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IMPLEMENTATION OF THE JARIMATIKA METHOD USED BY REPLICA MEDIA ON STUDENTS' LEARNING OUTCOMES ON THE MATERIAL OF MULTIPLICATION OF INTEGRATED NUMBERS IN MIN 3 BANDA ACEH

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Abstract

The action research in this classroom was undertaken as a result of the fourth-grade students in MIN 3 Banda Aceh struggling to grasp the concepts of multiplication and recalling what they have learned before, which impacted their learning performance. The purpose of the study was

to enhance the learning outcome of students in multiplication using Jarimatika method with the help of replica media. It consisted of 40 students and was conducted in three cycles. Teacher and student activities and learning achievement tests were used as data collection methods in the form of observation sheets. The success indicators were teacher and student activity scores ≥80%, individual mastery, at least 75 and classical mastery, >85. The findings indicated improvement throughout the cycles. Teacher activity increased from 69.31% to 78.40% and 90.90%, student activity from 62.61% to 76.90% and 90.47%, and learning outcomes from 67.5% to 77.5% and 90%. Thus, Jarimatika method was found to be effective with the help of replica media, which enhanced the learning outcomes of students in multiplication.

Keywords: Jarimatika, Replica Media, Multiplication, Learning Outcomes, Students

Abstrak

Penelitian tindakan di kelas ini dilakukan sebagai hasil dari kesulitan siswa kelas empat di MIN 3 Banda Aceh dalam memahami konsep perkalian dan mengingat kembali apa yang telah mereka pelajari sebelumnya, yang berdampak pada kinerja belajar mereka. Tujuan penelitian ini adalah untuk meningkatkan hasil belajar siswa dalam perkalian menggunakan metode Jarimatika dengan bantuan media replika. Penelitian ini melibatkan 40 siswa dan dilakukan dalam tiga siklus. Aktivitas guru dan siswa serta tes pencapaian belajar digunakan sebagai metode pengumpulan data dalam bentuk lembar observasi. Indikator keberhasilan adalah skor aktivitas guru dan siswa ≥80%, penguasaan individu minimal 75, dan penguasaan klasik >85. Hasil penelitian menunjukkan peningkatan sepanjang siklus. Aktivitas guru meningkat dari 69,31% menjadi 78,40% dan 90,90%, aktivitas siswa dari 62,61% menjadi 76,90% dan 90,47%, dan hasil belajar dari 67,5% menjadi 77,5% dan 90%. Dengan demikian, metode Jarimatika terbukti efektif dengan bantuan media replika, yang meningkatkan hasil belajar siswa dalam perkalian.

Kata Kunci: Jarimatika, Media Replika, Perkalian, Hasil Belajar, Siswa

INTRODUCTION

The process of education and learning is an activity involving reciprocal relationships among all elements or components involved in the learning process (Marvida et al., 2022). Educators play a central role in the success of the learning process, as this success is not only determined by the delivery of material but also by how teachers manage all aspects of

learning, from planning, communication, classroom management, to providing appropriate feedback (Jafar et al., 2022). This success is more easily achieved when students are actively involved in their thinking process.

Mathematics education at the elementary school level plays a crucial role in helping students meet needs and solve various problems encountered in daily life. This activity includes abilities such as arithmetic, processing and presenting information in the form of data, and interpreting the results using tools such as calculators and computers (Jarmita et al., 2024) Mathematics education is not only about teaching arithmetic operations but also about forming fundamental thinking patterns such as logic, analysis, and problem-solving (Stiadi, 2022). This is important as a foundation for developing knowledge and technology.

Moreover, mathematics also serves as a provision for students to become independent learners capable of solving everyday problems (Haji, 2015). As a basic science that develops rapidly, as shown by the need for students to understand and master other subjects, mathematics is equally important (Hasanah & Safari, 2024). Mathematics is a universal science that plays a role both in school and daily life, enhancing students' thinking and argumentative skills (Afwika et al., 2023). It also involves abstract materials and is hierarchical, meaning that mastering previous concepts is a prerequisite for understanding subsequent concepts (Irmawati, 2020). Therefore, mathematics instruction should begin at the elementary school level as a foundation for developing higher-order thinking skills and readiness to face the development of knowledge and technology (Sunedi, 2023).

