Jurnal Iqra' Kajian Ilmu Pendidikan

E-ISSN: 2548-7892 & P-ISSN: 2527-4449

Volume 8, Number 2, December 2023

Addition and Subtraction of Integers with a Realistic Mathematics Education Approach

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ARTICLE INFO
Article history:
Received
February 13, 2023
Revised
December 27, 2023
Accepted
December 30, 2023

ABSTRACT

The aim of this research is to analyze the existing mathematics curriculum at the MIN Medan school and to identify how whole numbers are currently taught at the school. In addition to exploring and developing teaching strategies that incorporate real-world contexts for teaching integer addition and subtraction, to determine the effectiveness of the Realistic Mathematics Education approach in teaching integer addition and subtraction. The Realistic Mathematics Education (RME) Approach is one possible method. Through circumstances they can really experience, the RME technique offers pupils a learning opportunity to comprehend mathematical ideas. The learning process for adding and subtracting integers using the RME approach is described in this study using a qualitative descriptive methodology. Up to 30 pupils from class IIA served as research subjects for the study, which was carried out at MIN Medan. Data were gathered using observation notes and pictures. Data were gathered using observation notes and pictures. Data were reduced, displayed, and concluded, after which they were descriptively narrated. The results showed an effective learning process when the RME Approach was applied to the topic of addition and subtracting integers over the course of five meetings

Keywords: *Addition Subtraction Mathematic, Realistic Mathematics Education*

Journal Homepage http://journal.iaimnumetrolampung.ac.id/index.php/ji/

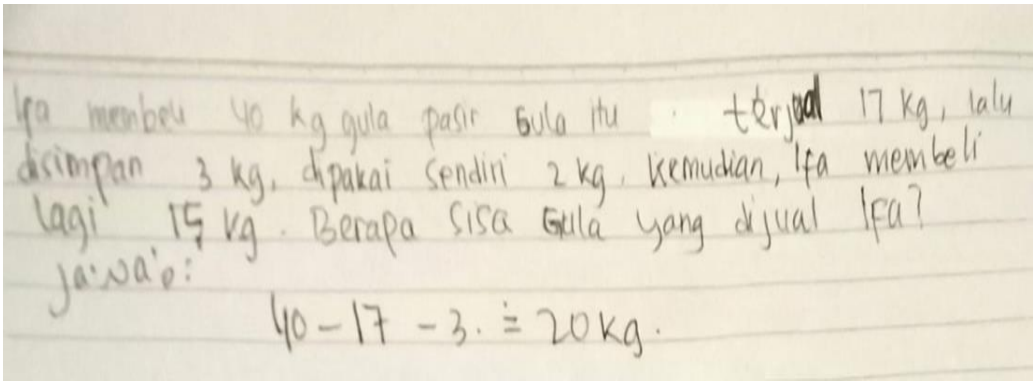
INTRODUCTION

Addition and subtraction material is one of the main materials in Elementary Schools or Madrasah Ibtidaiyah. Even though it is basic material and seems very simple, this material is still quite difficult for grade II elementary school students to understand (Saleh et al., 2018; Suherdi et al., 2020). This can be seen from the fact that there are still many students who have misconceptions or find it difficult to add and subtract integers (Isra & Mufit, 2023; Imaduddin et al., 2023; Jarrah et al., 2022; Machová & Ehler, 2023). Of course students whodo not master the concept of integer arithmetic operations will have difficulty following the next material (Bringula et al., 2021). Moreover, this material is the main bridge for developing logical thinking skills and improving higher cognitive skills in children (Angelelli et al., 2023; Darling-Hammond et al., 2020; Rivas et al., 2022; Sellars et al., 2018; Sheromova et al., 2020; Yilmaz, 2020).

The results of students' mathematics learning, especially in the material for adding and subtracting integer operations, are still low (Lamb et al., 2023; Yeh et al.,

2019; Triayomi, R., & Pamugkas, S. P. 2023). Especially if students are faced with word problems adopted in everyday life related to addition and subtraction material (Hidayatullah & Csíkos, 2023; Fauzi, et al., 2023; Lestari, F., et al., 2023). This is in line with the results of observations made by researchers on students' addition and subtraction abilities at one of the MIN in North Sumatra, it was found that many students had difficulty solving problems related to addition and subtraction. Based on Figure 1, it can be seen that there is still a lack of students in responding to word problems regarding addition and subtraction. Based on the results of interviews conducted with these students, it turned out that students still did not understand math problems from everyday life.

