# *Learning Angular Measurement in the Third Using a Realistic Mathematical Education Approach (RME)*

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***Abstract***

The realistic mathematics approach provides students with the opportunity to discover and reconstruct mathematical concepts. This research aims to reveal the analysis of the implementation of the realistic mathematics education approach to the lesson on measuring angles in triangles. This study is a descriptive qualitative research conducted at SD No.038/XI Koto Lolo with 31 fourth-grade students as subjects. Data collection techniques in this study include observation, documentation, and interviews. The results of this research show that students are able to use the protractor correctly in measuring angles. Furthermore, students also discovered the concept that the sum of angles in a triangle is 180°.

***Keywords:*** *Angles; Measurement; RME (Realistic Mathematics Education); Triangle.*

**Abstrak**

Pendekatan matematika realistik memberikan kesempatan kepada siswa untuk menemukan dan mengkonstruksi kembali konsep matematika. Penelitian ini berusaha mengungkapkan analisis penerapan pendekatan pendidikan matematika realistic terhadap pelajaran pengukuran sudut Pada segitiga. Penelitian ini merupakan jenis penelitian kualitatif deskriptif. Penelitian ini dilakukan di SD No.038/XI Koto Lolo dengan subjek siswa kelas IV yang berjumlah 31 orang siswa. Teknik pengumpulan data pada penelitian ini yaitu observasi, dokumentasi, dan wawancara. Hasil penelitian ini menunjukkan bahwa siswa mampu menggunakan busur derajat dengan benar dalam pengukuran sudut. Selanjutnya siswa juga menemukan konsep bahwa besar sudut dalam sebuah segitiga yaitu 180°.

**Kata Kunci:** *Pengukuran; RME; Segitiga; Sudut.*

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## INTRODUCTION

Mathematics is one of the most important subjects for children, where mathematics will help students to solve problems that exist in everyday life (As'ad & Khotimah, 2020). Mathematics as one of the subjects in the school is highly rated to play an important role in improving the ability of students. The ability to think critically, systematically, logically, creatively, and collaboratively effectively can be developed through learning mathematics. Therefore, the knowledge of mathematics should be mastered as much as possible by the students and mathematical learning at school should be able to develop the potential that the students have (Marsigit & Zaini, 2014).

Mathematical education in schools, especially primary schools, is the beginning of a child's beginning to deepen his ability to understand concepts within mathematics and the knowledge acquired will greatly influence him at the next level of education. It is in line with Sari, dkk (2020) that mathematics relates to abstract ideas/concepts that are organized hierarchically, in order to study a concept that is based on another concept, one needs to understand the concept of the precondition, without understanding the concepts of the prerequisite it is impossible that the person understands the new concept well.

One of the mathematical subjects in elementary school is the measurement of triangle angles in the fourth grade. Research on the ability of students to measure triangles using a degree arc yielded variable results. Hardison (2020) and Perkasa (2022) both found that students had difficulties in measuring angles, with Hardison specifically noting the challenge in quantifying precedence. On the other hand, Puspitasari (2020) identified a group of students with high mathematical creative thinking abilities, which potentially impact on better angle measurement skills. To support this, mathematical material must be packed and processed as pleasant and understandable to the student.

In this case a teacher really has to be creative and innovative in creating fun learning. To overcome this, use the learning process through the PMRI approach. (Pendidikan Matematika Realistik Indonesia). Given the importance of mathematics lessons then, the aim of learning should be to focus on the student so

that the learning process is more meaningful (Muliandari, 2019). Tamur (2020) further supported the effectiveness of RME, in Indonesia, where it was found that this approach significantly improved students' mathematical abilities. The Realistic Mathematics Education (RME) approach has been shown to be effective in improving students' mathematical reasoning skills (Halimah, 2020), cognitive scores, and affective outcomes (Purwati, 2020). It also enhances students' mathematization ability and learning outcomes (Lady, 2018). Irdawati (2019) also found that RME can improve student mathematics cognition, making it a valuable approach to improving the quality of math education. To realize this, the role of the teacher is necessary so that mathematical learning is easily understood by students. Through improved learning with an approach that enables students to better mathematical learning outcomes, the approach that can be used is a realistic mathematics education approach (PMR).