In class IV of elementary school, mathematics instruction should be aligned with the cognitive development stage of students, who are in the concrete operational phase. At this stage, students can better understand mathematical concepts through real-life experiences, direct activities, and the use of concrete media that enable them to construct their own understanding of a concept (Nursafitri et al., 2023). If not addressed, students may struggle, as almost every field of study requires adequate mathematical understanding (Jarmita, 2015).

Many students report that mathematics is one of the most challenging subjects (Hasanah & Safari, 2024). One contributing factor is the difficulty in remembering abstract materials previously taught by educators, which is a challenge that needs to be addressed. To assist students in understanding abstract mathematical concepts, instructional material presentation through media is necessary.

Based on interviews conducted by the researcher on September 2, 2024, with the fourth-grade teacher at MIN 3 Banda Aceh, the researcher received information that students faced obstacles in grasping concepts and recalling multiplication materials taught. As a result, students referred to a multiplication poster in the classroom when solving problems. This is not a viable alternative when they are outside the classroom. This material was taught when they were in third grade.

The pre-test carried out by the researcher on September 2, 2024 confirmed that this is true. The findings indicated that merely 7 of 40 students (17.5%) passed the learning achievement criteria and the rest 33 students (82.5%) failed. These results suggest that the level of mastery of multiplication concepts among students was still low and that a good number of students were struggling to recall and apply the previously learned information in solving mathematical problems. This condition indicates that students had not reached the desired level of mastery in concepts and learning yet. Thus, the Jarimatika approach with the help of the replica media as an instructional intervention to overcome these learning challenges and enhance the awareness of multiplication in students was deemed necessary.

Understanding concepts plays a critical role, as mastering a concept helps students develop other fundamental abilities, such as reasoning, communication, relating knowledge, and solving problems (Jarmita et al., 2019). Media is designed to be engaging and contextually appropriate for students (Sholikhah et al., 2021). Educational media serves as a tool to enhance conceptual understanding in the classroom, facilitating the learning process and clarifying the material presented (Sari et al., 2021). Therefore, the teacher's efforts in using methods and creativity are essential in improving the quality of mathematics instruction (Firdaus et al., 2024).

Figure 1 shows the instructional media used in this study. The finger replica media was to be appealing to the students and help them learn mathematics by using concrete and interesting experiences. Its application aids in lessening the abstraction of mathematics, promotes active learning, and boosts the conceptualization and learning results in students.

This research is unique in that it has integrated Jarimatika approach with finger replica media in learning of multiplication at elementary school level. This interaction creates a more tangible and visual learning experience that makes concepts of multiplication easier to learn by students. In practice, it provides a new and practical alternative to teachers to enhance student engagement and mathematics learning results.

Creative learning activities promote student creation, discovery, imagination, and conceptualization of their talents (Hayati et al., 2024). Mathematics learning in the elementary school should thus not just be focused on memorizing, but must also help

students to develop their own knowledge based on significant learning experiences understanding (Hasanah & Safari, 2024).

METHODS

Classroom action research (CAR) is a form of action research applied to classroom activities, starting from simple, real, and clear problems regarding what occurs in the classroom (Parnawi, 2020). This study employed Classroom Action Research (CAR) to improve the multiplication learning outcomes of 40 fourth-grade students of Class IV-B at MIN 3 Banda Aceh through the implementation of the Jarimatika method assisted by replica media. The study was conducted from November 18 to November 20, 2024, in three cycles. The study followed the Classroom Action Research model developed by Kemmis and McTaggart, which consists of four stages: planning, action, observation, and reflection (Susilo et al., 2022).

During the planning phase, the researcher made lesson plans, learning materials and finger replica media, observation sheets and learning achievement tests. The action stage involved the learning process through implementation of Jarimatika method with the help of replica media during lessons on multiplication. Observation sheets were used to record teacher activities and student activities in the learning process in the observation stage. During the reflection cycle, the outcome of every cycle was measured to find weaknesses and to know how to improve the subsequent cycle.

The methods of data collection included observation sheets of teacher activities, observation sheets of student activities and learning achievement tests. Data analysis was done by examining the observation sheets of teacher and student activities and examining the test data. Data on observation were analyzed in descriptive way through changing the scores into percentages, whereas the data on the test were analyzed to establish the personal and classical mastery of learning in students.

The following were the indicators of success in this study. The criteria used to determine successful teacher activity were a percentage of 80% and a very good classification. Successful student activity was counted and classified as very good when it had a percentage of at least 80% of successful student activity. Achievement was deemed as successful when the individual score had at least 75 on the basis of the school the learning achievement criteria and classical mastery was above 85.