Figure 1. Student answers regarding addition and subtraction questions



One factor that is strongly suspected of influencing students' lack of understanding regarding the concept of addition and subtraction is the conventional learning model used by teachers (Anderson et al., 2022; Schulz, 2023; Wang et al., 2023). Teacher-centered learning will make students passive and enable students to not understand the concept of arithmetic operations on integers (Chen & Tsai, 2021; Hidayatullah & Csíkos, 2023; Sawant & Rizvi, 2015). This is in line with the results of observations which show that the learning model used by teachers is still conventional. The teacher directly teaches in the abstract how to add and subtract. Learning is more lecturing and concentrated on the blackboard when the teacher explains addition and subtraction (Hino & Funahashi, 2022). The teacher also asks students to record examples and work on questions according to the examples that have been given. Of course the teacher's explanation in this way is still too difficult for students. In fact, elementary school students need physical experience in learning concepts (Syawaludin et al., 2019).

The research on the addition and subtraction of integers with a Realistic Mathematics Education (RME) approach is essential for several reasons: Investigating the application of Realistic Mathematics Education (RME) to integer operations helps ensure students develop a deeper conceptual understanding of addition and subtraction, the research aims to identify and address common misconceptions in the addition and subtraction of integers, providing insights into effective instructional strategies within the RME framework (Istia et al., 2022). By grounding mathematical concepts in real-world contexts, the study contributes to methods that enhance long-term retention of integer operation skills among students, understanding how RME impacts critical thinking skills in the context of integer operations is essential for promoting problem-solving abilities among students and researching the application of RME to integer operations ensures students are better prepared to apply

mathematical concepts in practical, real-world scenarios, such as financial management and problem-solving in various fields (Muslimin et al., 2020). This explanation is in line with the results of research Darto (2021) which revealed that learning realistic mathematics education is not a teacher explaining, giving examples, then the students imitate the example of the teacher, but requiring students to work in groups, investigate, experiment, discuss, and share. Realistic Mathematics Education (RME) approach not only gives great attention to the cognitive development of students but also to the affective and psychomotor of students (Do et al.,s 2021). Learning the realistic mathematics education approach can help students to speed up their understanding, solve problems using their informal knowledge, provisde opportunities for students to show their ability and to motivate students to solve problems related to students' mathematical communication skills (Tong et al., 2021; Suyanto, S. 2023; Latip, A. D. A., & Supriatna, A. 2023).

Given the very fundamentality of addition and subtraction material, it is necessary to implement an approach that has the potential to facilitate the learning process and help elementary school students understand the material. One approach that can be used as an alternative to facilitate elementary school students on the topic of addition and subtraction is the Realistic Mathematics Education (RME) Approach. RME is an approach that uses real-world contexts in the delivery of learning, where students are expectesd to be involved in the learning process in a meaningful way and make them feel that mathematics is very close to the real world (Budiyanto et al., 2021; Güler, 2018; Laurens et al., 2018; Palinussa et al., 2021). This will facilitate the student learning process, because concretely these problems exist and can be found by students (Fredriksen, 2021).

Some principles of the RME approach that need to be known are the use of real-world contexts in learning, the use of models, the contribution of students in learning, learning activities take place interactively, and the linkages between learning topics used can encourage students to learn (Do et al., 2021; Juandi et al., 2022; Yuanita et al., 2018). Teachers should design three stages of learning, namely concrete, representational, and abstract. At the concrete stage, students manipulate various real objects in learning skills. At the representational stage, an image can represent a real object. Whereas in the abstract stage, numbers eventually replace images or graphic symbols (Kusumaningsih et al., 2018; Palinussa et al., 2021; Uyen et al., 2021).

There have been several previous studies that have been conducted to investigate the impact of implementing the RME approach (Juandi et al., 2022; Samritin et al., 2023; Sumirattana et al., 2017). However, existing studies only examine the impact of the RME Approach on students' hard skills and soft skills using statistical calculations. There is still minimal research that examines comprehensively how the implementation of learning with the RME approach helps students' understanding of addition and subtraction material. Therefore, the researcher wants to describe the description of the process of learning addition and subtraction with the RME approach and the students' process in understanding the material to be studied.

