E – 59

Effectiveness Of React Strategy For Improve Of Problem Solving Ability On Mathematics In Junior High School

Sari Herlina
Mathematic Education
Islamic University of Riau
Email: sariherlina99@gmail.com

ABSTRACT

The research was moticated by difficullty of students to solve mathematical problem. Based on observation result show that students be familiar only get information from their teacher and the teacher often given problems wide of daily problem. Finally, students unable to developed their contemplative faculties and students be familiar to learned with remember of concept but unable to using it, so that their unable to solve mathematical problem in their life.

The objective of this research is to improve of problem solving ability on mathematics with the kind of the research quasi-experiment using design control group non-equivalent. The populations in this research was the entire student in junior high school in Pekanbaru, and the extraction of sampling in this research with purposive sampling technique. The sampel is student on grade IX in Junior High School. In this research compared two group, namely learning by *REACT* Strategy for experiment group and the convensional learning for control group. Each group consisted of 39 students are divided into three categories of mathematical ability of student to different students capable of high, medium, and low. Instrument used in the form of test and non-test.

The result obtained are (1) improvement of problem solving ability mathematics to obtain learning with *REACT* strategy better than students who received conventional learning; (2) there is a difference improvement problem solving ability between students who obtain by *REACT* strategy with students who obtain with convensional learning and categories of mathematical abilities of student; (3) Effectiveness of strategy REACT using Effect Size is 0,75 including medium category.

Keyword :REACT Strategy, Problem Solving Ability, Effectiveness

Introduction

Mathematics is a science that underlies the development of modern technology and has an important role in developing a variety of disciplines and human intellect. In general, there is none of the disciplines apart of the development of mathematics, at least a low level of mathematical calculations such as multiplication, division, summation, and reduction. Mathematics equips students to have the ability to think logically, analytical, systematic, critical and the ability to work together. Therefore, mathematics lessons should be given to all students for each level of education (Depdiknas, 2006).

Mathematics learning in elementary school to high school in the Education Unit Level Curriculum (KTSP) in 2006 aims to enable students to have a set of competencies that must be demonstrated in the results of their study in mathematics (competency standards). Competency standards in 2006 curriculum stated that problem solving is the focus of mathematics learning which include closed problem with single solution, opened problem with non-single solution, and resolution of problems in various ways. To enhance the problem solving skills, it is necessary to develope the skill of problem

understanding, create a mathematical model, solve the problems, and interpret the solution in mathematics.

The purpose of curriculum learning above based on the National Council of Teachers of Mathematics (NCTM) in 2000 in a book entitled 'Principles and Standards for School Mathematics' states that problem solving (problem solving), reasoning and proof (reasoning and proof), mathematical communication (communication), the mathematical relationship (connection), and representation (representation) is a standard process of mathematics learning. According to the NCTM standards, both material and process standards are the basic skills and understanding required by the students. Content and process standards in the curriculum emphasizes the importance of problem solving skills in mathematics learning for students.

To achieve these objectives the learning process needs to be effective and efficient. The effective and efficient learning process is a process that is appropriate and in accordance with the conditions of the class. In the learning process should contain a series of activities between teacher and students on the basis of reciprocity which lasts educatively. Interaction or reciprocal relationship between teacher and students in the learning process is the primary way for the continuity of the learning process. The changes of student behavior can be seen at the end of the learning process that leads to the student learning outcomes and high-low or wheter the learning process is effective (Sudjana, 2005).

Mathematical problem solving skills need to be developed because it can help people to solve problems, to anticipate the development of science and daily life problems. It is as stated by Ruseffendi (2006) that the problem-solving abilities are essential for the students who involves not one field of study but involves other lessons beyond the school lessons, stimulating students to use all their capabilities. It is important for students in the face of life now and later.

A survey organization (TIMSS) assesses the skills of fourth grade students of elementary school and eighth grade students of junior high school for math and science. TIMSS classifies four levels of students in the survey conducted, namely: low, medium, high and advanced. The results of the survey report Trends in International Mathematics and Science Study (TIMSS) in 2007, published December 9, 2008 for eighth grade students in math, Indonesian students are in 36th position with an average value of 397. Based on the results, there are only 48% of Indonesian students who reached the low level, 19% of the students achieving levels of moderate and 4% of the students reached high levels, while the advanced level is statistically negligible (Muchlish, 2009: 30).

In addition to the TIMSS survey institution, survey organization *Programme for International Student Assessment (PISA)* assesses the ability of reading, math, and science field. PISA survey organization does not only measure the student ability in solving mathematical problems or operating technique. The survey assesses the students' skills in problem solving, which includes identifying and analyzing problems, formulating reasons and communicating their ideas to others. The results of the PISA survey report in 2006, Indonesia was at 52nd rank of 57 participating countries in mathematics.

The low of mathematical problem solving ability is also a reality in this society. The result of the research conducted by Subagiyana (2009) regarding the students' mathematical problem solving, the results obtained from the research is the experimental group mean of 9.25 (39.38%). This result is still relatively lower than the

ideal score of 24 and the mean 8.25 of the control group (28.95%). This is because students are not accustomed to working on non-routine matters, so that students are not trained and ill-prepared to face the problems of non-routine descriptions and have difficulty in finishing them. It is also because previously students are often given multiple choice questions on exam.

