

# IMPROVING MATHEMATICS LEARNING OUTCOMES WITH THE HELP OF TEACHING AIDS IN GRADE VII STUDENTS

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**Abstrak.** Pembelajaran matematika di tingkat SMP/MTs masih menghadapi permasalahan rendahnya pemahaman konsep siswa, khususnya pada materi operasi penjumlahan dan pengurangan bilangan bulat. Materi ini bersifat abstrak sehingga sering menimbulkan kesalahan konsep apabila disampaikan tanpa bantuan media pembelajaran yang konkret. Kondisi tersebut berdampak pada rendahnya hasil belajar siswa, sehingga diperlukan upaya pembelajaran yang mampu membantu siswa memahami konsep secara lebih bermakna. Penelitian ini bertujuan untuk meningkatkan hasil belajar dan pemahaman konsep siswa pada materi operasi penjumlahan dan pengurangan bilangan bulat melalui penggunaan alat peraga. Jenis penelitian yang digunakan adalah Penelitian Tindakan Kelas (PTK) dengan model Kemmis dan McTaggart yang dilaksanakan dalam dua siklus, masing-masing siklus terdiri atas dua pertemuan yang meliputi tahap perencanaan, pelaksanaan tindakan, observasi, dan refleksi. Subjek penelitian adalah 32 siswa kelas VII MTsN 1 Probolinggo. Instrumen penelitian meliputi tes hasil belajar (pretest dan posttest), lembar observasi aktivitas siswa, dan dokumentasi. Data dianalisis secara deskriptif kuantitatif untuk melihat peningkatan hasil belajar dari pra-siklus hingga siklus II. Hasil penelitian menunjukkan adanya peningkatan hasil belajar siswa setelah penerapan alat peraga. Rata-rata nilai pretest pada pra-siklus sebesar 45%, meningkat menjadi 82,5% pada siklus I, dan kembali meningkat menjadi 92,2% pada siklus II. Ketuntasan belajar klasikal juga meningkat dari 18,75% pada pra-siklus menjadi 87,5% pada siklus I dan mencapai 100% pada siklus II. Dengan demikian, penggunaan alat peraga terbukti efektif dalam meningkatkan pemahaman konsep dan hasil belajar matematika siswa.

**Kata kunci:** Hasil Belajar, Alat Peraga, Pemahaman Konsep

**Abstract.** Learning mathematics at the junior high school level often faces challenges, particularly in students' low understanding of basic integer operations such as addition and subtraction. These difficulties frequently result in misconceptions and low learning outcomes because the material is abstract and is often taught using conventional methods without adequate learning support. Therefore, it is urgent to implement learning strategies that can make abstract mathematical concepts more concrete and meaningful for students. This research aims to improve learning outcomes and students' understanding of concepts in the material of integer addition and subtraction operations through the use of props. The type of research used is Classroom Action Research (CAR) with the Kemmis and McTaggart model, conducted in two cycles, each consisting of two meetings that include the stages of planning, action implementation, observation, and reflection. The subjects of this study were 32 seventh-grade students of MTsN 1 Probolinggo. The research instruments included learning outcome tests (pretest and posttest), student activity observation sheets, and documentation. The collected data were analyzed using descriptive quantitative analysis to examine improvements in learning outcomes from the pre-cycle to cycle II. The results showed a significant increase in student learning outcomes after the application of teaching aids. The average pretest score in the pre-cycle was 45%, which increased to 82.5% in the posttest of cycle I and further increased to 92.2% in the posttest of cycle II. The percentage of classical learning completeness also improved, from 18.75% in the pre-cycle to 87.5% in cycle I and reached 100% in cycle II. These findings indicate that the use of teaching aids helps students understand the concepts of integer addition and subtraction more concretely, facilitates problem-solving, and enhances learning outcomes. Thus, it can be concluded that the application of teaching aids is effective in improving conceptual understanding and mathematics learning outcomes of seventh-grade students at MTsN 1 Probolinggo.