METHOD

The research method used is descriptive qualitative research. Qualitative research methods are able to obtain various concepts/information that cannot be obtained by other methods (Bogdan & Biklen, 2003). This study describes the learning process using a realistic mathematics education approach on the topic of addition and subtraction. The topic of addition and subtraction that is specifically discussed is

integers. The learning process was carried out at MIN Medan from January to February 2019 with research subjects namely class II A students of 30 students. This research was conducted in 5 meetings where the first to fourth meetings were the implementation of a realistic mathematics education approach and the fifth meeting was the evaluation of learning outcomes. The activities carried out can be seen in Table 1.

Table 1. Description of Research Activities

Meetings	Activities
1	a. Finding the meaning of numbers b. Sort numbers c. Compare numbers
2	Determine the place value of a number
3	a. Finding the meaning of addition b. Adding two numbers c. Adding three numbers
4	a. Finding the meaning of subtraction b. Subtract two numbers
5	Carry out the learning outcomestest

In the learning process, there are two observers (including researchers) who observe the learning process of a realistic mathematics education approach carried out by class teachers. Observations were made using an observation sheet by placing a checklist on each core activity that was carried out as well as a brief description of the learning about good things or things that had not been implemented perfectly. What was observed was the core activity of the realistic mathematics education approach on the topic of addition and subtraction of integers. All student activities are documented with photos, recordings, and observation sheets. The collected data is then analyzed and reduced. Data in the form of photos during the learning process were analyzed by two people, namely researchers and observers. All the results of the analysis are then written down in the form of a descriptive narrative to describe the entire core set of the learning process using a realistic mathematics education approach on the topic of addition and subtraction of integers. At the end of the research activity, an evaluation of learning outcomes was carried out to see the success of implementing a realistic mathematics education approach on the topic of addition and subtraction of integers.

RESULT AND DISCUSSION

The First Meeting

The first meeting begins with preliminary activities carried out by the teacher, namely preparing students, motivating students, explaining learning objectives, and briefly explaining the activities students will do that day. At the first meeting there were three activities carried out by students, namely: 1) finding the meaning of numbers, 2) sorting numbers, and 3) comparing numbers. The teacher asks students to sit in predetermined groups, in which one group consists of 5 students, so that in one class there are 6 groups. The teacher also gives LAS-1 as a student work guide to write down the things found. The following is a description of the three activities at the first meeting.

Activity 1: Putting marbles in a jar to find the meaning of the numbers 50, 37, 45 and 24

The purpose of this activity is to guide students to recognize and understand the meaning of numbers by putting marbles into a jar. The activity of putting marbles one by one into a jar can lead students to know and understand the meaning of numbers through the help of concrete objects. With this activity of entering marbles students find the meaning of numbers and write down the symbol of the number.

In this activity, the teacher gives contextual problems about four children, namely Bono, Adi, Rafi, and Geno who have 50, 37, 45, and 24 marbles respectively. The teacher gives 160 marbles and four empty jars to each group. The teacher asks students to write names and numbers on each jar to represent the marbles belonging to Bono, Adi, Rafi and Geno. The students looked confused and told each other to take and put the marbles into the jar. Several students took the initiative to take marbles and put them one by one into the jar. For the Bono jar, students put 50 marbles in and wrote the number 50 on paper and then stuck the paper onto the jar. Then followed by other students. Likewise for Adi, Rafi, and Geno's jars, students were able to put in the number of marbles mentioned by the teacher and stick a number on the paper that represented the number of marbles. This means that students have understood that the amount of an item can be represented by a number.

Figure 2. Students Entering Marbles

Activity 2: Assemble the jars to sort the numbers 50, 37, 45, and 24

The purpose of this activity is to guide students to be able to sort numbers through many marbles from the least to the most or vice versa. This needs to be done because the concept of counting the number of marbles will lead students to know the sequence of numbers. It is hoped that with this activity students will gain initial knowledge about the sequence of numbers by counting the number of marbles in a jar.