Realistic Mathematical Approach is a mathematical learning approach that begins with a real problem and then with a complicated mathematics process, brought towards a formal form with a pleasant learning atmosphere. (Wahyuni et al., 2019). Through a realistic mathematical approach, students are not only given problems found in everyday life, but also students have to solve them. In other words, the realistic approach of mathematics will give students an opportunity to discover and re-construct concepts of math, so that students have a strong concept of understanding. The teacher can present learning that is close to the student's everyday life, as well as teachers can present concrete things according to student experience. Mathematical learning is a departure point from the reality that exists in daily life. Contextual problems experienced by students can be used as a starting point in learning mathematics in helping students understand math. This approach is right to be applied in elementary schools as it can help students to understand concepts in mathematics that are abstract in nature.

Therefore, learning mathematics with a realistic mathematical education approach needs to be applied to conduct analysis of student mathematic learning outcomes on angle measurement material on the triangle.

## RESEARCH METHODS

This research is qualitative descriptive research that describes the process of learning-teaching activities. This research activity was carried out in Class IV SD No.038/XI Koto Lolo in the strange semester, school year 2023/2024 with the number of students as much as 31 people. The research was conducted over two hours of learning using a realistic mathematical education approach. (PMR).

The instruments used in this study are HLT, LAS and origami paper. The researchers implemented PMR in triangular angle measurement learning using contextual problems or something imaginable by the students. Researchers used origami papers that were then formed into a triangle and inserted into the Student Activity Sheet (LAS) 1. The data collection techniques used in this study are observations, documentation, and interviews.

## RESULTS AND DISCUSSION

Learning activities were conducted during one meeting. The learning and teaching activities are carried out using the Realistic Mathematica Education approach, by providing a Student Activity Sheet (LAS) consisting of two activities that are done in groups. Through this, students can discuss and contribute to each other during the problem solving process given to the LAS.

Two learning activities are measuring large angles on origami paper that has been formed into three triangles and measuring larger angles in the images shown in LAS. Each activity has a different purpose. Teachers divided the total number of 31 students into 7 groups with each group consisting of 4 or 5 students. The initial obstacle that emerged was the class condition becoming noisy as students search for their groupmates and teachers difficulty in determining group seats with very dense classrooms. At the beginning of the activity the teacher gave the student the opportunity to imagine a picture or object in the shape of a triangle.

*Teacher: Before I distributed this paper (LAS), did anyone know examples of triangle-shaped objects?*

*Students: Cake, bread.*

*Teacher: Yeah, right, is there any more? Ayoo*

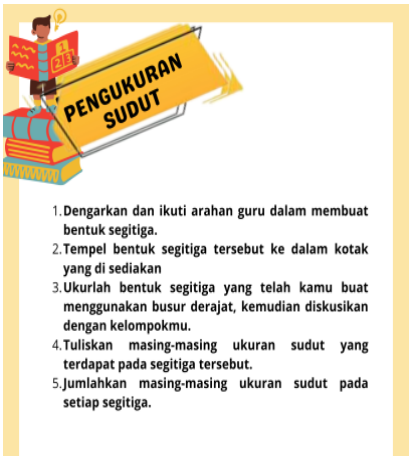
*Student: This is a buck (while showing a triangle)*

*Teacher: Yes, it's right.*

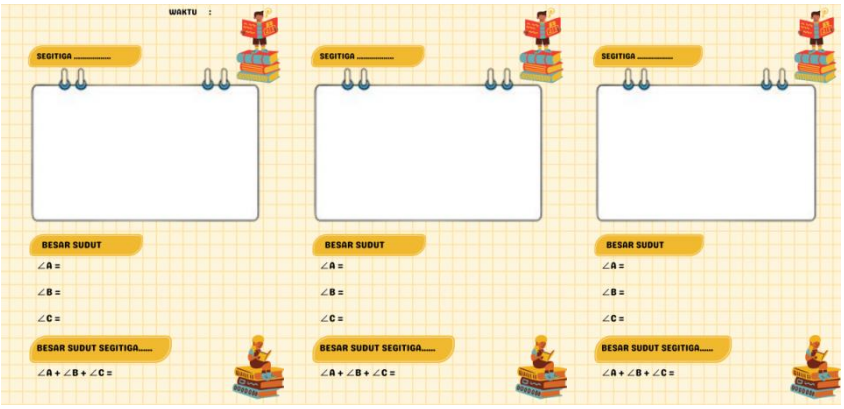
The teacher distributed a Student Activity Sheet (LAS), origami paper, and a degree bow that would be used for the first activity. Origami paper will be formed into three triangles for each group. In RME's approach, it is associated with contextual phenomena, that is, the phenomenon in everyday life or that can be imagined by students. These phenomena are linked to other interesting phenomenons. (Shavira, 2021). Starting with the phenomenon, students are asked to learn how to measure the angle of a triangle. Here's a description of two activities in learning.