**Keywords:** Learning Outcomes, Teaching Aids, Concept Comprehension



## A. Introduction

Mathematics is one of the basic subjects that plays an important role in forming a logical, critical, and systematic mindset. Mastering mathematical concepts not only helps students understand other subject matter, but also prepares them to face problems in daily life. However, the results of initial observations in grade VII MTsN 1 Probolinggo showed that most students had difficulty understanding the operation of addition and subtraction of integers. Of the 32 students, only about 18% achieved the Minimum Completeness Criteria (KKM). The most prominent difficulty arises when students have to operate negative numbers, where many conceptual errors occur. These findings are in line with the research of Markumbo, Kaunang, and (Markumbo et al., 2024) which states that conventional learning makes students tend to only memorize procedures without understanding concepts, so they are prone to misconceptions.

This low understanding is also reflected in the results of the 2023 National Assessment which reports that the numeracy ability of Indonesian students is still in the medium category, with many students not being able to interpret mathematical operations in a real context. (Annisa et al., 2022) Through his meta-analysis, it is emphasized that the use of teaching aids has been proven to consistently improve students' mathematics learning outcomes at various levels of education. This indicates the need for learning innovations that provide a concrete learning experience so that students can better internalize concepts.

One solution that can be applied is the use of concrete learning media that can help students visualize abstract concepts. (Asri Taufiq, Fathimah Az Zahra Nasiruddin, 2024) Found that interactive boards improve students' understanding because they present engaging and interactive visual representations. (Nahdi & Alfiani, 2020) showing that number lines help students understand the relationship between positive and negative numbers. (Nurwidyarini & Musthofa, 2023) It also emphasizes that the use of line teaching media significantly improves the understanding of mathematical concepts. Moreover (Sarumaha et al., 2024) added that the teaching aid-based opportunity board is able to make students more actively involved in learning.

A number of other studies have also shown a positive impact of the use of concrete media. (Lepinus Gombo et al., 2025) Reporting increased student participation when using number line props. (Herianti & Prihastari, 2023) Proving that the number scale media makes students understand the concept of balance of counting operations faster. (Layli Widya Hasanah, Karlina Wong Lieung, Fredy & Hanipah, 2024) It even introduced an innovative "number satay" media to make learning number operations more interesting.

In addition to the media, learning strategies also play an important role. The STAD-type cooperative learning model allows students to learn in heterogeneous groups, help each other, and compete healthily to achieve the best results. (Nasrawati & Putrini R Harahap, 2024) found that the application of STAD can increase learning completeness by more than 90%. (Noviani et al., 2025) through MOBILBUT media innovation, it also proves that group work encourages students to build a deeper and more enjoyable understanding of concepts.

This research has novelty because it was carried out in madrasas, where the characteristics of students are different from public schools, both in terms of background and learning motivation. Thus, this research is expected to make a practical contribution in the form of recommendations for effective learning strategies to improve mathematics learning outcomes.

The purpose of this study is to improve learning outcomes and understanding of the concept of addition and subtraction operations of integer students in grade VII MTsN 1 Probolinggo through the application of a STAD-type cooperative learning model assisted by teaching aids.



## B. Research Methodology

This research is a Class Action Research (PTK) conducted at MTsN 1 Probolinggo in the period August to September 2025 with the participation of 32 grade VII students, consisting of 10 males and 22 females. The research was carried out collaboratively with mathematics teachers who acted as partners in the implementation of actions and observations.

This study uses the Kemmis and McTaggart model which is carried out in two cycles, each consisting of two meetings. Each cycle includes four stages, namely planning, implementation of actions, observation, and reflection. At the planning stage, the researcher prepares lesson plans, props such as number lines and number cards, as well as learning outcome test instruments and observation sheets. The implementation of learning uses a STAD-type cooperative model with the help of teaching aids which includes: (1) the presentation of material by the teacher using teaching aids, (2) heterogeneous group work of 4-5 students formed based on academic ability and gender to discuss, (3) individual quizzes that are done independently and used to calculate individual improvement scores, (4) calculation of individual improvement scores by comparing the latest grades with the grades previous to determine the contribution to the group, and (5) the awarding of the group in the category of Good, Great, or Super based on the average score of the member's improvement.

