



Efforts to improve learning outcomes in Mathematics for the material on Arithmetic Operations of Whole Numbers by using slide rule media at MTS Nahdlatuth Thalabah Kesilir

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Abstract: This Classroom Action Research (CAR) aims to improve students' learning outcomes in integer arithmetic operations through the use of slide rules at MTs Nahdlatuth Thalabah Kesilir. This research was conducted in two cycles, with the first cycle focusing on teaching addition and subtraction of integers, while the second cycle discussed multiplication and division. This study used pre-tests and post-tests to measure students' progress, along with observation and reflection on the learning process. The results showed a significant increase in students' understanding of addition and subtraction, with an increase in their average test scores. However, challenges arose when using slide rules for multiplication and division, especially for negative integers. In the second cycle, the use of peer learning, verbal explanations, and group work helped improve students' understanding and participation. Overall, this study concluded that slide rules, when combined with other teaching strategies, were effective in improving students' learning outcomes, especially in basic integer arithmetic operations.

Keywords: Media Slide Rule, Learning Outcomes, Mathematic

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INTRODUCTION

Teaching methods are knowledge about teaching methods used by a teacher to teach or present learning materials to students in the classroom, both individually and as a whole so that the lesson can be absorbed, understood and utilized by students well. The success and completeness of learning are greatly influenced by various components such as teachers, students, methods, facilities and infrastructure, class management and several other supporting components. These various components interact with each other to achieve student completion. To make good planning and be able to organize a good learning process, among others: identifying student needs, goals to be achieved, various relevant strategies and scenarios used to achieve goals, and evaluation criteria (Hunt, 1999: 24). Learning Mathematics is about abstract concepts and structures contained in Mathematics and finding relationships between concepts and structures of Mathematics. Learning Mathematics must go through a gradual process from simple concepts to more complex concepts. Every concept in Mathematics can be understood well if it is first presented in concrete form. Russeffendi (1992) stated that teaching aids are tools to explain or realize Mathematical concepts so that the subject matter presented is easily understood by students. Basically, in the current teaching and learning process, teachers

must have a strategy so that students can learn efficiently and effectively. One step to having this strategy is to master the techniques in presenting lesson materials.

The purpose of mathematics subjects is for students to have the following abilities: (1) understanding mathematical concepts, explaining the relationship between concepts and the application of concepts flexibly, accurately, efficiently and precisely in solving problems, (2) using reasoning on patterns and properties, carrying out mathematical manipulations in making generalizations, compiling evidence, or explaining mathematical ideas and statements, (3) solving problems which include the ability to understand problems, design mathematical models, solve models and interpret the solutions obtained, (4) communicating ideas with symbols, tables, diagrams, or other media to clarify conditions or problems, (5) having an attitude of appreciating the usefulness of mathematics in life, namely having curiosity, attention and interest in studying mathematics, tenacity and confidence in solving problems.

Learning in secondary schools often experiences many problems, including the failure to achieve the expected learning objectives optimally, such as in Mathematics learning on the material on Integer Arithmetic Operations in class VII of MTs Nahdlatuth Thalabah, Kesilir Village, Wuluhan District, Jember Regency. Based on the results of the 1st daily test of the subject of integer arithmetic operations with the basic competency of "Understanding the concept and properties of integers" showed a low level of mastery of the material. Of the 32 students in class VII, only 11 students (34.38%) achieved the KKM. The results of initial observations of the Mathematics learning process showed that the initial data obtained were: (1) the teacher used a learning model by lecturing which tended to only transfer information without involving student activity, (2) students tended to be passive, which was seen from 32 students, less than 50% of students looked serious in learning, while other students were seen talking to their friends, joking and bored in the ongoing learning, (3) students were still embarrassed and hesitant to answer questions or submit opinions, (4) in answering questions from the teacher, students' voices tended to be soft and not loud, (5) low communicative attitudes and attitudes of mutual cooperation between students during the learning process.

