alignment of indicators, content, and research objectives.

Data collection techniques included observation, tests, interviews, and documentation. The data obtained were analyzed using quantitative descriptive analysis by calculating the percentage of student learning activities and the percentage of learning achievement in each cycle, then comparing the results obtained between Cycle I and Cycle II to determine the improvement that occurred after the implementation of the STAD Cooperative Learning model.

## 3. RESULT AND DISCUSSION

Mathematics instruction using the STAD cooperative learning model was implemented with sixth-grade students at SDN Dlemer 1 with the aim of improving students' understanding

of multi-digit multiplication as it relates to the volume of a cube. Prior to the implementation of the intervention, the researcher held discussions with the classroom teacher to develop instructional materials, including teaching modules, group worksheets, learning media, and assessment instruments. The study was conducted in two cycles, involving all sixth-grade students as research subjects.

Cycle I was conducted in a single session using the STAD model of cooperative learning through several learning stages. During the material presentation stage, the teacher explained the concept of columnar multiplication in relation to the volume of a cube using explanations and example problems on the blackboard. Next, students were divided into several heterogeneous groups to discuss and work on the worksheets together. During the team work stage, students helped one another understand the steps of multi-digit multiplication and solve the given problems. After the discussion activity was completed, students took an individual assessment to determine each student's level of understanding of the material studied. Subsequently, the teacher awarded recognition to the group that achieved the best results and demonstrated the best cooperation as a form of motivation in learning. These stages align with the steps of the STAD model, which include material presentation, group work, individual quizzes, and group recognition (Wulandari & Kunci, 2022). Meanwhile, in Cycle II, instruction was conducted by addressing the challenges identified in the previous cycle. The teacher provides more intensive guidance to each group and uses learning media aids to help students understand the steps of long multiplication more concretely. The learning stages continued to follow the steps of the STAD model, namely presentation of material, group discussion, individual quizzes, and group rewards. During the group work stage, the teacher was more active in guiding students who were struggling and encouraged every group member to participate in the discussion. In addition, the use of media aids made it easier for students to understand the process of long multiplication, so that students became more active and confident in solving problems. Observation results show that student activity and learning outcomes have improved compared to Cycle I.

In addition to the increase in learning activities, during the observation and reflection phase of Cycle I, the results of the observation of student learning activities showed that student attention was at 57%, engagement at 61%, cooperation at 46%, participation at 46%, presentation skills at 46%, accuracy of answers at 66%, comprehension at 58%, and independent learning at 65%. These results indicate that student learning activities are still in the "adequate" category and have not yet achieved optimal results. Meanwhile, in Cycle II, the results of the observation of student learning activities showed that student attention was 68%, activity was 66%, cooperation was 57%, participation was 60%, presentation was 54%, accuracy of answers was 67%, comprehension was 68%, and learning independence was 66%. The detailed results of the observation of student activities are presented in Table 1.

**Table 1** *Percentage of Student Activity Observations in Cycle I and Cycle II*

<b>Aspects observed</b>	<b>Cycle 1</b>	<b>Cycle 2</b>
Attention Students	57%	68%
Activity	61%	66%
Cooperation	46%	57%
Participation	46%	60%
Presentation	46%	54%

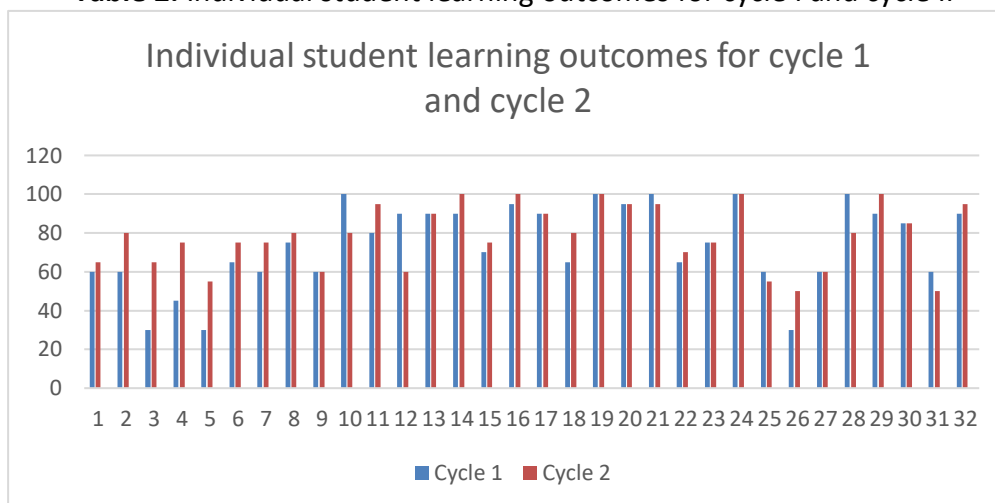
Accuracy of answering	66%	67%
Understanding	58%	68%
Learning Independence	65%	66%