The instruments used include learning outcome tests, student activity observation sheets, and documentation. Learning outcome tests are given in the pre-cycle (pretest), post-test cycle I, formative/enrichment test cycle II, and post-test cycle II, in the form of description questions arranged according to competency indicators. The observation sheet assesses student activities through six indicators, namely attention when delivering material, activeness in group discussions, ability to explain ideas, responsibility during individual quizzes, cooperation between members, and enthusiasm in receiving awards. Documentation in the form of photos and field notes serves as supporting data.

Data was collected through learning outcome tests, direct observation, and documentation. Learning outcome data was used to measure improved conceptual understanding, observation to assess student engagement during STAD learning with props, while documentation reinforced data from tests and observations.

Data analysis was carried out descriptively, quantitatively, and qualitatively. Quantitative data in the form of test scores were analyzed by calculating average scores, percentage of learning completion, and individual and group improvement scores based on the STAD model. The percentage of learning completeness is calculated using the formula:

$$\text{Completion Rate} = \frac{\text{Number of students who achieve mastery}}{\text{Total number of students}} \times 100\%$$

Students are considered to have achieved completeness if they obtain a minimum score in accordance with the Minimum Completeness Criteria (KKM) set by the school, which is 70. Individual improvement scores are calculated by comparing the initial score with the subsequent test score, with a score of 0 if the score is fixed or decreased, 10 for a minor improvement (1–10 points), 20 for a moderate improvement (11–20 points), and 30 for a major improvement (more than 20 points or reaches the maximum score). Group scores are obtained from the average improvement score of all group members, which is then classified with the predicate of Good, Great, or Super.

The qualitative data from the observation results were analyzed by calculating the average score from the student activity indicator, which was then converted into a percentage of achievement and categorized into very low (0–25%), low (26–50%), adequate (51–75%), and high (76–100%) levels. The results of reflection from each cycle are the basis for improving planning and implementation in the next cycle.



## C. Research and Discussion Results

### 1 Research Results

#### a. Pre-Cycle Test Results

This research began with a pre-cycle test to measure students' initial ability in the material of integer addition and subtraction operations. The test was given to 32 students of grade VII MTsN 1 Probolinggo. The results showed that the average grade of the class only reached 45.0%, with classical completeness of 18.75%. Of the 32 students, only 6 students managed to achieve scores above the Minimum Completeness Criteria (KKM = 70), while the other 26 students were still below the standard. This condition shows that the majority of students do not understand the basic concept of integers, especially when dealing with problems involving negative numbers.

The pre-cycle grade distribution showed that 20 students were in the low-grade category (<50), 6 students were in the medium category (50–69), and only 6 students reached the complete category ( $\geq 70$ ). This data provides an initial picture that students' understanding of concepts is still limited, so there is a need for improvement efforts through the implementation of more effective learning strategies.

#### b. Cycle I Test Results

After the application of teaching aids in cycle I, student learning outcomes showed a significant increase. The average posttest score of the first cycle reached 82.5 with classical completeness of 87.5% (28 students completed and 4 students did not complete). Compared to the pre-cycle, the average score increase reached 37.5 points, while the completion percentage increased by 68.75%.

However, the results of reflection with teachers show that there are still several obstacles. Some students still have difficulty using number line props correctly, especially in operating negative numbers. In addition, there were 4 students who tended to be passive in group discussion activities. This suggests that while teaching aids are effective in improving learning outcomes, there is a need for additional strategies to encourage the equal involvement of all students.

#### c. Cycle II Test Results

In cycle II, improvements were made by providing more structured directions on the use of teaching aids, increasing the variety of exercise questions, and optimizing group discussions. The teacher also gives students the opportunity to present the results of the group discussion in front of the class.

The results of the second cycle posttest showed a more significant increase. The average grade of the class reached 92.2%, with 100% classical completeness. All students have successfully exceeded the KKM, which means that the actions taken have succeeded in improving the overall understanding of students' concepts. The distribution of scores in cycle II shows that almost all students are in the high category (85–100), so the gap in learning outcomes between students is narrowing.