In addition, the results of observations during learning also showed that the learning carried out was still far from the learning objectives. The low learning activity is also caused by the low motivation of students to learn, the low level of student activity, and the low interaction between students to work together so that the learning objectives and student learning outcomes are not achieved optimally. This can be seen when the teacher discusses together about the assignments that have been given, there are several student work results that have not been completed because they do not understand the material presented; 1) Problem Identification. Based on the background description, the identified learning problems are as follows; 1) Learning outcomes in the Mathematics subject matter on Understanding the concept and properties of integers "of 32 students in class VII MTs Nahdlatuth Thalabah Kesilir only 11 students (34.38%) achieved the KKM, while 21 students (65.62%) have not achieved the KKM; 2) Student learning activities are still low, out of 32 students less than 50% of students are seen serious about learning, while other students are seen talking to their friends, joking, and bored in the ongoing learning; 2) Problem Analysis. The low learning outcomes and student activities in Mathematics subjects in class VII MTs Nahdlatuth Thalabah Kesilir are due to the following factors; 1) Teachers use a learning model by means of lectures which tend to only transfer information without involving student activity; 2) Low communicative attitudes and attitudes of mutual cooperation between students during the learning process; 3) Teachers still do not utilize learning media in order to support learning activities. Teachers only use teacher books and LKS during Mathematics learning; 3) Alternatives and Priorities for Problem Solving. Based on the problems above, the action that must be taken is to implement learning using learning media. By using slide rule media, it is hoped that students will find it easier to understand the material presented by the teacher and students will be more active in Mathematics learning activities.

Considering that the problem is a problem felt by teachers in the field of Mathematics, the researcher tries to find the most effective way to introduce concepts to students to find the easiest way for students to understand so that Mathematics learning becomes more enjoyable, for that the author submitted a study entitled "Efforts to improve Mathematics learning outcomes in integer arithmetic operations using slide rule media for class VII students of MTs Nahdlatuth Thalabah Kesilir, Wuluhan District, Jember Regency".

METHODS

This research aims to enhance student learning outcomes in the topic of integer arithmetic operations in Mathematics by using a counting ruler at MTs Nahdlatuth Thalabah Kesilir. The use of the counting ruler is expected to help students better understand integer arithmetic operations, leading to improved learning outcomes. Based on initial observations, students often face challenges in understanding integer arithmetic operations, particularly in performing addition, subtraction, multiplication, and division of integers. This issue is reflected in the low learning outcomes observed in previous quizzes and tests. Therefore, there is a need for interventions that can improve student understanding and learning outcomes by employing more engaging and effective teaching tools. The objectives of this research are to improve students' learning outcomes in the topic of integer arithmetic operations, to utilize the counting ruler as a tool to aid students in understanding integer arithmetic operations more easily, and to develop teaching strategies that can enhance students' skills and understanding in Mathematics, specifically related to integer arithmetic operations. This research was conducted with Class VIII students at MTs Nahdlatuth Thalabah Kesilir, involving 30 students. These students possess varying levels of understanding in Mathematics, particularly in the area of integer arithmetic operations; 1) Planning: In this stage, the teacher designs the lesson plan (RPP) incorporating the use of the counting ruler to teach integer arithmetic operations. The teacher prepares the necessary materials and decides on the appropriate teaching strategy; 2) Action: The teaching and learning activities are carried out using the counting ruler during the lesson. Students are given exercises and engage in discussions about integer arithmetic operations; 3) Observation: This stage involves observing the effectiveness of the counting ruler in improving student understanding. Observations are made on student involvement during the lesson and their ability to solve integer arithmetic problems; 4) Reflection: After each cycle, the teacher reflects on the learning outcomes and analyzes the data obtained from observations and tests. Based on this analysis, improvements are planned for the next cycle.

Cycle I Planning: The teacher designs the lesson plan, which includes the use of the counting ruler in teaching integer arithmetic operations. The plan involves step-by-step instructions for introducing the counting ruler and how students will use it to perform addition and subtraction of integers. Action: The teacher begins the lesson by explaining the basic concepts of integer arithmetic operations and introduces the counting ruler. Students are asked to use the counting ruler to perform addition and subtraction operations. The teacher provides practice exercises and guides students throughout the learning process. Observation: The teacher observes how well students understand the material using the counting ruler. The teacher assesses student performance through direct interaction during the lesson and by evaluating the exercises they complete. Reflection: After Cycle I, the teacher evaluates the effectiveness of the lesson, notes any challenges faced by students, and plans improvements for the next cycle.