RESULTS AND DISCUSSION

This study was conducted at MIN 3 Banda Aceh, involving the class teacher and colleagues as observers. The classroom action research method involved 40 students, with the challenges faced by students including difficulty in understanding the material presented

and recalling the multiplication taught earlier, which affected their ability to solve math problems. This was evidenced through a pre-test conducted by the researcher on September 2, 2024. The results indicated that only 7 out of 40 students met the learning achievement criteria, while the remaining 33 students did not pass.

The Classroom Action Research (CAR) consisted of three cycles, aiming to evaluate the improvement in student learning outcomes, the teacher's role in managing the learning process, and student involvement during the learning process. Based on the results, several factors need to be analyzed as follows:

1. Teacher Activity

There was an improvement in the teacher's activity in managing the learning process in each cycle. Data obtained from cycles I, II, and III showed a significant increase in the teacher's activity, as can be seen in the diagram below:

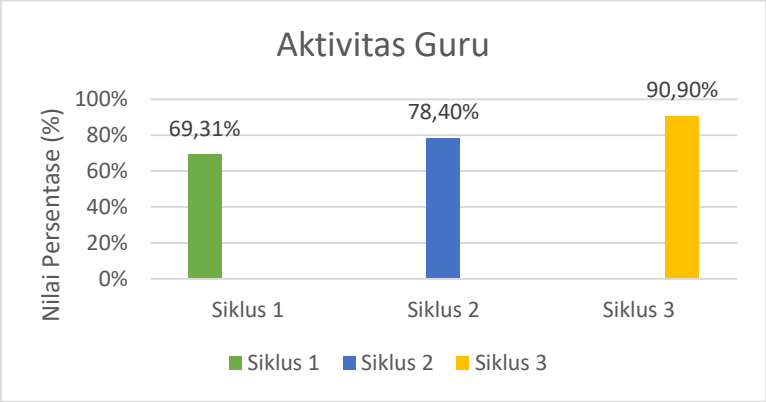


Figure 2 indicates that the teacher activity became better, with the values rising up to 69.31% and 78.40% and eventually 90.90%. This was not only the message of the numerical increase, but the increasing capacity of the teacher to use the Jarimatika technique helped with the help of replica media more efficiently with each cycle. Cycle I The teacher was still getting used to the implementation of the method and the media, thus some of the elements of the learning process were yet to be implemented in the best way possible. These entailed delivering clear instructions, encouraging students in activities that involve question and answer activities, proper time management as well as facilitating students to conclude at the end of the lesson. Consequently, the learning steps that were planned had not been implemented completely as per the expectations.

The rise in Cycle II was due to the reflection on Cycle I having the basis to make the next action better. The teacher started to work with the replica media more systematic, demonstrated the Jarimatika steps more clearly and demonstrated improved classroom

management in the process of learning. Moreover, the teacher was also more active in motivating the students to participate and also giving them a reward when students answered questions or did some multiplication tasks. These additions resulted in a more structured and interactive learning process, which led to the upsurge in the teacher activity score to 78.40% though there are still several areas that needed to be refined.

The maximum growth in the cycle III of 90.90 percent indicates that the teacher was now more confident and competent in dealing with the learning process. At this point the teacher could incorporate the Jarimatika approach and the replica media more systematically, provide instructions in a better way, engage students more actively and carry out the closing activities in a more efficient way. The other significant aspect was that students were now well-informed about the learning processes and the working of the media and hence the lesson was conducted in a much smoother way and the teacher could carry out all the learning processes more fully. Thus, the enhancement of teacher activity during the three cycles was possible due to the constant reflection and revision of the teaching approach, greater mastery of the instructional method and media, classroom management, and growing student willingness to engage in the learning process. The findings and follow-up actions for the teacher's activity in each cycle are as follows:

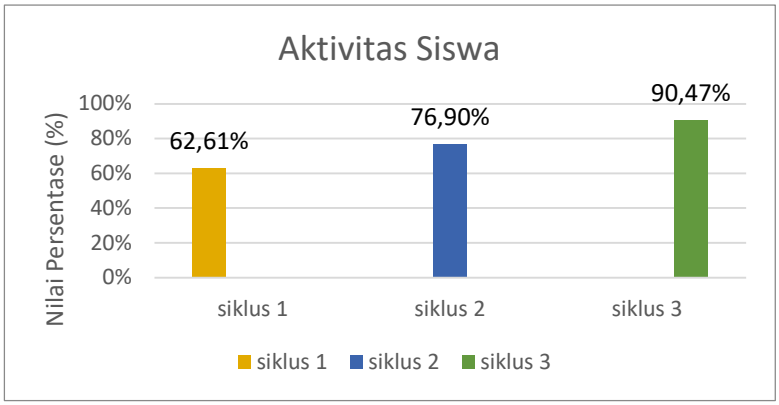
Table 1. Findings and Follow-up of Teacher Activities in the Three Cycles