#### d. Recapitulation of the Development of Learning Outcomes

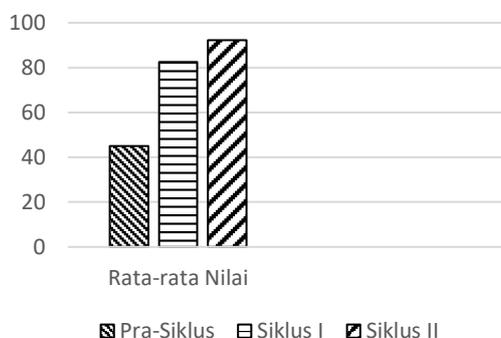
Comparison of learning outcomes from pre-cycle to cycle II can be seen in Table 1.

**Table 1 Development of Student Learning Outcomes**

Statistics	Grade Point Average	Classical Completeness	Number of Students Completed	The Number of Students Is Incomplete
Pre-Cycle	45,0	18,75%	6	26
Cycle I	82,5	87,50%	28	4
Cycle II	92,2	100%	32	0



The improvement in student learning outcomes can be seen from the development of average grades at each learning stage. In the pre-cycle, the average score only reached 45%, which shows the students' low understanding of the material of addition and subtraction of integers. After the action was carried out in the first cycle with the use of props, the average value increased significantly to 82.5%. This result increased again in the second cycle to reach 92.2%. This upward trend confirms that the use of teaching aids is able to have a positive impact on students' understanding in solving abstract mathematics problems.



**Figure 1** Average Development of Pre-Cycle to Cycle II Student Scores

*e. Student Activity Observation Data*

In addition to the results of the written test, this study also involves observation data to monitor the development of student learning activities during the learning process. Observations were carried out by teachers and researchers using observation sheets that included four main aspects, namely activeness in discussion, enthusiasm in using props, ability to solve problems, and courage in presenting the results of group work. This observation aims to provide a comprehensive overview of changes in student learning behavior after the implementation of teaching aid-based learning.

Based on the observation results, it was found that there was a significant increase in all aspects of student learning activities from cycle I to cycle II. In the first cycle, students' activeness in discussing is still moderate; Some students have not actively participated and tend to wait for the teacher's instructions. Enthusiasm for the use of props is also still varied, with some groups still needing further direction to make optimal use of them. Students' ability to solve problems is also uneven, with some students still having difficulty in connecting abstract concepts with concrete representations. In addition, only a small percentage of students dared to present the results of the group work in front of the class.

Entering cycle II, there was a striking increase. Most students showed high enthusiasm for learning, actively discussed in groups, and were able to solve problems with a better level of accuracy. The courage in presenting the results of the work also increased, where almost all students actively participated in the presentation sessions. This shows that the use of teaching aids not only has an impact on the cognitive aspect, but also fosters students' confidence and motivation to learn.

**Table 2** Recapitulation of Student Activity Observation Results

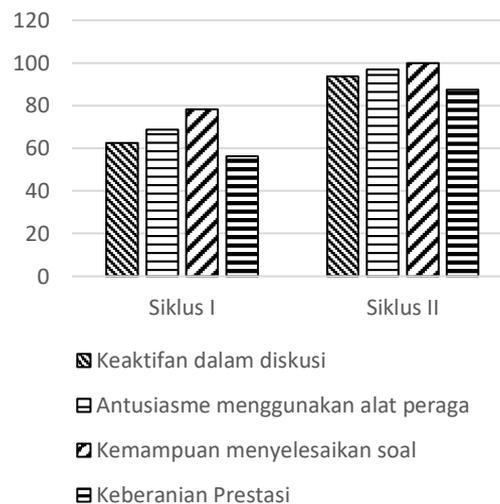
Observed Aspects	Cycle I(%)	Cycle II(%)
Activeness in discussion	62,6	93,57
Enthusiasm for using props	68,75	96,88
Ability to solve problems	78,13	100
Presentation boldness	56,25	87,5

Based on the data in Table 2, it can be seen that all aspects of student learning activities have increased from cycle I to cycle II. The activeness aspect of discussions showed the most



significant improvement, which indicates that learning based on teaching aids encourages more intensive interaction between students. The increase in enthusiasm in using teaching aids also indicates that concrete media is able to attract interest in learning and make the material easier to understand. The ability to solve problems has improved along with a better understanding of concepts, while students' courage to present the results of their work shows developments in the affective and social domains.