After activity 1, students were able to write numbers according to the number of marbles in the jar. Students then pay attention to the number written and the number of marbles in the jar. With the instructions given by the teacher to sort the number of marbles, students were able to arrange Geno jars containing 24 marbles on the far left, followed by Adi's jars containing 37 marbles, Rafi's jars containing 45 marbles, and Bono's jars containing 50 marbles. Students write down the order of numbers into 24, 37, 45, 50 as shown in Figure 3. There are also groups of students who order numbers into 50, 45, 37, and 24. By understanding the meaning of numbers and the magnitude of a number, students are able to order

numbers from smallest to largest. the biggestor vice versa. This is because students see for themselves that the number represented by more marbles is the biggest number.

Figure 3. Students Entering Marbles

Activity 3. Comparing the numbers 35, 72, 91

The purpose of this activity is to lead students to see the difference in numbers by comparing the number of marbles in the jar. This needs to be doneby comparing the marbles in one jar with the marbles in another jar. In this activity students are expected to be able to compare two numbers. It is expected that students can put <, =, or > signs between two numbers. Before this activity is carried out, the teacher explains the meaning of <, =, or > signs to students.

Students first put the marbles into the number of jars mentioned in the LAS, namely the Adi, Raja, and Yudi jars each containing 35, 72, and 91 marbles. Then students were asked to compare the number of marbles in the jars of Adi and Raja, Adi and Yudi, and Yudi and Raja. Students found that Adi's jar containing 35 marbles contained less than Raja's jar which contained 72 marbles. Students are able to write 35 < 72 on the LAS given by the teacher. Adi's jar, which contains 35 marbles, has less content than Yudi's jar, which contains 91 marbles. Students are able to write 35 < 91. For Yudi's jar which contains 91 marbles, it contains more than Raja's jar which contains 72 marbles. Students are able to write 91 > 72. By understanding the meaning that numbers represent the amount of an object and students have understood the sequence of numbers, students can easily compare the order between two numbers.

Figure 4. Students Comparing Between Jars

At the end of the meeting in directing students' understanding to read and write number symbols, the teacher gave a little guidance on the meaning of numbers. The teacher emphasizes that all existing objects can be represented by numbers, for example 35 marbles can be written down by the number 35 or 35cars

can be written by the number 35. In conclusion, all existing objects can be represented by numbers. The teacher then closes the lesson by leading the prayer and greeting.

Based on the results of observations at the first meeting, in general students had no difficulty recognizing and understanding numbers. However there were still some students who did not seem to participate in putting the marbles into the jar. The student just smiled. Then there were students who only put marbles into the jar but did not write down how many marbles were in the jar. Teachers need to give more ways and attention to students who seem hesitant and afraid to give opinions. Overall the learning process of planting the concept of recognition, reading, writing, sorting, and comparing numbers can be said to be successful and students seem to be enthusiastic about learning mathematics.

Second meeting

The second meeting begins with preliminary activities carried out by the teacher, namely preparing students, motivating students, conducting apperceptions, explaining learning objectives, and briefly explaining the activities students will carry out that day. In this second meeting, students will discuss the place value of a number. This meeting consists of one activity, namely determining the place value of numbers. The teacher asks students to sit in groups randomly, in which one group consists of 5 students, so that in one class there are 6 groups. The teacher also gives LAS-2 as a student work guide to write down the things found. The following is a description of the activities at the second meeting.

Activity 1. Determine place value 399

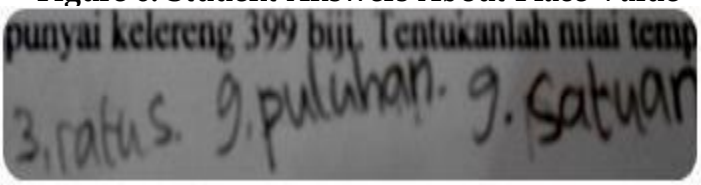
The purpose of this activity is to guide students to recognize the place value of a number by counting the number of marbles. This needs to be done so that by counting the number of marbles students will see firsthand and understand the place value of a number. With this activity students can understand the place value that is meant by hundreds, tens, and units. The teacher instructs the students to collect 399 Adi marbles. The teacher asks students to determine the place value.