1. Learn how to use a degree arc and find a large angle on an origami paper that is already formed into a triangle.

The objective of this activity is that the student can learn to use the degree arc by measuring the size of the angle and find the big angle on the triangles made of origami papers. In activity 1, students are asked to paste a triangle shape into the provided box, then measure the triangles in their respective groups.




**Gambar 1. Activity Indicator 1 on LAS**




**Gambar 2. Activity 1 on LAS**

In activity 1 presented on LAS (Figure 2), students were asked to measure the angle of the triangle in groups by making a triangular shape from origami paper with the instructions of the teacher first. Before the student measures an angle, the teacher first affirms that the center point on the degree bow must be placed at the angle point of the angle to be measured. One of the bottom lines of the bow (the long end) is parallel to one side of the corner to be measure. The short line of the arc (the smaller end) points to the direction of the measurement angle.

Learning implemented with the RME approach makes students actively engage in groups, so that learning is more meaningful. In one group the teacher distributes as many origami papers as the students are in the group, whereas the origami paper required in the initial activity is only 3 papers. Based on observations, it is seen that students can discuss well starting from the simple thing about origami paper who will be used to make a triangle, whereas students whose origam paper is not used are tasked with sticking a triangel to the LAS. This is a simple form of student interaction in a group. Student interaction with other students is important in learning realistic mathematics education (Herawaty, 2018).

Students start measuring the angle of a triangle using a degree arc. After acquiring the size of each angle on a triangel, students are asked to sum up the three angle sizes obtained. On the measurement of the angle point that is located at the tip of the triangle, there are students who are confused.

**Gambar 3. Students Paste Triangle Shapes to the LAS**

**Gambar 4. Students measure angles**

In measuring the angle of a triangle whose angle point is at the top, the student is confused as seen in the following dialog

*Students: Buk, the line adjusted in the bow can be to both of them buk?*

*Teacher: Yeah, well, pick one of the students. (while showing the process of measuring the angle of a triangle whose point of departure is at the top)*

*Teacher: Well, yes, right. The point on the bow must be adjusted yes*

*Students: Yeah, well.*

Based on the dialogue, the student is still confused about the one side of the triangel that will be aligned with the line on the arc and the group asks for instructions from the teacher. It shows that students construct knowledge in knowing to measure the angle that is at the top of the triangle. It is one of the characteristics of RME is to construct the knowledge and the teacher guides students by giving reinforcement to the answers and opinions of students (Kamsurya & Masnia, 2021).

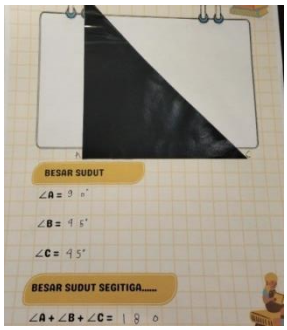



**Figure 5. Group Response 6 Activity 1**

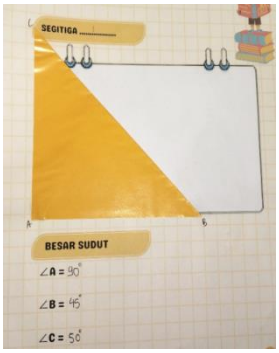



**Figure 6. Group Response 2 Activity 1**

In the process of solving the problem of measuring the angle of the first triangle there is a difference of answer between group 6 and group 2, as shown in Figure 5 and Figure 6. In the measurement of A, the student was able to use the degree bow correctly so that he obtained A=90°. Next measurements at C (group 6) and B (groupe 2), there was a difference in the measuring result of ≥ C (groups 6)= 90° and ≥ B= 50° (groupa 2). This is because the student did not accurately place the center point on the degree arc against the angle point to be chosen, so the measured result is inaccurate