Based on Table 1, there was an increase in student activity observed in Cycle II. This was due to the use of instructional media that helped students understand the steps of long multiplication and the volume of a cube in a more concrete way. Instructional media serves as a means of conveying learning messages, thereby making it easier for students to understand the material presented by the teacher (Hasan et al., 2021). Additionally, learning media aim to enhance students' attention, interest, and engagement in the learning process, thereby making learning more effective and meaningful (Fadilah et al., 2023). In this study, the media were used to help students visualize the process of long multiplication related to calculating the volume of a cube, making the concepts being studied easier to grasp. In line with this, Saleh et al. (2023) explain that the use of instructional media can help students understand abstract concepts in a more concrete way, thereby supporting improved learning outcomes. Furthermore, teachers provide more intensive guidance to students who are still struggling and more actively facilitate group collaboration, so that improvements in students' learning activities regarding the material on multi-step multiplication can be seen more optimally. This is consistent with the findings of Harefa et al. (2022), who state that the use of instructional models and media that actively engage students can help improve conceptual understanding and student learning outcomes. Instruction that provides students with opportunities to interact and build understanding independently tends to result in more meaningful learning experiences. Additionally, teachers provide more intensive support to students who are still struggling and more actively facilitate group collaboration, resulting in more optimal improvements in student learning activities regarding the topic of multi-digit multiplication.

The increase in student engagement with the material on multi-digit multiplication was also influenced by the implementation of the STAD Cooperative Learning model. Through this model, students are encouraged to learn in groups, discuss, help one another understand the material, and actively collaborate on tasks. These conditions make students more engaged during the learning process compared to teacher-centered instruction. This aligns with the research by Masyhudah and Widayarsi (2024), which states that the implementation of the STAD-type Cooperative Learning model can enhance student engagement and mathematics learning outcomes because students have the opportunity to exchange ideas and collaborate in understanding the learning material. Additionally, group discussion activities and the provision of rewards within the STAD model also help boost students' learning motivation, thereby making the learning process more active and meaningful. This indicates that the implementation of the STAD Cooperative Learning model, supported by instructional media tools, can help students become more active in discussing and understanding the learning material. Furthermore, the improvement in comprehension suggests that the use of media can help students understand the concepts of multi-step multiplication and the volume of a cube more clearly.

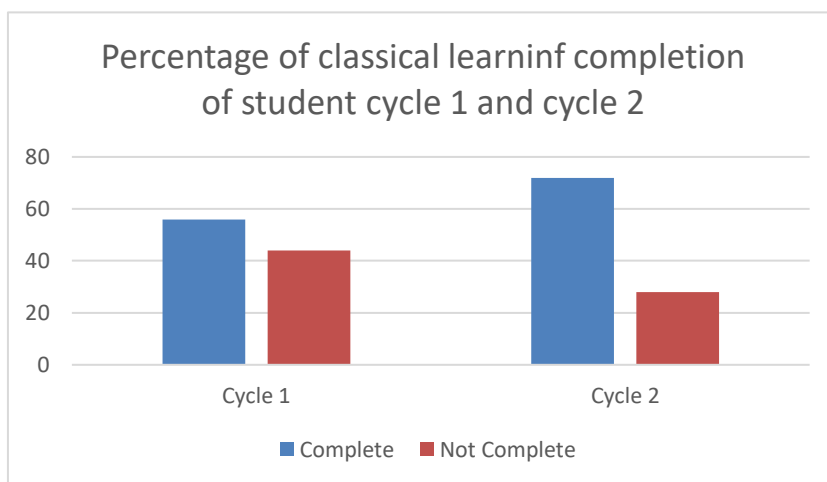
In addition to increased learning activity, student learning outcomes also showed an improvement from Cycle I to Cycle II. Based on student learning outcome data, the classical learning achievement rate in Cycle I reached 56% of students, while in Cycle II it reached 72%. The percentage increase in student learning achievement is presented in detail in Figure 2.

**Table 2:** Individual student learning outcomes for cycle I and cycle II



This improvement indicates that, although there are still some students who have not yet achieved mastery, the implementation of STAD and learning media is gradually beginning to have a positive impact on conceptual understanding.

**Table 3:** Percentage of classical learning completion of students cycle 1 and cycle 2



Based on Table 2 and Table 3, it is evident that students' evaluation results and learning achievement improved in Cycle II. Most students achieved better scores compared to Cycle I after the implementation of the STAD-type Cooperative Learning model supported by learning media. This improvement indicates that the use of group learning and learning media aids can help students understand the steps of long multiplication and cube volume calculations more clearly. Additionally, students became more active in discussing, asking questions, and collaborating with their group members during the learning process.

The results of this study indicate that the STAD Cooperative Learning model can enhance student engagement and understanding in mathematics learning. These findings align with the research by Ningsih et al. (2025), which states that the STAD model can improve the arithmetic skills of elementary school students. Additionally, the results of this study also support the view of Sihaloho et al. (2021), who explain that student engagement in learning influences mathematics learning outcomes. Overall, the implementation of the STAD Cooperative Learning model supported by learning media was able to increase student learning activity and

understanding of the material on multi-step multiplication and cube volume in the sixth grade at SDN Dlemer 1. Thus, the results of this study confirm that the combination of the STAD model and learning media is more effective in overcoming procedural difficulties in multi-step multiplication compared to conventional learning.