As in the previous meeting, the teacher distributed props to each group. The teacher instructs students first to read and understand the problems given. The teacher asks each group representative to take props, then solve the problem. The props used are in the form of colored bags, namely green, yellow, and red. The green bag will be full if it is filled with 100 marbles. The yellow bag will be full if it contains 10 marbles. And the red bag can only be filled by one marble. The teacher instructs the students to put the marbles in the bags and asks not to use too many bags. If this has been done, the teacher asks students to write down their respective work results in the LAS-2 provided. The answers generated by students in their groups varied, for example, 399 marbles could be put in 3 green bags, 9 yellow bags, and 9 red bags. There was also another group of students who produced the wrong number of bags because the number of marbles included was not in accordance with the teacher's instructions. With the teacher's guidance, each group begins to understand the instructions. The teacher conveys, green bags can be expressed as hundreds, yellow bags are expressed as tens, red bags are expressed as units. The teacher asks students to write down the results in the form of hundreds, tens and units. There were also students whose answers to the number 399 were 300 hundreds, 90 tens, and 9 units answered. There are also groups of students who do not understand the instructions given. From the various student answers, the teacher asked each student to explain the reasons why they answered that way. The teacher

asks students whose answers are 399, namely 3 hundreds, 9 tens, and 9 units to write down the answers on the blackboard.

Figure 5. Students Showing Bag of Marbles

Figure 6. Student Answers About Place Value



After that the teacher closes the lesson by emphasizing that the number with the greater value is always in the far left of the group of numbers, then followed by the number with the smaller value and so on. In this case the number 399, the number with the greatest value is the number 3 hundreds worth 300, then followed by 9 tens which is 90, and finally 9 units which is 9. The teacher asks students to do the task to determine the place value of other numbers. The teacher leads the prayer and greets.

After the second meeting learning process ended, researchers, teachers, and observers discussed the extent of the implementation of the learning outcomes design. There are students who are able to directly solve problems without using props. However, there are still students who do not understand that they must be assisted by using visual aids. After being assisted with visual aids, in general students already understand the place value of a number.

Third meeting

The third meeting begins with preliminary activities carried out by the teacher, namely preparing students, motivating students, conducting apperceptions, explaining learning objectives, and briefly explaining the activities students will carry out that day. At this third meeting, students will discuss the meaning of addition. This meeting consists of three activities, namely: 1) Understanding the meaning of addition, 2) Adding two numbers, and 3) Adding three numbers. The teacher asks all students to be involved in this activity. The teacher gives LAS-3 as a student worksheet to write down the things found. The following is a description of the three activities at the third meeting.

Activity 1. Ride an angkot Understanding the Meaning of Addition

The purpose of this activity is to guide students to understand the concept of adding numbers by simulating taking public transportation to school. This public

transportation simulation can lead students to understand the concept of addition by demonstrating taking public transportation in class. The teacher conveys the problem that occurs, namely the angkot car picks up 10passengers from Amplas, 6 passengers board at Simpanglimun. The teacher asks students to count how many passengers there are now.At this third meeting, the teacher acted as a bus driver calling the first 10 people then called again 6 students. The teacher gives assignments to students who are not called to pay attention and write answers on their respective answer sheets and this activity is carried out alternately. The student's answer to this problem was using the sideways path, namely 10 + 6 = 16, and there were also students who used the downward path. After that the teacher emphasizes that in adding numbers students must understand the place value that has been studied in the previous meeting. This means that in adding numbers we must pay attention to numbers that have the same place value, for example hundreds with hundreds, tens with tens and units with units.

Activity 2. Adding two numbers

The purpose of this activity is to lead students to understand the concept of adding two numbers by showing a frog jump game. This frog jumping game can guide students in understanding the concept of addition by demonstrating frog jumping and following the rules of the game. In this activity, students are expected to understand the pattern of adding two numbers by understanding the place value of the numbers to be added. The teacher explains the rules of the frog jumping game, namely one jump has a value of 100, one step has a value of 50 and one walk has a value of 5. The teacher presents a problem, namely Soni jumps 2 times, steps 2 times. The teacher asks students to count how many marks Soni got. Before the problem is answered, the teacher asks one of the students to come forward to act as Soni and practice the frog jump game. The other students were told to pay attention and record how many marks the students who practiced earlier got. This game is played alternately. students answer; Soni jumps 2 times to get 200, because 1 time jump is worth 100, and 2 steps gets 100, because 1 time step is worth 50. So the value Soni gets is 200 + 100 = 300 or walk down

Figure 8. Students Demonstrating the Frog Jump

Figure 9. Students Write the Addition of Numbers

After that the teacher emphasizes that in adding numbers students must understand the place value that has been studied in the previous meeting. This means that in adding numbers we must pay attention to numbers that have the same place value, for example hundreds with hundreds, tens with tens and units with units.