These findings are in line with research (Nasrawati & Putrini R Harahap, 2024) which states that the application of the STAD cooperative learning model assisted by teaching aids can increase student learning activity and motivation.



**Figure 2** Development of Increasing Student Learning Activities in Every Aspect in Cycles I and II

*f. Value Distribution Analysis*

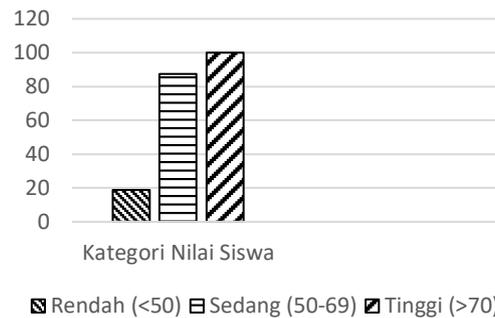
The analysis of the value distribution shows significant changes at each stage. In the pre-cycle, as many as 20 students (62.5%) were in the low category (<50), 6 students (18.75%) in the medium category (50–69), and only 6 students (18.75%) in the high category ( $\geq 70$ ). In the first cycle, there are no more students in the low category, 4 students (12.5%) are still in the medium category, and 28 students (87.5%) are already in the high category. In cycle II, all students (100%) were in the high category. This means that in addition to increasing the class average, the gap between students has also been successfully narrowed.

**Table 3** Distribution of Student Grades per Stage

Grade Categories	Pre-Cycle	Cycle I	Cycle II
Low (<50)	20 (62,5%)	0 (0%)	0 (0%)
Medium (50-69)	6 (18,75%)	4 (12,5%)	0 (0%)
Height (>70)	6 (18,75%)	28 (87,5%)	32 (100%)

If we look further based on the category of value achievement, there is a very noticeable change in distribution. In the pre-cycle, most students were in the low grade category (below the KKM). After the action in cycle I, the majority of students shifted to the medium to high category. In cycle II, almost all students achieved the high grade category, indicating that learning with the help of teaching aids succeeded in bringing an even improvement in all levels of students' abilities.





**Figure 3** Distribution of Pre-Cycle, Cycle I, Cycle II Student Scores

*g. Observation Per Cycle*

In the pre-cycle, the atmosphere of the class is passive. Students listen to the teacher more without interaction. Many are confused when given questions. In the first cycle, students began to be interested in using props. However, the activities are still dominated by certain students, while others are passive. Some students have difficulty understanding the operation of negative numbers. In cycle II, the changes are noticeable. Students are more confident, actively discuss, and dare to present answers. Props make concepts easier to understand so that students feel confident in the answers.

## 2 Discussion

The results of this study showed a consistent increase from pre-cycle to cycle I and cycle II. In the pre-cycle, the average score of students was still far below the KKM, only 18% of students completed. After the application of the STAD model with number line props in cycle I, the average value increased significantly, although the classical level of completeness had not yet been achieved. Analysis of the observation sheets showed that some students were still passive, did not dare to ask questions, and only relied on more active group members. Based on reflection, improvements were made in cycle II by providing a more challenging variety of questions, facilitating more intensive discussions, and giving rewards to active groups. As a result, in cycle II classical completeness reached 100%, and student involvement increased overall.

This increase in results is in line with the findings (Annisa et al., 2022) in a meta-analysis that emphasizes that the use of concrete media has a positive influence on mathematics learning outcomes. In this study, the number line props function as a visual bridge between abstract concepts and students' real experiences. This is in accordance with the findings (Lepinus Gombo et al., 2025) that reported that number line media increased student active participation, as well as (Herianti & Prihastari, 2023) which states that the medium of number scales helps students understand the concept of balance of counting operations. (Nephi, 2023) He also added that the use of number lines can improve students' ability to understand the relationships between numbers, thereby reducing conceptual errors.