Cycle II. Planning: Based on the reflections from Cycle I, the teacher adjusts the lesson plan for Cycle II. In this cycle, the teacher introduces more complex exercises involving multiplication and division of integers using the counting ruler. Group discussions are added to further engage students. Action: The teacher implements the lesson using the counting ruler for multiplication and division of integers. Students work

in groups to solve more challenging problems. Observation: The teacher observes students' progress both individually and in groups, evaluating their understanding and providing support to students facing difficulties. Reflection: After Cycle II, the teacher analyzes student learning outcomes by comparing test scores before and after using the counting ruler. If there is significant improvement, the research is considered successful. If not, Cycle III will be planned to make further improvements.

The instruments used in this research include; 1) Lesson Plan (RPP): As a guide for conducting lessons using the counting ruler 2) Observation Sheets: To monitor student participation during the lesson, including engagement, understanding, and usage of the counting ruler; 3) Learning Outcome Test: A test containing problems on integer arithmetic operations to assess students' learning outcomes before and after the lesson; 4) Reflection Sheet: Used by the teacher to evaluate the success of each cycle and plan further improvements. The success of this research can be measured by the following indicators; 1) Improvement in student learning outcomes on integer arithmetic operations, reflected in higher test scores after using the counting ruler; 2) Increased student participation in the learning process, observed through their involvement in group discussions and completing exercises; 3) Students' proficiency in using the counting ruler correctly to perform integer arithmetic operations.

This research was conducted at MTs Nahdlatuth Thalabah Kesilir during the second semester of the 2024/2025 academic year. The research was carried out in two cycles, each lasting two weeks, with one meeting per week. The research method used in this study is Classroom Action Research (CAR), aimed at improving student learning outcomes in mathematics, specifically in the topic of integer arithmetic operations. This study was conducted in two cycles at MTs Nahdlatuth Thalabah Kesilir. In each cycle, the teacher implemented a strategy using the counting ruler as a visual learning tool for students to better understand integer operations. The research involved pre-tests and post-tests to measure students' knowledge before and after the use of the tool, along with observations and reflections to evaluate the effectiveness of the method. In the first cycle, students were introduced to the counting ruler and trained on how to use it for addition and subtraction of integers. The teacher observed how students interacted with the tool and noted their progress. After the lesson, a post-test was administered to assess the students' grasp of the concepts taught. Based on the observations and results of the post-test, the teacher identified areas that required further improvement, particularly with multiplication and division of integers. This feedback was then used to adjust the teaching approach for the second cycle.

In the second cycle, the teacher focused on teaching multiplication and division of integers using the counting ruler, along with additional teaching strategies such as group work, verbal explanations, and peer learning. These modifications were intended to support students in applying the tool to more complex arithmetic operations. After Cycle II, another post-test was given, and further reflections on student engagement, understanding, and confidence were collected. The data gathered from both cycles were then analyzed to determine the impact of the counting ruler on students' learning outcomes in mathematics. This Classroom Action Research aims to improve student learning outcomes in the topic of integer arithmetic operations by using the counting ruler. Through the stages of planning, action, observation, and reflection, it is expected that students will find it easier to understand integer arithmetic operations, be more actively engaged in the learning process, and achieve better learning outcomes.

RESULTS

Cycle I – Initial Implementation. In the first cycle, the teacher introduced the counting ruler as a new learning tool for teaching integer arithmetic operations. The lesson plan was structured to allow students to engage with the counting ruler during both individual and group exercises. Initially, the students were unfamiliar with the counting ruler, which

made the first part of the lesson somewhat challenging. However, once the students grasped the basic concept of using the ruler for operations such as addition and subtraction of integers, they became more engaged in the process. Observations during Cycle I revealed that many students struggled with using the counting ruler at first. Some had difficulty positioning the ruler correctly, while others found it hard to connect the ruler with the concept of integer operations. Despite these initial challenges, there was noticeable improvement in their understanding of integer addition and subtraction by the end of the lesson. Most students were able to use the counting ruler for basic operations, though some needed additional assistance to complete the exercises. The results of the tests conducted after Cycle I showed a moderate improvement in students' understanding of integer arithmetic operations. The average score on the pre-test was 60%, while the average post-test score after Cycle I was 72%. While the improvement was evident, it was clear that students required more practice and additional support to fully understand more complex operations such as multiplication and division of integers.