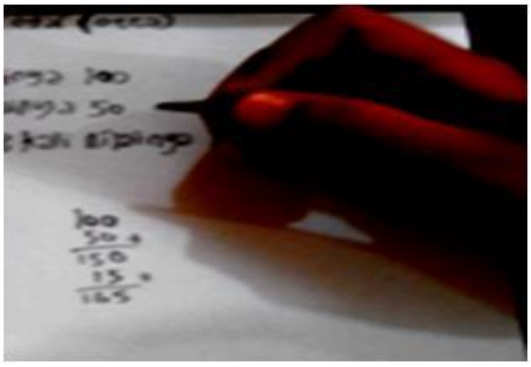
Activity 3. Add three numbers

The purpose of this activity is to lead students to understand the concept of adding three numbers by showing a frog jump game. This frog jump game can guide students in understanding the concept of addition by demonstrating the frog jump game by following the rules of the game. In this activity, students are expected to understand the pattern of adding three numbers by understanding the place value of the numbers to be added.

The teacher still uses the frog jump game for this activity. The teacher conveys the problem, namely Boncel jumps 1 time, steps 1 time and walks 3 times. Students were asked to calculate how much value Boncel got. The student answered that Boncel steps 1 time gets a value of 10, 1 time steps a value of 50. 3 times a walk has a value of 15, because 1 time a walk has a value of 5. So the value that Boncel gets is 100 + 50 + 15 = 165 or walk down

$$\begin{array}{r} 1\ 0\ 0 \\ 5\ 0 \\ \hline 1\ 5 \\ 1\ 6\ 5 \end{array} +$$

Figure 10. Student Answers About Addition



Most students seem to be able to add two or three numbers. At the end of the lesson the teacher emphasized again that in adding numbers we must pay attention to numbers that have the same place value, for example hundreds with hundreds, tens with tens and units with units. The teacher closes with prayer and greetings.

Fourth Meeting

The fourth meeting begins with preliminary activities carried out by the teacher, namely preparing students, motivating students, conducting apperceptions, explaining learning objectives, and briefly explaining the activities students will carry out that day. At this fourth meeting, students will discuss the meaning of subtraction. This meeting consists of one activity, namely subtracting two numbers. The teacher asks all students to be involved in this activity. The teacher gives LAS-4 as a student worksheet to write down the things found. The following is a description of the three activities at the fourth meeting.

Activity 1. Subtract two numbers

The purpose of this activity is to lead students to understand the concept of subtracting numbers by distributing popsicle sticks. Distributing popsicle sticks can lead students to understand the concept of subtracting numbers by demonstrating giving popsicle sticks in class. The teacher conveyed the problem to the students, namely Fikri had 139 popsicle sticks and he gave 74 popsicle sticks to his younger sibling. The teacher asks the students to count how many sticks of ice are left in Fikri's. The teacher asks one of the students to come forward to take props and practice taking 139 ice sticks then giving one of the students 74 ice sticks. The other students were told to pay attention and record how many ice sticks were left from what the students practiced earlier. Students write down their Fikri there are 139 ice sticks, then they are given 74, so all that is left is 139 - 74 = 65 or go down $\begin{array}{r} 139 \\ 74 \\ \hline 65 \end{array}$ —

Fifth Meeting

The sixth meeting begins with a prayer, the teacher conducts student attendance, gives apperceptions, and conveys the learning objectives. The initial activity before the final evaluation of learning is a routine activity before the learning process. Furthermore, at this fifth meeting, students were given evaluation questions to see student understanding after implementing learning with the RME approach. The evaluation consists of 4 questions with material coverage according to the first to fourth meetings. The evaluation results can beseen in Figure 11.