The applied STAD model is an important supporting factor in improving learning outcomes. Through heterogeneous group work, students who were initially passive became more courageous to participate because they felt supported by group members. This is in line with the findings (Nasrawati & Putrini R Harahap, 2024) which states that the implementation of STAD can increase learning completeness by more than 90%. (Amanda Prasasti et al., 2025) emphasized that LKPD based on problem solving accompanied by concrete media can increase student motivation. This can be seen in cycle II, where students show higher enthusiasm in discussions and are able to solve problems with a better level of accuracy.

The findings of this study are also consistent with (Retno Mulianingtias, Tiona Pasaribu Ferry, 2024) who found that the use of props can significantly improve learning outcomes.



(Noviani et al., 2025) through MOBILBUT media, it proves that a fun learning experience encourages active student engagement. Even (Rifka Alkhilyatul Ma'rifat, I Made Suraharta, 2024) Shows that number board media can broaden students' understanding not only of addition and subtraction operations, but also integer multiplication. This indicates that concrete media has broad potential for use in a wide range of mathematical topics.

In addition to the cognitive aspect, the use of concrete media also contributes to increasing students' motivation and social skills. In cycle II, the classroom atmosphere was more conducive, students actively asked questions, and group discussions were more balanced. This supports the results of the research (Layli Widya Hasanah, Karlina Wong Lieung, Fredy & Hanipah, 2024) who reported that the use of creative media such as Sate Numbers can make learning more interesting and trigger student activity. (Fitri Handayani et al., 2024) also added that teaching aids are effectively used not only at the basic level but also at the intermediate level, so that their use can be widely applied.

Theoretically, these findings reinforce the principle of constructivism which states that learning will be more meaningful if students directly experience the process of building their knowledge. By manipulating props and discussing with peers, students not only receive information, but also actively build understanding. This shows that concrete media-based learning can support experiential learning as recommended in the Independent Curriculum.

#### D. Conclusion

This study proves that the application of the STAD-type cooperative learning model assisted by number line props is able to significantly improve student learning outcomes in the addition and subtraction of integers. The average grade of the class increased from pre-cycle to cycle II, with classical completeness reaching 100%. Students' learning activities also increased, as seen from active involvement in group discussions, enthusiasm in using the media, and the courage to present the results of their work.

This research contributes to the mathematics learning literature by emphasizing the effectiveness of the combination of concrete media and STAD models in the madrasah environment. The practical implication is that teachers are encouraged to use simple media such as number lines and combine them with cooperative learning to create a more collaborative learning atmosphere.

Mathematics teachers are advised to continue to integrate concrete media in daily learning, especially in abstract materials, and to utilize the STAD model to improve cooperation between students. Schools are expected to support the provision of simple props that can be used sustainably. Further research can explore the use of technology-based media, such as digital applications or gamification, and test it on other mathematical materials, such as multiplication operations or division of integers, to see their effectiveness in a broader context.

## BIBLIOGRAPHY

Amanda Prasasti, Depriyanti Depriyanti, Eka Yulianti, & Syutaridho Syutaridho. (2025). Implementation of LKPD for Problem Solving-Based Integer Addition and Subtraction Operations. *Number : Scientific Journal of Mathematics, Earth and Space*, 3(3), 62–69. <https://doi.org/10.62383/bilangan.v3i3.522>

Annisa, F., Maulidiya, & Rahmawati, S. (2022). Meta-Analysis of the Use of Teaching Aids on Improving Students' Mathematics Learning Outcomes in Elementary School.