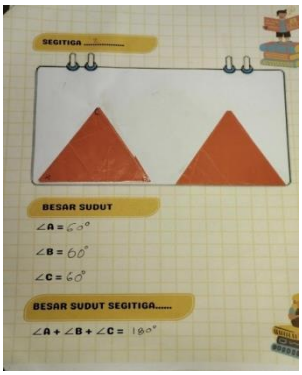



**Figure 7. Response Group 1 Activity 1**

Further, the process of solving problems in measuring the second triangle angle by the group 1. As shown in the Figure 7 it is seen that the student has been biased to measure the angle correctly based on the experience gained on the measurement of the first triangular angle. In the measurement process the student gets the result A=60°, B=60° and C =60°.


**Figure 8. Group Response 4 Activity 1**


**Figure 9. Group Response 1 Activity 1**

In the process of solving the problem of measuring the third triangle angle there is also a difference of answer between group 4 and group 2, as shown in Figure 8 and Figure 9. In the measurement of A, the student was able to use the arc of degree correctly so that he obtained A= 45°. Next measurements on B (group 4) and B (groupe 1), there was a difference in the results of the measuring: C (groupa 4) = 45° and †B = 44°. Then in C the student obtains the same result of measuring c = 90°. As for the difference in measuring results found at the angle b due to the student's lack of care in viewing the large angle shown at the time of the process.

After obtaining the measurements of each angle on the triangle. At the activity 1 students are then asked to summarize the angle measurement results on the triangle obtained. The objective of this activity is that students can discover the great summits that exist on a triangle. By summarizing the measurements of A, B, C on each triangle formed from origami paper.

**Figure 10. Students Perform Measurements**


**Figure 11. Group Answers 1 Problem 1**


**Figure 12. Group Answer 1 Problem 2**


**Figure 13. Answer Group 2 Problem 3**

In this activity, students are asked in groups to summarize previously obtained triangle angle measurements on the provided activity sheet. This activity is unobstructed, each group discusses well in performing triangle angle aggregation to know the larger angle in a triangel. On the figure 10, it is seen that the angle measurement of the first triangle, which is A = 90°, B = 45°, and C = 45°, is obtained. Then from the result, the student is asked to sum up the angle measurements of A + B + C = 45 ° + 45° + 90° = 180°. Then the same thing is done by the student to the second triangel. The result of the measured is that a = 45, b = 45, c = 90 °. So A + B + C = 45 + 45 + 60 ° + 90 ° = 180 °.

And the last student also does the same for the third trigger. Then the teacher gives the student the stimulus to the goal of learning that the student can know that the angle in a triangle is 180°, as in the following dialogue:

*Teacher: Let's take a look at the cumulative results that you get, how many of them are?*

*Teacher: 180 for the first triangle what's the second?*

*Disciple: Three of the three corners of the triangle: because all the triangel we measured was 180, so the size of all the corners is how big?*

*Students: 180 yeah, mis?*

*Teacher : It's right...*

2. Measures the angle to the image provided.

**Figure 14. Students Measure Activity 2**


**Figure 15. Students Measured Activity 2**

At the last activity, students are asked to solve problems with the LAS. This activity aims to enable students to use the degree arc and measure the angle size correctly. Learning with an RME approach directs students to be able to solve problems informally according to their previous experience (Yetri,dkk, 2019). Figure 14 shows that the students in their group are already able to use the degree bow correctly in measuring angles. This is because students use previously acquired experience in measuring angles. In question 1 that is present in activity 2 students obtain the angle measurement result is 55°. Next in question 2 students get the angle measured result is 110°. And in question 3 students gain the angle reduction result is 40°.

## CONCLUSION

Learning with the Realistic Mathematical Education (PMR) approach with the angle measurement material on the triangle using the Student Activity Sheet (LAS) aims to enable students to learn how to use the degree arc as well as measure the angle size correctly and students find large angles on the three. The results of the study show that through such a LAS students are able to use degree arc correctly gradually with the experience gained by students on previous measurements. Further students also discovered that the greatest angle in a triangle is 180°

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