Figure 11. Results of Learning Evaluation About Addition and Subtraction Figure

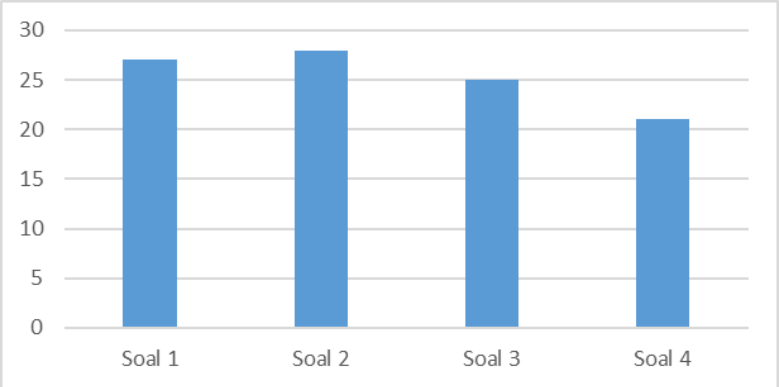


Figure 11 shows that the most difficult problem for students to work on is question number 4 about subtracting two numbers. This is in accordance with what Paliwal & Baroody (2020) stated that the subtraction operation is the most difficult thing for students. As for some of the mistakes made by students are students' mistakes in doing calculations. Overall, the results obtained by students in this evaluation indicated that the implementation of the RME approach to addition and subtraction material was able to facilitate more than 50% of students doing the final evaluation questions correctly. This means that more than 50% of students have understood the concept of addition and subtraction so that they are able to complete the final evaluation questions correctly. This happens because students

are involved in the learning process in a meaningful way and make them feel that mathematics is very close to the real world.

DISCUSSION

Desribe paragraph main finding about Addition and Subtraction of Integers with a Realistic Mathematics Education Approach are in the context of Addition and Subtraction of Integers with a Realistic Mathematics Education (RME) approach, the main finding revolves around the effectiveness of incorporating real-world contexts and meaningful situations to enhance students' understanding of these mathematical operations (Uyen et al., 2021). RME emphasizes the application of mathematical concepts in authentic, everyday scenarios, providing students with a concrete foundation for abstract ideas (Ardiyani et al., 2018). The approach recognizes the importance of connecting mathematical concepts to the real world, making the learning experience more engaging and relevant for students. This explanation is in line with the results of research Uyen et al., (2021) which revealed that , it is possible to conduct research related to the application of RME in other mathematical contents and the effectiveness of this teaching approach in developing students' math competencies. Also, the research on the influence of RME on students' learning attitude, mathematical beliefs, and interest in learning is worth considering. The results of research Ndiung et al., (2021) also revealed that the creative thinking skill and Mathematics learning outcome of the students who learn mathematics through the Treffinger learning model with realistic mathematics education approaches are better than those of their counterparts who learn mathematics through the conventional teaching model both separately and simultaneously. It can be said that the integration of Treffinger's creative learning model combined with the six principles of RME as one of the learning models that can be used by elementary school teachers in mathematics learning to shape creative thinking skills while enhancing mathematics learning outcomes.

Through the use of real-life examples, students can develop a deeper understanding of the principles behind addition and subtraction of integers. By relating mathematical concepts to practical situations, RME aims to bridge the gap between theoretical knowledge and its practical applications. This approach not only facilitates better comprehension but also promotes critical thinking skills as students learn to analyze and solve problems in context. Additionally, the findings may highlight the positive impact of the RME approach on students' overall mathematical proficiency, as it fosters a conceptual understanding of integers and their operations rather than relying solely on rote memorization of rules. Ultimately, the incorporation of realistic scenarios in teaching addition and subtraction of integers under the RME framework contributes to a more meaningful and effective learning experience for students. This explanation is in line with the results of research Febriana (2021) which revealed that it was concluded that applying the RME approach could improve students' understanding of mathematical concepts at SD Munita Yogyakarta. It means that Realistic Mathematics Education (RME) approaches can be implemented in mathematics learning.Teachers can use the RME approach in the learning process of mathematics andanyother subjects in general.

The differences your main finding among previous finding are this research has introduced additional strategies in the RME approach to teach addition and subtraction of whole numbers. Apart from that, the application of these learning strategies can be based on continuous experimentation and feedback from educators,

whereas in research Saputri et al., (2020), it was only limited to the development of Mathematics teaching materials using the Realistic Mathematic Education (RME) approach but there was no implementation of learning strategies carried out by the teacher (Fitri, H., et al., 2023). In this research, there are new findings that focus on the long-term impact of the RME approach, assessing how well students retain and apply their understanding of integer operations over a long period of time, whereas other research only understands the definition of the RME approach.

