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MATHEMATICAL UNDERSTANDING ABILITY AND SELF-REGULATED LEARNING OF ELEMENTARY SCHOOL STUDENTS USING SNOWBALL THROWING APPROACH

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ABSTRACT (10 PT)

This research was motivated by the problem of the low abilities of elementary students to understand mathematical understanding and self-regulated learning (SRL). The purpose of this study was to examine the mathematical understanding ability and SRL of elementary school students who received learning using the Snowball Throwing approach. The research method is quasi-experimental with the population of all students in private elementary schools in Karawang district. The samples were two classes of Fourth-grade elementary school students in Karawang, totaling 44 students. The first class with 22 students receive the snowball throwing learning approach and the other 22 students receive regular learning. The instruments used in this research were a test of the mathematical understanding ability on the flat shape material, that consist of 5 essay questions and a self-regulated learning scale that consist of 30 statements. The results showed that the enhancement in the mathematical understanding ability of elementary school students who received learning with the snowball throwing approach was better than the regular learning, while for Self-Regulated Learning students who received learning using the snowball throwing approach there was no significant difference with students who received regular learning. In addition, there is no correlation between mathematical understanding abilities and students' self-regulated learning.

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INTRODUCTION

In every mathematics lesson, the teacher's task is to construct students' mathematical understanding so that students can understand mathematical concepts correctly and are able to solve mathematics problems well. Therefore, students' mathematical understanding ability must be trained through a process that is carried out continuously and for a long time and requires patience, both from the teacher and the students. This is in accordance with Piaget's opinion (Ruseffendi, 2006) which states that the ability to understand it goes through a long, gradual and continuous process. The level of mastery of understanding varies greatly in each child, at a certain age period. Understanding between one child and another is different

According to Hendriana and Sumarmo (2014), understanding mathematics in Bloom's taxonomy is that understanding is at the second cognitive level, namely being able to apply formulas in counting or algorithmically. This is a low-level understanding and usually occurs at the concrete or real level of thinking. Meanwhile, Ruseffendi (Hendriana et al, 2017) states that there are 3 kinds of understanding, namely: 1) Translation, Interpretation, and Extrapolation. The purpose of these 3 stages of understanding is a mental activity or process of using the brain that converts an equation into another by using appropriate and precise concepts and applying those concepts to calculations or in diagrams.

Based on the author's observations in the field, elementary school students' mathematical understanding ability is still low. There are still students who have not memorized very simple calculations, especially in the multiplication and division of integers and fractions, students have not been able to apply mathematical formulas or concepts that have been studied before and express situations experienced in everyday life into mathematical problems. In accordance with Abidin's opinion (Hendriana, et al., 2017) that understanding is the ability to explain and communicate something, not just knowing or remembering but repeating what has been learned. During the learning process, students receive ideas and express mathematics problems. In this matter, there is an active interaction among fellow students also teachers, and students, both individually and in groups. Students express their understanding so that mathematics problems can be solved.

In addition to students' mathematical understanding abilities, we must also pay attention to student affective. The affective side is meant by changes in behavior that appear during the learning process. The students' effective to be achieved in increasing their mathematical comprehension skills are self-regulated learning. Self-regulated learning (SRL) is a behavior that is formed in students during the learning process. Students carry out learning activities without coercion, are aware of learning objectives, and are able to solve problems based on appropriate concepts without the help of others. According to Sumarmo (2015), self-regulated learning is very important to have because each individual must have a strong desire from within himself to analyze needs and formulate goals and all aspects related to learning. In line with the 2013 Curriculum (Irwantoro & Suryana, 2015) that self-regulated learning can increase cognitive knowledge and thinking power as well as a critical, thorough, objective, and open attitude and feel happy when learning mathematics. Furthermore, Hargis (Sumarmo, 2017) states that self-regulated learning is the process of designing and monitoring students' self to learn mathematics and carry out various mathematical activities.

Basically, the ability of students to understand mathematics and self-regulated learning cannot be separated from the role of the teacher during the learning process. One of the roles of the teacher is to use a learning approach that is able to build and foster an atmosphere that does not limit student involvement and fosters a conducive learning atmosphere so that elementary students' mathematical understanding and self-regulated learning abilities develop optimally. The learning approach that is relevant in this research is the snowball throwing approach.

A snowball throwing approach is a learning approach related to learning activities that aim to make it easier for students to solve problems in class. A snowball throwing approach is a learning approach that involves students actively in the learning process. This learning approach uses paper that is rolled up in around like a ball and then rotates it to the other groups. The snowball throwing approach combines a communicative approach, integrative and social skills to make it easier for students to understand the material by studying in groups while playing.