#### **4. CONCLUSION**

Based on the results of the study, it can be concluded that the implementation of the Student Teams Achievement Division (STAD) cooperative learning model, supported by instructional media, was able to improve the learning activities and outcomes of sixth-grade students at SDN Dlemer 1. Improvements in learning activities were evident in the areas of attention, engagement, cooperation, participation, presentation, comprehension, and independent learning from Cycle I to Cycle II. In addition, student learning outcomes also improved, as indicated by an increase in the percentage of classical learning mastery from 56% in Cycle I to 72% in Cycle II.

This improvement occurred because the STAD model provides students with the opportunity to learn in groups, discuss, and help one another understand the material, while the use of learning media helps students visualize the steps of multi-step multiplication related to calculating the volume of a cube in a more concrete way. Thus, the implementation of the STAD Cooperative Learning model supported by learning media can serve as an effective alternative for teaching mathematics to enhance learning activities and understanding among elementary school students regarding the concept of multi-step multiplication as applied to solving cube volume problems.

## 5. REFERENCE

- Anitra, R. (2021). Pembelajaran kooperatif tipe jigsaw dalam pembelajaran matematika di sekolah dasar. *JPDI (Jurnal Pendidikan Dasar Indonesia)*, 6(1), 8.
- Fadilah, A., Nurzakiah, K. R., Kanya, N. A., Hidayat, S. P., & Setiawan, U. (2023). Pengertian media, tujuan, fungsi, manfaat dan urgensi media pembelajaran. *Journal of Student Research*, 1(2), 01-17.
- Harefa, D., Sarumaha, M., Fau, A., Telaumbanua, T., Hulu, F., Telaumbanua, K., ... & Ndraha, L. D. M. (2022). Penggunaan model pembelajaran kooperatif tipe jigsaw terhadap kemampuan pemahaman konsep belajar siswa. *Aksara: Jurnal Ilmu Pendidikan Nonformal*, 8(1), 325-332.
- Hasan, M., Milawati, Darodjat, Harahap, T. K., Tahrim, T., Anwari, A. M., Rahmat, A., Masdiana, & Indra, I. M. (2021). Media pembelajaran. Tahta Media Group
- inelda Nuboba, A., & Imron, M. (2024). Studi+ Literatur Model Pembelajaran Kooperatif Tipe (NHT) Terhadap Hasil Belajar. *Prosiding Ilmu Kependidikan*, 1(2), 15-20.
- Leby, L. N. B., Irianto, D. M., & Yuniarti, Y. (2023). Analisis kesulitan belajar operasi hitung pembagian matematika pada siswa kelas 3. *Jurnal Review Pendidikan Dasar: Jurnal Kajian Pendidikan dan Hasil Penelitian*, 9(1), 37-42.
- Masyhudah, M. S., & Widyasari, C. (2024). Penerapan model pembelajaran cooperative learning tipe STAD untuk meningkatkan hasil belajar matematika siswa kelas V. *Ainara Journal (Jurnal Penelitian dan PKM Bidang Ilmu Pendidikan)*, 5(4), 526-532.
- Mutiara, T., Safrizal, S., & Yulnetri, Y. (2023). Faktor penyebab rendahnya motivasi belajar matematika siswa kelas IV sekolah dasar negeri 12 Andaleh Baruh Bukit. *Jurnal Riset Madrasah Ibtidaiyah (JURMIA)*, 3(2), 96-105.
- Ningsih, A. P. S., Putri, N. A. A., Damayanti, N. A., Fidila, I. R., Maulana, M. N. A. D., & Pratikno, A. S. (2025). Pengaruh model pembelajaran STAD terhadap kemampuan berhitung perkalian dan pembagian pada siswa kelas V SDN Bilaporah 1 Bangkalan. *Jurnal Binagogik*, 12(2), 265-276.
- Pagarra, H., Syawaluddin, A., Krismanto, W., & Sayidiman. (2022). Media pembelajaran. Makassar: Badan Penerbit UNM
- Saila, N., Jannah, F., Isyuniandri, D., & Sulianti, A. (2023). Penerapan Pembelajaran Kooperatif Tipe NHT Ditinjau dari Kemampuan Pemecahan Masalah Matematis Siswa Sekolah Dasar. *Journal on Education*, 5(2), 3444-3451.
- Sari, B. P., Prihastari, E. B., & Irmade, O. (2025). Efektivitas model pembelajaran kooperatif tipe Jigsaw terhadap kemampuan berhitung perkalian. *Al-Irsyad Journal of Mathematics Education*, 4(2), 533-541.
- Sihaloho, I. M., Asyiril, A., & Azainil, A. (2021). Pengaruh keaktifan dan minat belajar siswa terhadap hasil belajar matematika. *Prosiding Seminar Nasional Pendidikan Matematika Universitas Mulawarman*, 1, 33-42.
- Wulandari, I., & Kunci, K. (2022). Model pembelajaran kooperatif tipe STAD (student teams achievement division) dalam pembelajaran MI. *Jurnal papeda*, 4(1).