*Conference of Elementary Studies*, 99–105. <https://journal.um-surabaya.ac.id/Pro/article/view/14914>

- Asri Taufiq, Fathimah Az Zahra Nasiruddin, N. R. R. (2024). The Effect Of The Use Of Interactive Board Teaching Aids On Students' Mathematics Learning Outcomes In One-Variable Linear Equation Material In Class Vii Mts Ddi Darul Ihsan. *Journal of Basic Education*, 9(1), 41–48.
- Fitri Handayani, U., Bahtiar Arif, M., & Herman, R. (2024). The Effectiveness of Mathematics Teaching Aids in Secondary Education. *Indonesian Journal of Integrated Science and Learning*, 2(1), 13–22. <https://doi.org/10.60041/ijisl.v2i1.100>
- Herianti, S. A., & Prihastari, E. B. (2023). The Effectiveness Of The Use Of Number Scale Teaching Aids On Mathematics Learning Outcomes In Grade Iv Sdn Karangpelem 1 Kedawung. *Scientific Journal of Basic Education (JIPDAS)*, 3(1), 66–74.
- Layli Widya Hasanah, Karlina Wong Lieung, Fredy, W. O. S. H. D., & Hanipah, S. (2024). The use of number satay teaching aids to improve mathematics learning outcomes in elementary schools. *Journal of Education Innovation*, 468–475.
- Lepinus Gombo, Christine M Rumpaisum, Marthinus Kayame, & Sutarman Borean. (2025). The Effect of the Use of Number Line Teaching Media on Mathematics Learning Activity on Integer Addition and Subtraction Materials in Grade VII Students of Wamena Adventist Junior High School. *Mathematics Education, STKIP Abdi Wacana Wamena*, 9, 4989–4992.
- Markumbo, M. M., Kaunang, D. F., & Maukar, M. G. (2024). Learning Operation Count Addition and Subtraction of Integers: An Innovation Using Number Card Props. *J-CEKI: Journal of Scientific Scholars*, 3(6), 7487–7495.
- Nahdi, D. S., & Alfiani, N. A. (2020). The use of number line media in improving the mathematical understanding of elementary school students. *Journal of Didactical Mathematics*, 2(3), 54–61. [http://jurnal.unma.ac.id/index.php/dm/article/view/2455%0Afile:///C:/Users/User/Downloads/2455-6663-1-PB \(1\).pdf](http://jurnal.unma.ac.id/index.php/dm/article/view/2455%0Afile:///C:/Users/User/Downloads/2455-6663-1-PB%20(1).pdf)
- Nasrawati, N., & Putri R Harahap, S. (2024). Improvement of mathematics learning outcomes using teaching aids through the STAD method. *Journal of Science and Applied Education Innovation (INTERN)*, 3(2), 77–88. <https://doi.org/10.58466/intern.v3i2.1696>
- Netanyahu, M. (2023). The Use Of Number Line Media In Improving The Ability To Count Integers In Grade Vi Students At Sdn Samatan. *Taxonomy Journal of Basic Education*, 3, 72–78.
- Noviani, D., Efriani, A., & Ramury, F. (2025). Mobilbut: An innovation of interactive teaching aids for learning integer counting operations. *De Fermat: Journal of Mathematics Education*, 8(1), 111–121. <https://doi.org/10.36277/deferat.v8i1.2270>
- Nurwidyarini, R., & Musthofa, A. (2023). The Effectiveness Of The Use Of Character Number Line Teaching Media On Mathematics Learning Motivation. *Scientific Journal of Swara Ganesha*, 10(2), 51–56.



Retno Mulianingtias, Feri Tiona Pasaribu, S. (2024). The Use of Teaching Aids to Improve Student Learning Outcomes. *OMEGA : Scientific Journal of Mathematics Education*, 3(2), 57–64.

Rifka Alkhilyatul Ma'rifat, I Made Suraharta, I. I. J. (2024). The Effectiveness Of The Use Of Number Board Media On The Ability To Calculate Integer Multiplication In Students. *Journal of Mathematics Education*, 2, 306–312.

Sarumaha, Y. A., Pratama, R., Saputri, W. O. D., & Hofifah, R. T. (2024). The Use of Mathematics Opportunity Board Teaching Aids in Junior High School Class VII Opportunity Materials. *Constructivism : Journal of Education and Learning*, 16(1), 142–151. <https://doi.org/10.35457/konstruk.v16i1.3437>