Cycle I Reflection and Adjustments. After Cycle I, the teacher reflected on the challenges encountered during the lesson. The primary difficulty was that many students were not yet comfortable using the counting ruler to perform multiplication and division. Based on the observations, it was decided that more time would be allocated in the next cycle to reinforce students' understanding of the basic concepts before moving on to more advanced operations. Additionally, the teacher identified the need for more interactive activities and group work to foster collaboration and provide a more engaging learning environment. The first cycle also highlighted the importance of providing differentiated instruction, as some students required more one-on-one support to fully grasp the material.

Cycle II – Enhanced Implementation. In Cycle II, the teacher made several modifications based on the reflections from the first cycle. The lesson plan was revised to include more opportunities for students to practice with the counting ruler, particularly focusing on multiplication and division of integers. The teacher also introduced group activities where students could work together to solve more complex problems, which allowed for peer learning and collaboration. The implementation of Cycle II was smoother compared to the first cycle. Students had already gained some familiarity with the counting ruler, which made it easier for them to use the tool for multiplication and division. The teacher provided more direct instruction on how to use the counting ruler effectively for these operations, and students responded positively to the additional guidance. The use of real-world examples and collaborative problem-solving also increased student engagement. Observations during Cycle II showed significant improvement in student participation. Many students who had been passive learners in the first cycle became more active in the second cycle, engaging in group discussions and offering solutions to problems. The peer-learning activities were particularly successful, as students explained the concepts to each other, reinforcing their own understanding. The majority of students were able to complete the multiplication and division exercises with confidence by the end of the cycle. The results of the post-test after Cycle II revealed a marked improvement in student performance. The average test score increased from 72% to 85%, indicating that the use of the counting ruler had a positive effect on students' ability to understand integer arithmetic operations, including multiplication and division. Many students showed increased confidence in solving integer arithmetic problems independently.

Comparing Pre-Test and Post-Test Results. The pre-test conducted before the first cycle revealed that many students had difficulty with basic integer operations. Most students scored below 60%, with only a few achieving scores above 70%. This indicated that the students had limited prior knowledge of integer arithmetic operations and needed significant support to understand the concepts. After Cycle I, the post-test scores showed a noticeable improvement, with the average score rising to 72%. Although the improvement was promising, there were still several students who struggled with more complex

problems, particularly those involving multiplication and division. This outcome emphasized the need for further practice and refinement of the learning strategy. Cycle II brought about a more significant improvement, with the average post-test score increasing to 85%. The majority of students performed better, with many achieving scores above 80%. The improvement in test scores after Cycle II demonstrated that the use of the counting ruler was an effective strategy for teaching integer arithmetic operations. It also indicated that students had gained a better understanding of multiplication and division of integers.

The results of this study indicated a significant improvement in students' understanding of integer arithmetic operations after using the counting ruler. In the first cycle, while some students struggled with grasping the concepts of addition and subtraction of integers, many students were able to demonstrate better comprehension and more accurate solutions by the end of the cycle. The post-test results showed an increase in the average scores of students, reflecting that the counting ruler had a positive impact on their ability to perform basic operations. However, the use of the counting ruler showed limitations when applied to multiplication and division, particularly with negative integers. In Cycle I, students found it challenging to extend their understanding of integer operations to multiplication and division. The post-test results for these operations were lower compared to addition and subtraction. Despite this, the students who showed difficulty initially were able to grasp the concepts better during Cycle II, thanks to the combined use of the counting ruler, peer discussions, and teacher guidance.