Through learning with the snowball throwing approach, it is expected that students' mathematical understanding abilities will increase and students are able to apply mathematical concepts. Students are able to read teaching materials, conclude material and compose

questions, predict and solve them. In addition, students are able to take questions from the problems given to students. Furthermore, the snowball throwing approach can help students remember, explore, identify, select, and organize the information needed during the learning process.

Referring to the above problems, the researcher made an article entitled "Mathematical Understanding Ability and Self Regulated Learning of Elementary School Students Using the Snowball Throwing Approach", with the formulation of the problem:

1. Is the mathematical understanding of elementary students who receive the snowball throwing learning approach better than students who receive regular learning?
2. Is the self-regulated learning of elementary school students who receive the snowball throwing learning approach better than students who receive regular learning?
3. Is there any connection between mathematical understanding and self-regulated learning of elementary school students?
4. How is the implementation of learning with the snowball throwing approach?
5. What are the students' mistakes in completing the mathematical understanding test?

METHOD

The research method is quasi-experimental with a population of all students in private elementary schools in Karawang district, with a sample of two fourth grade elementary school students in Karawang, totaling 22 students as a class that receives the snowball throwing approach and 22 students who receive the regular learning. The instrument used was one set of mathematical understanding ability tests, consisting of 5 questions and one set of a self-regulated learning scale consisting of 30 statements.

The research design was carried out by conducting pretest-posttest in the experimental class and control class with the following design:

0 X 0
---
0 0

Information:

0 : Pretest = Posttest of mathematical understanding ability
X : Learning using snowball throwing approach
\- : Subjects were not random sampling.

Furthermore, the data from the analysis of the students' mathematical understanding ability trials are presented in Table 1.

Table 1. Recapitulation of the Results of the Analysis of the Mathematical Understanding Ability Trial

No.	Validity	Criteria	Reliability	Criteria	DI	Criteria	DP	Criteria	Information
1	0.79	High	0.72	High	0.48	Medium	0.35	Enough	Used
2	0.80	High			0.55	Medium	0.81	Very Good	Used
3	0.89	High			0.65	Medium	0.65	Good	Used
4	0.94	Very High			0.86	Easy	0.86	Very Good	Used
5	0.76	High			0.19	Difficult	0.32	Enough	Used

Information: DI = Difference Index; DP = Difference Power

Examples of Mathematical Understanding Ability Test questions:

1. The circumference of a fish pond in the form of a right triangle is 72 meters, while the sides are up to 18m, and the sides of the base are 24 m.
   a. Determine the known and questionable elements.
   b. What are the hypotenuse and the area of the pond?
2. Given that two squares A and B. The side length of square A is 19cm and square B is 5cm longer than square A.
   a. List the elements that are known and asked for.
   b. What is the total the circumference of the two squares?
   c. Investigate whether the difference between the circumference of squares A and B is 20cm.

Table 2. Examples of Statements In Student's Self-Regulated Learning Scale

No	Statements	SA	A	D	SD
1	I tried to solve the math problems by myself until I finished				
2	I am waiting for a friend's help when I have trouble solving circumference of a flat shape problems				
3	I avoid relearning math lessons even though I don't understand them				
4	I understand that the material of the perimeter and area of squares, rectangles, and triangles needs to be studied again to deal with tests				
5	I chose to study on my own to get good grades on math tests				

Information: SA = Strongly Agree; A = Agree; D = Disagree; SD = Strongly Disagree

A snowball throwing approach is a learning approach related to learning activities while playing, using learning media in the form of paper rolled round like a ball, containing questions. That rolled paper is then thrown alternately to students in other groups. The student who gets the roll of paper works on the problem with his group. Furthermore, students present their group's work to other students.

RESULTS AND DISCUSSION

Results

The pretest, posttest, and N-Gain score data for mathematical understanding abilities were analyzed to determine the achievement and enhancement in mathematical understanding abilities of the class that received the snowball throwing approach and the class that received regular learning, as presented in Table 3.

From the results of data processing pretest and posttest scores, it is known that the average pretest score of students who receive learning with the Snowball Throwing approach is smaller than the pretest scores of students with regular learning, while the posttest scores of students who receive learning with snowball throwing are greater than the posttest scores of students, who receive regular learning. This shows that there is an enhancement in the scores of students in the class who receive learning with snowball throwing, as evidenced by the N-Gain value of students of 0.47 compared to the N-Gain of students with regular learning of 0.38, although both enhancements are in the moderate category. To determine the significance of differences in achievement and improvement in students' mathematical understanding abilities, the test result data was then tested statistically, the results of which are presented in Table 4.