No.	Reflection	Findings	Follow-Up Actions
1.	Teacher Activity in Cycle I	The teacher appeared hesitant in delivering motivation to students.	In the next meeting, the teacher is expected to gain confidence in motivating students, such as encouraging students to solve multiplication problems without referring to the multiplication poster.
2.	Teacher Activity in Cycle II	The teacher successfully involved students in the Q&A process, but some students were still shy to ask questions.	In the next meeting, the teacher should encourage students to ask more questions during the Q&A process.Pada pertemuan mendatang, guru diharapkan lebih percaya diri dalam mengarahkan siswa untuk menyimpulkan pembelajaran.
3.	Teacher Activity in Cycle III	The teacher's ability in the learning process reached an	No further follow-up is required as the success indicator has been achieved.

No.	Reflection	Findings	Follow-Up Actions
		excellent category with 90.90%.	

2. Student Activity

Figure 3 shows that student activity has steadily increased between Cycle I and Cycle III, 62.61% to 76.90% and 90.47% respectively. This growth shows that students got more actively engaged in the learning process when Jarimatika method with the help of replica media was implemented. Student activity in Cycle I was still relatively low since the students were not yet aware of the learning procedures, how the replica media was used as well as the steps of applying Jarimatika in solving multiplication problems. At this point, not all students were willing to engage in discussions, answer questions and show the steps of the solution and therefore their participation was not as high as it should be.



Cycle II was increased as students were now in a position to comprehend how the Jarimatika method can be utilized with the aid of replica media. The media also helped to make learning about multiplication more tangible and easier to understand, as students could see positions of fingers and could directly practice the steps of calculations. This minimized the confusion of students to learn multiplication procedures and made students more active in classroom activities. Moreover, the teacher improvement through reflection in Cycle I, i.e., the provision of clearer instructions, more structured demonstrations and more effective guidance in the process of practice, also helped to increase the student activity in Cycle II.

The increase in Cycle III of 90.47 was the greatest and indicates that students were now more confident, familiar and involved in the learning process. At this point, the learning activities were more efficient since students were no longer accustomed to the approach, but could already engage in the lesson actively by observing, practicing, responding to questions and conclusions. This observation indicates that the positive change in student activity was made possible by the Jarimatika approach which helped in the establishment of more

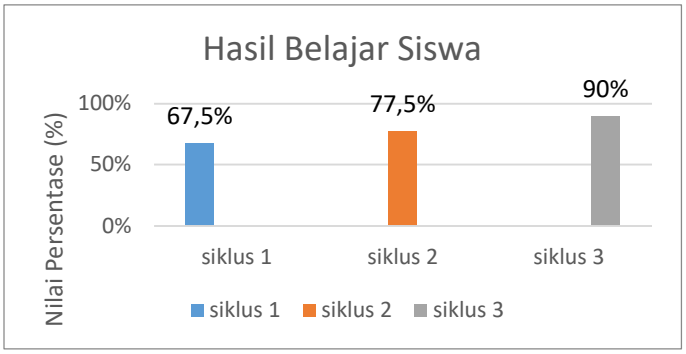
tangible, interactive and enjoyable learning environment through the use of replica media, and enhanced participation and confidence of the students through the repetition of the implemented cycles. The findings and follow-up actions for student activity in each cycle are as follows:

No.	Reflection	Findings	Follow-Up Actions
1.	Student Activity in Cycle I	Some students did not fully pay attention to the information about long multiplication using the jarimatika method with replica media.	In the next meeting, all students should be expected to fully pay attention to the presentation of long multiplication using the jarimatika method with replica media.
2.	Student Activity in Cycle II	Students were still hesitant to ask questions regarding material they did not understand.	In the next meeting, the teacher should encourage students to ask more questions about material they do not understand.
3.	Student Activity in Cycle III	The student activity in the learning process reached 90.47%, categorized as excellent.	No further follow-up is required as the success indicator has been achieved.