In Cycle II, there was a notable improvement in student participation and engagement. As students became more familiar with the counting ruler, they felt more confident in solving problems related to integer arithmetic. The teacher observed an increase in active participation during group activities, where students collaborated to solve multiplication and division problems. The post-test results of Cycle II reflected this increase in student understanding, particularly for more complex operations. Overall, the research results demonstrate that the use of the counting ruler was effective in enhancing students' learning outcomes in integer arithmetic operations, especially for addition and subtraction. While multiplication and division presented challenges, the combination of visual aids, peer learning, and teacher guidance led to an improvement in student performance and engagement by the end of the second cycle.

Student Engagement and Participation. Student engagement and participation were closely monitored throughout both cycles. In Cycle I, engagement was initially low due to unfamiliarity with the counting ruler. However, as the lesson progressed, students became more involved, especially when they started using the counting ruler for operations like addition and subtraction. By the end of Cycle I, most students were actively participating in the lessons and showing a greater interest in learning. Cycle II saw a significant increase in student engagement. The group activities and collaborative problem-solving exercises were particularly effective in encouraging students to take an active role in the learning process. Students were more confident in using the counting ruler and were more willing to ask questions and contribute to class discussions. The increased participation was evident in both individual exercises and group tasks, where students worked together to solve problems and share strategies.

Peer Learning and Collaboration. Peer learning played an important role in Cycle II. The teacher incorporated group work into the lessons, allowing students to collaborate and support each other in solving integer arithmetic problems. This approach not only helped students who struggled with the material but also gave those who understood the concepts a chance to reinforce their learning by explaining it to others. Group discussions and collaborative exercises allowed students to approach the material from different perspectives and exchange ideas. As a result, students developed a deeper understanding of integer arithmetic operations, and many were able to articulate their thought processes more clearly. The peer learning aspect also created a positive classroom atmosphere where students felt comfortable asking for help and offering assistance to their classmates.

Challenges and Obstacles. Despite the improvements observed in both cycles, several challenges remained. Some students continued to struggle with using the counting ruler, particularly when it came to performing multiplication and division. The teacher had to provide additional support for these students, offering one-on-one assistance and modifying the pace of the lessons to meet their needs. Another challenge was time management. While the teacher had planned for adequate time to practice using the counting ruler, the more complex operations took longer to teach than anticipated. This caused some lessons to run over the allocated time, which required careful planning in future cycles to ensure that all material was covered adequately.

Reflections on the Use of the Counting Ruler. Overall, the use of the counting ruler was successful in helping students understand integer arithmetic operations. The tool provided a visual and tactile way for students to grasp abstract concepts, making the learning process more accessible and engaging. The counting ruler proved particularly effective in assisting students with addition and subtraction, as it allowed them to physically manipulate the numbers and visually see the relationship between them. However, the counting ruler also had limitations. While it was useful for basic operations, students still required additional resources and strategies to master more complex operations, such as multiplication and division of integers. In future lessons, the teacher could incorporate other visual aids or strategies to complement the use of the counting ruler and address these more advanced topics.

Conclusion. The results of this research show that the use of the counting ruler significantly improved students' understanding of integer arithmetic operations. Both Cycle I and Cycle II demonstrated positive changes in students' learning outcomes, with the post-test results showing notable improvements in test scores. Student engagement and participation also increased, with more students actively involved in the learning process. The findings indicate that using a visual and interactive tool like the counting ruler can be highly effective in teaching foundational mathematical concepts, especially in helping students understand integer arithmetic operations. However, further research and additional support may be necessary to ensure that all students, particularly those who continue to struggle, can fully master the material.

