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Improving Students' Mathematical Problem-solving Skills with The REACT Model

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Abstract

Mathematical problem-solving ability is a way of thinking that can be used when trying to solve a problem, it is hoped that students can use it to solve problems in everyday life. However, the fact is that the students' mathematical problem-solving abilities are still low. One of the efforts that can improve students' mathematical problem-solving abilities is to use the Relating, Experiencing, Applying, Cooperating, transferring (REACT) mathematics learning model. REACT learning model where the REACT model is a contextual learning approach. The purpose of this study was to improve mathematical problem-solving skills using the REACT model. The research method used in this study is a Quasi-Experimental type Pretest-Posttest Control Group Design. The sample used in this study was 71 students at one high school in Jakarta. The results of this study indicate that the mathematics problem-solving abilities of students with the REACT model are better than the mathematics problem-solving abilities of students with conventional models.

Keywords: REACT Learning Model, Mathematical Problem-solving

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INTRODUCTION

Solving logical mathematical word problems is a complex task that requires numerous operations, including comprehension, reasoning, calculation. Knowledge of previously learned mathematical rules, as well as manipulating the new information given by the components of the problem itself (Molina del Río, Guevara, Hernández González, Hidalgo Aguirre, & Cruz Aguilar, 2019). Bahar and Maker (2015) states that the concept of problem-solving is called by scientists as a high-level thinking process consisting of intellectual abilities and major cognitive processes (Simamora, Saragih, & Hasratuddin, 2018). According to Branca and Chapman in (Pimta, Tayruakham, & Nuangchale, 2009) the goal of teaching mathematics to be effective is that students are able to solve their problems. As a matter of fact, experience in solving subject matter is very important to develop students' thinking skills and help them gain more skills in solving problems in their daily lives.

Students 'mathematical problem-solving abilities can be defined as students' ability to understand problems, plan problem-solving strategies, carry out selected solution strategies, and re-examine problem-solving to further make solutions in other ways or develop problem-solving when students are dealing with mathematical problems (Kuzle, 2013; Hendroanto, et al., 2018; Polya, 1957; Simamora et al., 2018). Although mathematics is a very important subject in formal education and is closely related to human life, mathematics is not an interesting subject for students. According to the results of research conducted by Nidya and Jerizon in Simamora et al. (2018)

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the ability to solve mathematical problems of Indonesian students is still low. In the same line Simamora (2018) reported that the results of interviews with teachers stated that word problems in mathematics were very difficult for students. It was also found that many students did not like mathematics because mathematics was too difficult for these students. In addition, mathematics teacher explained that students have difficulties in doing mathematics problems, logical thinking with numbers, manipulating numbers, logical and sistematical thinking (Gunur, et al., 2018). Teachers still teached mathematics conventionally to students which is teachers tend to be more active than students and rarely applied group discussion in the class. This learning method causes students have less critical and creative thinking when facing a mathematical problems (Huda, 2016). Learning mathematics can be transferred by using contextual approach to become students are more active in the class. Contextual approach modeled REACT can be applied to increase students's problem-solving ability.

REACT Learning Model

REACT learning model is one of learning model that applies contextual learning (Sulistyaningsih & Prihaswati, 2015). The REACT contextual learning model has five important learning components including: (1) relating or learning in linking contexts; (2) experiencing or learning in the context of experiencing; (3) applying or learning in the context of applying; (4) cooperating or learning in the context of cooperation; and (5) transferring or learning in the context of knowledge transfer (Selamet, Sadia, & Suma, 2013). Contextual learning itself is learning that can motivate and relate problems in everyday life. In line with Dewi (in Sastri et al., 2018) that REACT is a learning model that links experiences in daily life for students. REACT learning model is a contextual learning model developed by Michael L. Crawford which states that: Crawford (2001) suggests using contextual learning strategies through REACT: Relating, Experiencing, Applying, Cooperating, and Transferring (Crawford, 2001).

The REACT model shows that the application of the REACT learning model increases in students' mathematical problem-solving abilities. The learning outcomes state that the improvement of mathematical problem-solving abilities with REACT learning models is better than the problem-solving ability with conventional models (Fauziah, 2005; Ritonga, 2017). In the Relating stage, students are expected to be able to identify a problem and provide a simple explanation, where the explanation will encourage students to release their ideas. These ideas can be used to build students' basic skills when students experience. So that students can make good conclusions, students can do it in groups. Experiencing (experiencing) means "learning by doing" or learning through exploration, discovery, and creation. At the stage of Applying or applying is the students using the concepts they get in learning. At the Cooperating stage (working together) is learning in the context of sharing, responding, communicating with other students. Correspondingly argues that cooperation is the ability to complete tasks together. When discussing, students are expected to be able to provide further explanations and manage strategies and tactics in applying the concepts being studied in applying and transferring. While at the stage of Transferring Transferring is the use of knowledge in a new context. Transfering also means connecting what students have learned or what students already know in context (Sastri et al., 2018).