The results obtained from the research and the institution showed the weakness of students' mathematical problem solving ability. The low of students' ability was caused by several factors related to the learning of mathematics. The termed learning as Teaching and Learning Activities (KBM) is a concrete measures of student learning activities in order to acquire, actualize or enhance the desired competencies (Muslich 2011: 71).

The material presentation model in learning mathematics is one of interesting factor to be examined and researched, as it turns out in the field in general the presentation of the material is still mostly in the form of providing information, a little question and answer, students' brain are forced to recall and hoard information without being required to understand the information given, the teachers often give math assignments questions with contexts that are far from the reality of everyday life (routine questions), so it less provides the opportunity for the students to develop the power of their thought. Consequently, the students are only proficient to memorize formulas but wrong in applying it, the students are also not able to communicate their ideas to the others and are not able to solve the problems in their life independently. Thus, improvement and variation are needed in learning activities in the classroom.

Overcoming the gap between expectations and reality as pointed out above, it is needed appropriate strategies, models, approaches or methods to train students' mathematical problem solving abilities, and engage the students actively in learning. The effective learning model in mathematics such as: having relevance value to the power of mathematical achievement and providing an opportunity for the rise of the teacher creativity. Then, it has the potential to develop independent learning atmosphere as well as to attract the attention and interest of the students. It could be achieved through a form of alternative learning model which is designed in such a way the students actively reflect their visibility through *REACT strategy (Relating, Experiencing, Applying, Cooperating, and Transferring).* This strategy is a learning strategy and contextual approach.

Hull's and Sounder (Komalasari, 2010) says in a contextual learning, the students discover meaningful relationships between abstract ideas and practical application in the real world context. Students integrate the concepts through discovery, reinforcement, and connectedness. Contextual learning requires team work and increase student performance. Furthermore, Crawford (1999) said that the reference to *relating* is a learning that begins with linking between new concepts that are being studied and the concepts they have learned; *Experiencing* is a learning making the students learn by doing mathematical activities (doing the math) through exploration, search, and discovery; *Applying* is a learning to make students learn to apply the concepts; *Cooperating* is a learning to condition the students to learn together, share, and communicate with each other to respond to his friends; and *Transferring* is learning which encourages the students to learn using the knowledge they have learned in the classroom based on understanding. Learning math like this then we call the learning of mathematics with REACT strategy.

Learning activities considered to provide an opportunity for students to understand, plan, implement solutions, and to re-examine the results of his work, is learning covered by the REACT strategy. It is because in this strategy the students are also given a problem which make them able to connect between a new concept that is being studied and the concepts that have been mastered and also able to communicate them orally and in writing. In addition, through learning together in the groups, the students were given the opportunity to learn to explore, search and discovery of what they have learned and faced, which then the students learn to apply which they have learned to the context of the new situation that has not been studied on the basis of understanding.

In this study, in addition to the learning factor (*REACT strategy and conventional*), there are allegedly other factors that affect or contribute to the improvement of mathematical problem solving ability. The factor is the category of mathematical ability (KKM) the students of high, medium and low. Galton (Ruseffendi, 2006) says that of the group of students who were not selected specifically (any), will always be encountered the students capable of high, medium and low. According to Piaget (Nur, 1998) says that most of the the student's cognitive development is determined by the students' active manipulation and interaction with the environment.

Based on description above, it appears that the ability of solving mathematical problems can help the success of learning mathematics and improve the learning achievement. The learning with *REACT* strategy is a bridge in the mathematics learning process which aims to improve the students' mathematical problem solving ability, in addition to the strategy is also expected to accommodate heterogeneous the students ability.

Research Methods

The research design used in this study is a type of quasi-experimental design with non-equivalent control group (Ruseffendi, 2003: 52). The reason of using this design because the researcher does not select the students for the experimental group and the control group, but the researcher used an existing class. Target population is State Junior high School (SMP Negeri 23) Pekanbaru on odd semester in academic year 2011/2012 which is located on Jalan HR. Subrantas Simpang Baru, Riau Province. The sample selection was done by purposive sampling because of certain considerations (Sugiyono, 2010). The instrument used in this study is a test and non-test instruments. As for a test instrument, it is a description form test which is to measure the students' mathematical problem solving, while the non-test instruments is in the form of observation which is to measure the activity level of teacher and the students during the learning process.

The Results and Discussions

The results of this study were taken based on the factors that were observed and found during the research. These factors include learning the REACT strategy and improving the ability of solving the mathematical problem.

The results of the data analysis showed that the mean scores of the experimental group which was REACT applied in this group and control group was not really

significant. This means that learning mathematical in this study begins from the same situation. Here is the findings of the research.