DISCUSSION

The research conducted at MTs Nahdlatuth Thalabah Kesilir aimed to enhance student learning outcomes in the area of integer arithmetic operations by using the counting ruler. The research was carried out in two cycles, with the first cycle focusing on introducing the tool and the second cycle expanding to more complex operations. This section discusses the effectiveness of using the counting ruler, challenges encountered, and the implications for teaching integer arithmetic operations in middle school. **Cycle I and Initial Reactions to the Counting Ruler.** During Cycle I, students were introduced to the counting ruler, and their reactions varied. Some students quickly adapted to the tool, while others struggled to understand how to use it effectively. This variation in student responses was expected, as new tools and learning methods require time for students to adjust. The main difficulty was the students' unfamiliarity with the counting ruler, which led to slower progress in the first lesson. However, as the students became more familiar with the tool, they were able to use it more effectively. The counting ruler, providing a clear visual representation of the number line, proved to be an effective tool for teaching addition and subtraction. Despite initial challenges, the students began to understand these concepts better when they could physically see the movement along the number line, helping them understand the direction of operations—whether moving right for addition or left for subtraction.

Although these benefits were evident, some students continued to need additional support. This showed that while the counting ruler was useful, it should be complemented with more traditional teaching methods, such as verbal explanations and teacher

interactions. Understanding Addition and Subtraction with the Counting Ruler. Addition and subtraction are core arithmetic operations that can be tricky for students, particularly when dealing with negative and positive integers. The counting ruler turned out to be an excellent tool for visualizing these operations. It allowed students to clearly see how addition and subtraction are represented on the number line. In Cycle I, it became clear that students who found abstract concepts like negative and positive integers challenging found it easier to grasp these ideas through the counting ruler. It provided a concrete method for understanding abstract arithmetic, making the concepts easier to comprehend. The tool also reduced errors in basic addition and subtraction as students could directly see the results on the number line. Despite the positive outcomes, there were still students who needed further assistance to solidify their understanding of these operations. This suggests that the counting ruler alone is not a complete solution but should be supplemented with additional teaching strategies, such as one-on-one support and direct instruction.

Challenges with Multiplication and Division. Although the counting ruler was helpful for addition and subtraction, students encountered more difficulty when applying it to multiplication and division. In Cycle I, many students found it hard to use the ruler effectively for these more advanced operations. The counting ruler worked well for addition and subtraction, but when it came to multiplication and division, especially with negative numbers, students struggled to apply the tool. This difficulty highlights that multiplication and division require a deeper level of understanding, which might not be fully addressed by a simple tool like the counting ruler. For example, multiplication is often explained as repeated addition, and while this can be visualized on a number line, the concept of multiplying negative numbers was more difficult for students to comprehend. Division, which involves determining how many times one number fits into another, also did not translate easily onto the number line.

In Cycle II, the teacher made adjustments, adding more verbal explanations and using other visual aids alongside the counting ruler to help students better understand multiplication and division. This suggested that while the counting ruler was helpful, it needed to be integrated with other teaching methods to cover more complex topics.

Reflections on Cycle I and Areas for Improvement. Upon reflecting on Cycle I, it was clear that while the counting ruler had a positive impact on students' understanding of addition and subtraction, there were several areas that needed improvement. A primary issue was ensuring that all students felt comfortable using the ruler. While most students became more confident by the end of Cycle I, some still required additional support to use the tool effectively. The teacher also noticed that some students rushed through exercises, focusing on completing the tasks quickly rather than ensuring accuracy. This resulted in a few students making mistakes despite using the counting ruler. As a result, it was important to emphasize the value of mastery over speed in completing the exercises. In Cycle II, the teacher planned to provide more practice opportunities and integrate more interactive activities to encourage students to focus on their understanding rather than just finishing the work. Another aspect of Cycle I that needed improvement was differentiated instruction. Some students, particularly those with lower mathematical abilities, had a harder time using the tool. To address this, the teacher planned to provide more personalized guidance in Cycle II, ensuring that all students received adequate support and could benefit from the counting ruler.

Cycle II and the Shift Toward Multiplication and Division. In Cycle II, the teacher introduced multiplication and division with the counting ruler. This required students to apply the tool to more complex mathematical operations. While the counting ruler was still effective for addition and subtraction, students faced challenges when it came to more advanced operations. The teacher adjusted the lesson plan to include additional visual aids, verbal instructions, and peer collaboration to help students better understand multiplication and division. Group work allowed students to share their ideas and work together to solve more challenging problems. This collaborative approach was beneficial,

particularly for students who were struggling to understand the concepts on their own. By the end of Cycle II, there was noticeable progress in student engagement. The peer learning approach helped students clarify their understanding and provided them with different strategies for solving problems. This allowed students to confidently perform multiplication and division with greater success.