The REACT model focuses on fundamental principles in constructivism (Crawford, 2001) are listed below:

1. Relating: learning in real life contexts
   Learning in the context of human experience, is a type of contextual learning that is typical of children. As children grow older giving meaningful context to learning becomes increasingly difficult. A curriculum that tries to place learning in the context of life experiences must call attention to students on events, and everyday conditions. Then students must connect the daily situation with new information that is absorbed or problems that are solved.
2. Experiencing
   Learning in the context of exploration, discovery and creation, which is the heart of contextual learning. Students will become motivated and feel comfortable thanks to the results of other learning strategies such as activities with text, stories, or videos. Students who do not have prior knowledge relevant to new information are certainly not able to make any connection between new information and prior knowledge.
3. Applying: applying learning by combining knowledge with its use
   Students will be more motivated to understand these concepts if the lecturer provides realistic and relevant exercises.
4. Cooperating: in learning in the context of group interaction
   Learning in the context of billing, response, and communication with other learners is the main learning strategy in contextual teaching. The experience of working together does not only help most students to learn teaching material. During the learning process, of course there are always problems that cannot be solved individually by students. To solve complex problems, especially problems involving realistic situations that cannot be solved individually, students should be able to work together with friends in groups.
5. Transferring
   Transferring is the use of knowledge in new contexts or new situations. The lecturer designs the assignments. To achieve something new and diverse, students' interest, motivation, involvement, and mastery of mathematics can increase. This is where the teacher is expected to be able to introduce new ideas that can arouse the attention and motivation of students and provoke curiosity and emotional.

RESEARCH METHOD

This research is a quantitative methodology with a quasi-experimental design with a pretest-posttest control group (pretest posttest control group design). The study was conducted in one of Jakarta's junior high schools, in first semester of the 2019/2020 Academic Year. The study population was junior high school students in one of jakarta's junior high schools. Samples of this research is 71 students by using probability sampling techniques. These samples are divided into experimental and control class. There are 35 students for experimenral class and 36 students for control class. Data collection techniques in this study used an instrument to test mathematical problem-solving abilities. The data obtained through the test is used to see an increase in the ability of mathematical problem-solving abilities. The data is scores of students' mathematical problem-solving abilitis obtained from the results of the instrument test in the form of descriptions carried out before and after the treatment in the two classes. It aims to find out that the effect of students' mathematical problem-solving abilities is caused by the treatment of the two classes.

Validity test of the problem-solving instrument used product moment correlation coefficient. Reliability test of the instrument used alfa Cronbach formula.

The analysis was carried out by comparing the results of mathematics scores through the pretest and posttest tests of mathematical problem-solving abilities in the control class and the experimental class to determine whether students' mathematical problem-solving abilities were influenced by Relating, Experiencing, Applying, Cooperating and Transferring (REACT) or not. If in testing there is an increase, the researcher wants to find out how much increase in the class given the treatment. Before testing the research hypothesis, the researcher first conducted a prerequisite test. The prerequisite tests that need to be met are the normality test and the homogeneity test.

Gain is the difference between posttest and pretest scores, gain shows an increase in students' understanding or mastery of concepts after learning is carried out by the teacher (Herlanti, 2016). The data that has been obtained were analyzed descriptively to calculate the increase in student problem-solving after learning took place. The aim is to avoid biased conclusions in research. Hake (2002) developed an alternative to explain the gain called normalized gain. Normalized gain analysis is used to determine the resulting gain normalization criteria. The gain is obtained from the said pretest and posttest scores then processed to calculate the normalized average gain.

RESULTS AND DISCUSSION

Calculation of the hypothesis test using the Independent Samples Test output with the SPSS t-test for Equality of Means and the results of the data in the equal variances assumed value of Sig. (2-tailed). It can be seen that the data obtained from the t-test for Equality of Means which can be interpreted so that it is rejected. So, it can be concluded that the Relating, Experiencing, Applying, Cooperating, Transferring (REACT) model of mathematical problem-solving abilities can be seen in the Table 1.