Table 2. Findings and Follow-up of Student Activities in the Three Cycles

3. Student Learning Outcomes

Figure 4 illustrates that the learning outcomes of students increased with each cycle. Classical mastery level score was raised by 67.5% in Cycle I to 77.5% in Cycle II to 90% in Cycle III. By the number of students, 27 students were mastering Cycle I, 31 students Cycle II and 36 students Cycle III. This tendency shows that the usage of Jarimatika approach with the help of the replica media helped to improve the concepts of multiplication in students and their skills to solve the multiplication problems in the right way gradually.



The learning outcomes at Cycle I were fairly low since the students were still at the adaptation stage concerning the new learning strategy. Even though the procedure and media were introduced, not every student could comprehend and use the multiplication procedures correctly. There were still some students who had problems with following Jarimatika steps and inserting them in the correct answers on the test. Consequently, the classical mastery score in Cycle I was yet to achieve the indicator of success.

The increase in Cycle II was the fact that the students were beginning to comprehend better the procedural steps that were required in Jarimatika and had become more used to the replica media as a learning tool. The media made the abstract concept of multiplication less abstract by giving a concrete and visual image that students can view and directly interact with. This assisted students in developing conceptual knowledge and reduced the calculation errors. Additionally, the reflection outcomes of Cycle I helped the teacher to make the learning process better by providing clearer explanations, more guided practice, and more powerful reinforcing students who continued to have difficulties. Such enhancements made the mastery rise to 77.5% out of 67.5% though the outcome was yet to reach the classical success criterion.

The greatest percentage of improvement in Cycle III, which was 90, shows that the learning process was more efficient and that the majority of students had learned the material of multiplication quite well. This outcome indicates, too, that the indicator of success of classical mastery that had been established at an above 85% level, was attained in Cycle III. The rise was proven as the students were provided with repetition, better teaching direction and meaningful learning activities due to the constant application of Jarimatika method and replica media.

Based on the figure, it can be concluded that the classical completion rate of students increased in each cycle. In Cycle I, the completion rate was 67.5% (27 students completed, 13 did not). In Cycle II, it increased to 77.5% (31 students completed, 9 did not), and in Cycle III, it reached 90% (36 students completed, 4 did not).

As for The findings and follow-up actions for student learning outcomes in each cycle are as follows:

No.	Reflection	Findings	Follow-Up Actions
1.	Student Learning Outcomes in Cycle I	In the first cycle, 27 students met the passing criteria, while 13 others did not meet the individual passing standard. The classical completion rate was only 67.5%.	In the next meeting, the teacher needs to improve student learning outcomes by optimizing the application of the jarimatika method with replica media.

No.	Reflection	Findings	Follow-Up Actions
2.	Student Learning Outcomes in Cycle II	In the second cycle, 31 students met the passing criteria, while 9 others did not meet the individual passing standard. The classical completion rate was 77.5%.	In the next meeting, the teacher needs to further improve student learning outcomes by optimizing the application of the jarimatika method with replica media.
3.	Student Learning Outcomes in Cycle III	In the third cycle, 36 students achieved the passing standard, and the classical completion rate was 90%, meeting the success criteria of ≥85%.	No further follow-up is necessary as the success indicators have been achieved.

Table 3. Findings and Follow-up of Learning Outcomes in the Three Cycles

According to the results of all the three cycles, the Jarimatika method which was aided by replica media proved to be effective in enhancing the learning outcomes of students in multiplication. But the effectiveness was not only exhibited in the improvement in percentages, but also by the learning process through which the process became more and more effective in every cycle. The improvement was possible as the actions that were taken in each cycle were constantly improved after reflection. The students in Cycle I were still adjusting with the learning steps, use of the replica media and the procedures of Jarimatika method, hence their understanding and performance were still not at the expected level. Through reflection, the next cycle was improved especially in the clarity of explanation, the systematic use of the media, the teacher guidance in the practice and the student involvement in the classroom activities. Consequently, Cycle II learning process became more interactive and structured which led to improved student participation and comprehension.

The improved result in Cycle III, where the classical mastery had reached 90, means that the students were more accustomed to the learning processes and were more confident in tackling multiplication problems. The finger replica media assisted in taking the concept of multiplication out of the abstract world and into the more concrete/visual learning process, a step which enabled students to more easily follow the instructions of Jarimatika and implement them properly. Moreover, cycle repetition enhanced procedural accuracy and conceptual knowledge of students. Thus, the learning outcomes were increased not only due to the repetition of the material, but a more systematic improvement of the learning strategy, a more effective approach of the teacher, and meaningful learning process of the students.