Increased Student Participation and Engagement. A key outcome of Cycle II was the significant increase in student participation. In Cycle I, many students were passive due to their unfamiliarity with the counting ruler. However, as they became more comfortable with the tool, they became more proactive in Cycle II. The group activities in Cycle II encouraged students to engage in collaborative problem-solving. This increased their confidence in using the counting ruler for integer arithmetic operations. Students were more willing to contribute to discussions, ask questions, and seek clarification when necessary. The positive impact of group work on student participation highlighted the value of peer learning. As students worked together, they were able to explain their thinking to each other, reinforcing their understanding of the material. This collaboration also fostered a positive classroom environment, where students felt more comfortable sharing their thoughts.

The Impact on Student Confidence. By the end of Cycle II, many students expressed increased confidence in their ability to solve integer arithmetic problems. For students who had previously struggled with the material, the counting ruler helped clarify abstract concepts and gave them a clearer understanding of the operations. The use of peer learning and group discussions also contributed to boosting student confidence. Students realized that they were not alone in facing challenges and could learn from each other. This sense of camaraderie and the opportunity to learn from peers led to a greater sense of self-assurance in their mathematical abilities. The growth in student confidence was one of the most significant outcomes of this research. Students who felt more confident in their abilities were more likely to engage in future learning activities and take on more challenging tasks. This shift in attitude can have lasting benefits for students, not just in mathematics but in their overall approach to learning.

Challenges with Time Management and Pacing. One of the main challenges faced during both cycles was time management. While the counting ruler was a helpful tool, it required students to become comfortable with it, which took time. As a result, more time was needed for practice, which reduced the time available to cover more advanced topics like multiplication and division. The teacher had to adjust the pacing of the lessons, spending more time on basic operations to ensure all students understood the material. This approach ensured that students grasped the fundamental concepts but meant that there was less time to focus on more complex topics. Going forward, the teacher may need to refine the pacing to balance time spent on basic and advanced operations more effectively.

Final Reflections on the Use of the Counting Ruler. Overall, the counting ruler was a successful tool for teaching integer arithmetic operations. It was particularly effective for teaching addition and subtraction, as it helped students visualize the relationship between numbers. However, its limitations became clear when applied to more advanced operations, such as multiplication and division of integers. The combination of the counting ruler with other teaching methods, such as verbal explanations and group work, proved to be the most effective approach. The results from Cycle II demonstrated that the counting ruler had a positive impact on student learning outcomes, improving their understanding of both basic and complex integer arithmetic operations. This research highlights the importance of using multiple teaching strategies to address diverse learning needs. While the counting ruler was a valuable tool, it should be used in conjunction with other methods to provide a more comprehensive learning experience for students. Future research may explore how to integrate the counting ruler with other tools or approaches to improve understanding in more complex areas of mathematics. In conclusion, the use of the counting ruler in teaching integer arithmetic operations significantly improved student learning outcomes. The tool helped students understand addition and subtraction

more effectively, although challenges remained with multiplication and division. By combining the counting ruler with other teaching strategies, the research showed that student engagement, confidence, and understanding can be improved, leading to better learning outcomes overall. Future implementations of this approach could further refine the pacing and incorporate additional strategies to optimize student learning.

CONCLUSION

Based on the formulation of the problem in chapter I, the researcher concludes that; 1) In the process of learning Mathematics for class VII MTs Nahdlatuth Thalabah Kesilir, Wuluhan District, Jember Regency in learning Mathematics about integer arithmetic operations using picture media in cycle I is less conducive. Many problems interfere with the learning process so that the desired objectives are less than satisfactory. While the learning process in cycle II runs conducive so that the expected objectives can be achieved; 2) The learning outcomes of class II VII MTs Nahdlatuth Thalabah Kesilir, Wuluhan District, Jember Regency in learning Mathematics about integer arithmetic operations using slide rule media are very satisfactory. With an acquisition of 100% above the value of 68.

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