Table 3. Descriptive Statistics of Mathematical Understanding Ability (MUA) Test and Self-Regulated Learning (SRL) Results

		Snowball Throwing (ST) Approach			Regular (REG) Learning		
Variables	**Stat**	**Pretest**	**Posttest**	**N-Gain**	**Pretest**	**Posttest**	**N-Gain**
MUA SMI = 56	Mean	12.36	29.09	0.47	14.59	25.59	0.38
	%	26.88	63.28		31.72	55.63	
	s	5.47	12.02		7.13	11.83	
SRL SMI = 120	Mean		89.09			91.68	
	%		72.24			76.40	
	s		8.67			7.72	

Table 4. T-Test Results Data Score of Mathematical Understanding Ability (MUA) Test and Self-Regulated Learning (SRL)

Variables	**Teaching Approach**	**Mean**	**SD**	**N**	**Sig. (1-tailed)**	**Interpretation**
Posttest MUA	ST	29.09	12.02	22	0.102>0.05	There is no difference
	REG	25.59	11.83			
N-Gain MUA	ST	0.47	-		0.00<0.05	ST better than REG
	REG	0.38	-			
SRL	ST	89.09	8.67		0.218>0.05	There is no difference
	REG	91.68	7.72			

Based on Table 4, it can be seen that there is no difference in the achievement of mathematical understanding and self-regulated learning abilities between students who receive the snowball throwing learning approach and students who receive regular learning. However, the enhancement in the mathematical understanding ability of students who receive learning with the snowball throwing approach is better than the enhancement in the mathematical understanding ability of students who receive regular learning. The following shows statistical data for the association between students' mathematical understanding abilities and self-regulated learning in Table 5.

Table 5. Association Table of Mathematical Understanding Ability and Self-Regulated Learning

Understanding	**SRL**		**Total**
	High	**Moderate**	
High	4	3	7
Moderate	3	3	6
Low	4	5	9
Total	11	11	22

Furthermore, the data were tested statistically by using the Pearson-Chi Square test to see whether or not there was a relationship (association) between students' mathematical understanding abilities and self-regulated learning. The following are the results of the statistical test in Table 6.

Table 6. Pearson-Chi Square Contingency Test of Mathematical Understanding Ability and Self-Regulated Learning

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	0.254[a]	2	0.881

The results of statistical tests show that there is no connection between students' mathematical understanding abilities and self-regulated learning. This means that if the ability to understand mathematics is good, not necessarily self-regulated learning is also good. Likewise, students who have good self-regulated learning have not yet determined that their mathematical understanding ability is also good.

Learning activities in the snowball throwing approach succeeded in improving students' mathematical understanding and self-regulated learning abilities.

Figure 1. Activities for introducing materials, working on worksheets, and when throwing paper balls

In Figure 1, it can be seen that the teacher takes students outside the classroom to introduce the material. Students are very enthusiastic and can understand the definition and the meaning of a flat shape circumference. At the time of working, their group was full of enthusiasm in working on the questions on the Student Work Sheets. Students do not appear to be bored during the learning process. Especially when throwing rolls of paper in the shape of a ball at the students in the other groups with joy.

Figure 2. Student activities working on questions from other groups, students working together with their groups, and during presentations in front of the class

In Figure 2, it can be seen that students who have received paper balls are working on the questions in their groups. The teacher appoints a group to confidently present their work in front of the class.

Discussions

Based on the results of student observations, it shows that learning with the snowball throwing approach can provide progress in learning mathematics for students in developing understanding abilities. This can be seen in the learning process that students are actively involved in working together in groups and feel happy learning mathematics so that students' understanding skills are more focused and experience good development. Student self-regulated learning during the learning process through the snowball throwing approach is relatively good.

This means that students learn mathematics enthusiastically, students try to do the questions correctly, students communicate mathematically in their own way so that it is easy to understand the meaning of the question statement and learn without being forced to start being embedded in students.

In learning mathematics using this snowball throwing approach that related to self-regulated learning, students' error in solving mathematical understanding problems are applying variations of mathematical formulas in the problems and performing calculations related to the area and perimeter of the triangle in the story problem. Their mistakes are described as follows:

1. A fish pond in the shape of a right triangle with sides 18 m and 24 m. If the circumference of the pond is 72 meters, what is the length of the other side? Determine the area of the pond.