The research was deemed done in Cycle III since the classical mastery score had passed the success criterion of 85.

This research also aligns with the theory of David Paul Ausabel, a prominent cognitive psychologist who developed cognitive psychology theory, specifically related to how humans think to acquire knowledge, which includes processing impressions received through the senses, problem-solving, memory exploration, and the application of knowledge and procedures needed in everyday life. Meaningful learning is characterized by the process of connecting and integrating new experiences with students' prior knowledge or concepts (Shohibah et al., 2024).

The implementation of the Jarimatika method with the aid of replica media in class IV-B of MIN 3 Banda Aceh created a meaningful learning experience, enabling students to deeply understand and internalize mathematical concepts. Meaningful learning in this study was created when the Jarimatika method with the help of finger replica media that was used converted multiplication as an abstract concept to a concrete and visual learning process. Children did not simply learn facts of multiplication by rote, but through observing finger representation, directly practicing the actual steps of computing, and by correlating the new processes to what they already knew about numbers. The empirical results indicated this process because the student activity in Cycle I was 62.61% and it rose to 76.90% and lastly 90.47% in Cycle II and III and the learning outcomes improved to 67.5% to 77.5% and lastly 90%. These findings suggest that students not only acquired procedural skills but also improved their conceptual knowledge of multiplication.

And also supports Ausubel's theory that meaningful learning is more effective than rote learning. Prior to the implementation of the Jarimatika method in the class, students were still consulting multiplication textbooks when working on problems. This occurred because students were unable to store information temporarily. However, after implementing the Jarimatika method, they were able to deeply understand and internalize mathematical concepts.The results of this study also align with research by (Fikri & Susanto, 2024) which showed that the Jarimatika method positively influences mathematics learning outcomes, particularly in multiplication, improving students' understanding and skills. Likewise, this study found that the Jarimatika method effectively improved student learning outcomes in multiplication.

This method not only improves individual and class learning outcomes but also changes the way students understand and apply mathematical concepts in real life. Furthermore, the findings of this study are consistent with those of other relevant research, which indicates that the jarimatika method is an effective and feasible approach for mathematics learning at various levels of education.

This research also shows that the jarimatika method is effective in improving student learning outcomes in multiplication. This finding aligns with research (Wicaksono & Iswan, 2019) which states that learning success can be measured through four aspects: changes in students' perspectives, changes in knowledge, variations in emerging abilities, and improvements in abilities after learning (Dirgantara, 2019). And this finding was achieved in this study.

However, this research has differences with other research since it combines Jarimatika and finger replica media and investigates not the learning outcomes alone, but also the teacher activity and student activity through 3 cycles of classroom action research. Therefore, the value of the study to the literature is in the fact that it shows that the effectiveness of Jarimatika may be reinforced in case it is backed up with concrete learning media and implementations based on the reflective cycle. This research thus builds upon current results by demonstrating that Jarimatika is not merely another effective method of calculation, but also useful as a component of a more interactive and meaningful learning design in teaching mathematics in the elementary.

CONCLUSION

This study aimed to improve the multiplication learning outcomes of fourth-grade students at MIN 3 Banda Aceh through the implementation of the Jarimatika method assisted by replica media. Based on the findings across the three cycles, it can be concluded that the objective of the study was successfully achieved. The results showed a consistent improvement in teacher activity, student activity, and student learning outcomes.

The teacher activity went up to 69.31% in Cycle I to 78.40% in Cycle II and 90.90% in Cycle III. Student activity also improved from 62.61% to 76.90% and 90.47%. Moreover, learning outcomes among students improved by 67.5 to 77.5 and 90 in Cycle I to Cycle II and III respectively as compared to the classical mastery level of 85.

These results suggest that Jarimatika approach with support of replica media helped to make multiplication learning more tangible, interactive, and meaningful to elementary school students. Replica media was used to enable students to grasp concepts of abstract multiplication more easily and Jarimatika method was used to stimulate active contribution and procedural organization in the learning process.

The implication for teachers is that the Jarimatika method assisted by replica media can be used as an innovative and practical alternative in teaching multiplication, especially to increase student engagement, classroom participation, and learning outcomes. The implication for elementary school learning is that mathematics instruction should not rely only on explanation and memorization, but should also involve concrete, student-centered,

and meaningful learning experiences that help students construct their understanding actively.

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