This research also focuses on the RME approach in serving diverse student populations, including those with different learning styles, cultural backgrounds or abilities, whereas in research Darto (2021), the RME approach focuses on the learning approach, realistic mathematics education loaded with mathematics. activities (doing mathematics), investigation, discussion, and reflection. Findings could emphasize the importance of teacher professional development in effectively implementing the RME approach, highlighting successful strategies for training educators to use this methodology in the classroom.

The research on Addition and Subtraction of Integers with a Realistic Mathematics Education (RME) approach carries significant implications for both educators and students. First and foremost, the findings suggest that incorporating real-world contexts into the teaching of integer operations can enhance students' understanding and engagement. By grounding mathematical concepts in practical situations, educators can foster a deeper comprehension of addition and subtraction of integers, moving beyond mere memorization of rules. Furthermore, the implications extend to the development of critical thinking skills. The emphasis on real-life examples within the RME framework encourages students to analyze problems in context, promoting a more holistic and problem-solving-oriented approach to mathematics. This not only aids in mastering integer operations but also cultivates skills that are transferable to various aspects of students' academic and everyday lives.

The research also underscores the importance of making mathematical concepts relevant and applicable. As students see the direct connections between integer operations and real-world scenarios, they are more likely to appreciate the practical utility of mathematics. This can contribute to increased motivation and a positive attitude towards learning, potentially improving overall mathematical proficiency. Additionally, the implications may extend to instructional practices. Educators may need to adapt their teaching methods to align with the principles of the RME approach, emphasizing the integration of meaningful contexts and hands-on activities. Professional development programs for teachers may play a crucial role in equipping educators with the skills and knowledge needed to effectively implement the RME approach in their classrooms. In summary, the implications of research on the Addition and Subtraction of Integers with a Realistic Mathematics Education Approach highlight the potential for improved student learning experiences, enhanced critical thinking skills, and the development of a more profound and practical understanding of mathematical concepts. These implications carry far-reaching benefits for both educators and students within the realm of mathematics education.

It's essential to consider these limitations and drawbacks when evaluating the feasibility and applicability of the Realistic Mathematics Education approach in specific educational settings. Teachers and curriculum designers may need to strike a balance that best suits the needs of their students and aligns with broader educational

goals. Incorporating realistic contexts and hands-on activities may be time-consuming. In a curriculum with strict time constraints, teachers might find it challenging to cover the necessary content thoroughly while also integrating the RME approach.

Further research could explore the long-term effects of the RME approach on students' mathematical proficiency. Investigate whether the understanding of addition and subtraction of integers acquired through realistic contexts persists and influences advanced mathematical learning. Conduct comparative studies to assess the effectiveness of the RME approach versus traditional methods in different cultural and socio-economic settings. This could provide insights into the approach's universal applicability and effectiveness across diverse student populations and conduct research on the impact of the RME approach on student motivation and engagement in mathematics. Explore how real-world contexts contribute to a positive attitude towards learning and whether this translates to increased interest in STEM fields.

CONCLUSION

The RME approach can be used to provide experience to elementary school students in understanding addition and subtraction material. The implementation of learning with the RME approach is carried out by conveying problems and situations that are close to students such as the number of marbles, ice sticks, riding public transportation, and frog jumping. During learning, students know and understand problems in math word problems. This makes students get closer to environmental problems related to mathematics, in the sense that students know mathematics not only with formulas and numbers, but mathematics is also related to the surrounding environment or everyday life. With problems that are close to students and thehelp of concrete objects that students hold directly, it can help students understand the meaning of integers, addition, and subtraction. In addition, learning is carried out in four meetings with several activities that can lead students to find concepts related to the material to be achieved. At the end of the learning implementation, the RME approach actually helps students understand the addition and subtraction material as seen from the final evaluation results.

This suggestion emphasizes the practical development and implementation of curriculum resources that explicitly leverage the RME approach. Evaluating the impact of such targeted modules can offer valuable guidance for educators seeking effective and engaging ways to teach integer operations.

ACKNOWLEDGEMENT

The researcher would like to thank the Class IIA students at MIN Medan and the class IIA MIN Medan teachers. Researchers also thank the State Islamic University of North Sumatra for continuing to support researchers in terms of research and publication of research results.

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