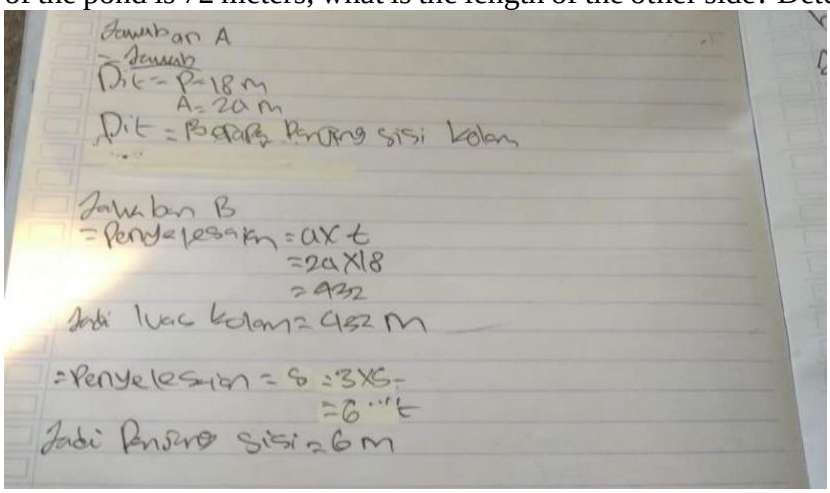

Figure 3. Student's Error on Question Number 1

Based on students' answers in Figure 3, the writing of the concept is incomplete. Errors in writing formulas lead to errors in number counting operations. Basically this student is able to perform multiplication arithmetic operations, only he is not careful in working on problems such as finding the area of a triangle and problem variations in finding unknown sides.

2. Given two squares A and B. The side length of square A is 19cm and square B is 5cm longer than square A. What is the total of the two squares? Investigate whether the difference between the circumference of squares A and B is 20cm.

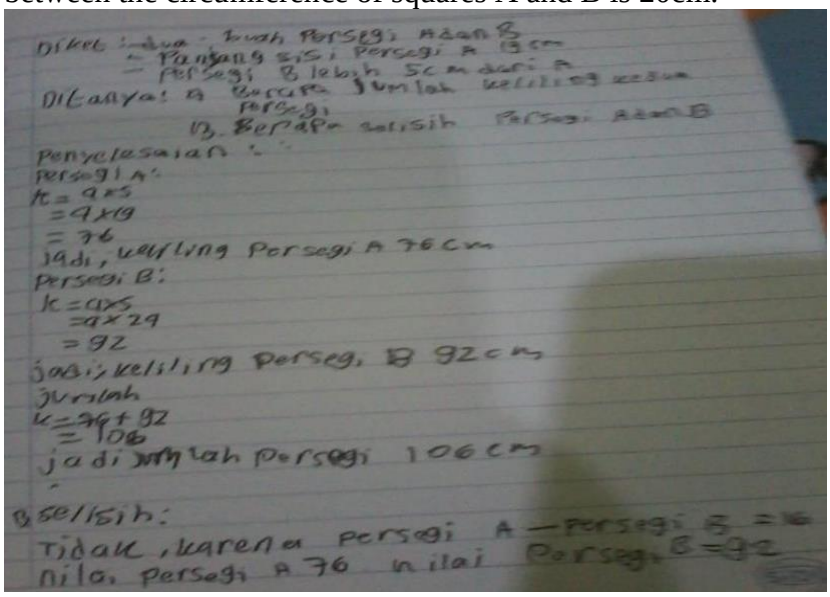

Figure 4. Student's Error in Solving Problem Number 2

Based on Figure 4, the students' answer errors indicated that they were still lacking in applying the concept and could not understand the questions. They still make mistakes in calculating the multiplication.

CONCLUSION

Based on the findings and discussion in this study, conclusions can be drawn:

1. Enhancement of the mathematical understanding ability and the achievement of student learning outcomes whose learning uses the snowball throwing approach is better than students who receive regular learning. The category of improvement and achievement is moderate.
2. Self-Regulated Learning Students whose learning uses the snowball throwing approach and ordinary learning are relatively the same and both are in the high category. The growth of a positive attitude, full of enthusiasm in learning mathematics. This learning model provides a new color in mathematics learning in elementary schools.
3. There is no connection between mathematical understanding abilities and students' self-regulated learning. This means that if the ability to understand mathematics is good, not necessarily self-regulated learning is also good. Likewise, students who have good self-regulated learning have not yet determined that their mathematical understanding ability is also good.
4. Based on the author's observations in the field, mathematics learning activities using the snowball throwing approach are generally very good. From the first meeting to the last meeting students responded positively. They also wish to learn the next material using the snowball throwing approach again.
5. Student errors in their mathematical understanding abilities are found in indicators of calculating the area and circumference of rectangles and multiplication in story problems (Rational Understanding), applying variations in mathematical formulas in problems, and applying concepts or algorithms in problem-solving. Students still make mistakes in simple calculations.

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