Table 1. Independent Samples Test

		t-test for Equality of Means					
		df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
n-gain gabungan	Equal variances assumed	69	.000	.24336	.04784	.14793	.33879
	Equal variances not assumed	68.804	.000	.24336	.04778	.14804	.33868

After it is known that there is an increase in the use of the Relating, Experiencing, Applying, Cooperating, Transferring (REACT) model on students' mathematical problem-solving abilities, further calculations are needed to find out how much improvement in this learning. This calculation uses the n-gain calculation. The results

of the calculation of the N-Gain test of each class were tested again with the normality test using SPSS obtained t test results as follows:

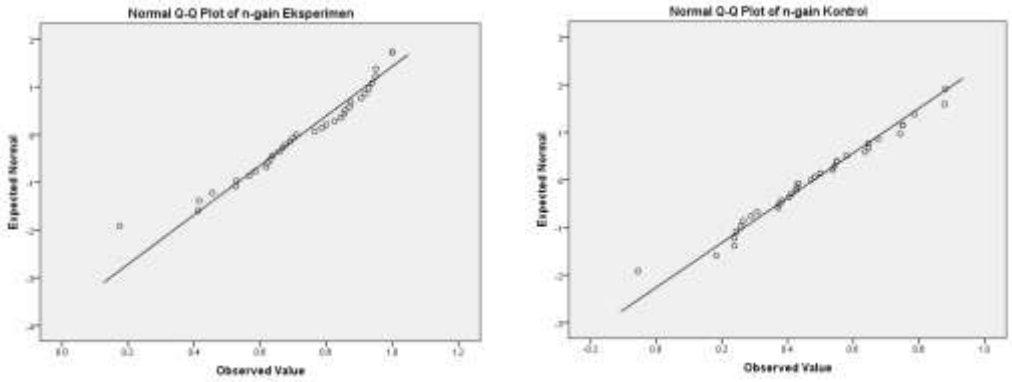

Figure 1. Normality Test Results

An independent sample test was conducted to evaluate the hypothesis that students' mathematical problem-solving abilities were still low. The results of calculations using SPSS obtained a significant test, but the results are contrary to the research hypothesis. experimental class students on average mathematical problem-solving ability is higher than the control class mathematical problem-solving ability of students. The confidence interval for the average difference is quite wide, ranging from to. The eta squared index indicates that 17% of the variance of the speech variable is taken into account the mathematical problem-solving ability of the experimental class students with the mathematical problem-solving ability of the control class students. Figure 2 shows the results of the independent sample t test for both classes.

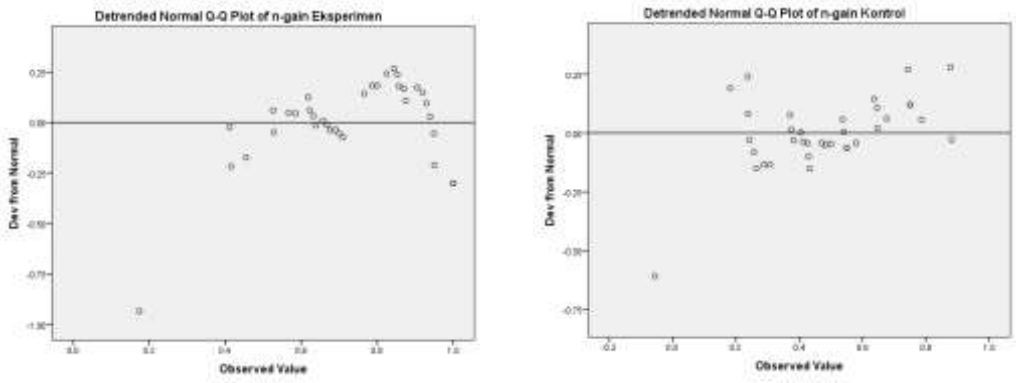

Figure 2. Independent Test Results Sample t-Test

The results of the hypothesis testing in the t-test above can be concluded that there is an increase in the learning model of Relating, Experiencing, Applying, Cooperating, Transferring (REACT) on students' mathematical problem-solving abilities.

Improving mathematics learning with the Relating, Experiencing, Applying, Cooperating, Transferring (REACT) model can be seen in the Figure 3.

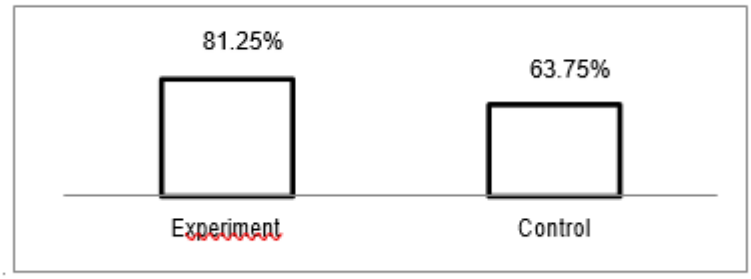

Figure 3. Improvement of mathematics learning using REACT

Based on this Figure 3, it can be seen that the average score of the experimental class mathematical problem-solving ability is higher than the control class.

CONCLUSION

The results of the n-gain calculation show that there is an increase of students'problem-solving ability by using REACT learning model. Relating, Experiencing, Applying, Cooperating, Transferring (REACT) learning models can help students understand integer learning material. This is because in learning activities students are no longer passive listening to teacher explanations, but students can further explore their ability to understand integer learning material through the Relating, Experiencing, Applying, Cooperating, Transferring (REACT) model.

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