1. The Comparison of Improvement of Based-Learning Ability in Solving the Mathematical Problem

Based on the results of calculations for normality and homogeneity of variance test it appears that the data were normally distributed and homogeneous. Furthermore, T-Test was used to analyze thedifferences of the gain in mathematical problem solving. The Summary of T-test result are presented in the following table.

Table 1. T-Test the Improvement in Mathematical Problem Solving Ability

Aspect of Ability	group	T-Amount	Asymp. Sig. (2-tailed)	Asymp. Sig. (1-tailed)	H_0
Problem Solving	Experiment	-3,099	0,003	0,0015	Rejected
	control				

The table above shows that the improvement of problem solving ability in mathematical problem who studied with REACT was better than students who learned with the conventional approach. This is the evident from the results of calculations where H0 is rejected.

2. The Comparison of Improvement Problem Solving Ability Base on Mathematical Problem Solving Ability (KKM) and Learning

The results of test calculations for normality with the Shapiro-Wilkshows that the data indicate the improvement in mathematical problem-solving ability for the experimental group (REACT strategy) or control group (conventional approach) is normally distributed and homogeneous.

The results of improvement problem solving ability can be seen in in the following Table 2.

Table 2. Anova-Test One Way Capacityof Improving the Mathematical Problem Solving based on KKM and Learning

	Sum of squares	**Df**	**Mean Square**	**F**	**Sig.**
Between Groups	2,609	5	0,522	18,123	0,000
WithinGroups	2,073	72	0,029		
Total	4,682	77			

Based on the Table 2 above,the data shows that the value of Asymp.Sig. 0,000 when it is compared to the value of $\alpha = 0.05$, it is clear that the value of Sig. is smaller than the value of α. It means that an improvementthe students in problem-solving ability of learning by REACT strategy significantly better than students who learned conventional learning for all levels of students. In addition, it can be concluded that there is one of the groups that the different from others. For further,Scheffe test is used to determine the group in any different level. The results of the calculation are presented in the following table:

Table 3: Scheffe Test Advanced Mathematical Problem Solving Capacity based KKM Students and Learning

KKM *REACT*	KKM Konv	Mean Difference (I-J)	Std. Error	Sig.	H_0
High	High	0,273	0,072	0,021	rejected
	Medium	0,419	0,066	0,000	rejected
	Low	0,573	0,072	0,000	rejected
medium	High	0,029	0,066	0,999	accepted
	Medium	0,176	0,058	0,116	accepted
	Low	0,329	0,066	0,001	rejected
low	High	-0,264	0,072	0,029	rejected
	Medium	-0,117	0,066	0,673	accepted
	Low	0,036	0,072	0,998	accepted

Based on Table 3 above, it shows that the different of KKM both learning (REACT strategy and conventional strategy) The KKM REACT strategy is higher for each sub-group of students in a conventional strategy, KKM students are on the REACT strategy with low student KKM on conventional, it shows that the student who has low KKM in REACT strategy and Conventional Strategy has no differences. So, low on learning for students with REACT strategy compared to the students who studied with conventional learning statistically no difference or H_0 is accepted.

3. The Effectiveness of Learning through REACT Strategy

To get the information about the differences between the experimental group and the control group, especially to determine the effectiveness of REACT strategy compared to conventional learning, effect Size is needed. These statistics technic are used to determine how big strategy in learning mathematics REACT. According to Marzano (2006) formula the used:

$$ES = \frac{rerata_{eksperimen} - rerata_{\ kontrol}}{s_{kontrol}}$$

The results of Effect Size calculations for communication skills using Microsoft excel 2007 are presented in following Table 4:

Table 4.The effectiveness of REACT strategybased on the students' KKM for Mathematical Problem Solving Ability

The category	RataanKelompok		$s_{kontrol}$	ES	Interpretation
	Experiment	Control			
High	9,36	6,45	2,62	1,11	High
Medium	7,55	4,47	1,81	1,70	High
Low	2,73	2,09	1,45	0,44	Medium
∑	6,28	4,36	2,55	0,75	Medium

The Effect Size values obtained for mathematical problem solving ability was 0.75, it means that the effectiveness of REACT strategy is on Medium. For the students who have high KKMand its effect size also high, whereas the low-ability students its

effect size was relatively low . It can be concluded that learning with REACT strategy is effective in improving the mathematical problem solving ability at high and medium ability students, however, the low-ability students' learning is also effective or learning contribute in mathematics.

Based on the results of the research conducted, observation and control by researchers during the implementation of learning, the most widely REACT activities contribute the largest increase in the ability of solving mathematical problems the give the biggest contribution is the activity Relating, Experiencing, Applying, and student activity. In REACT strategies, student activities such as exploration activities, work together in groups to solve the problem the proposed, and transfer the knowledge gained is the activities the can strengthen students' memory. This is in line with the cone of learning experiences, which reads: "if students do activities said and done, the students can Taking 90% of the students say and what they do" (Muslich: 2011).

Conclusion

Based on the research problem and the findings and discussion of the results are as follows:

1. Increase in mathematical problem-solving ability of students who received learning with REACT strategy is significantly better than students who received conventional learning strategy.
2. The increase in mathematical problem-solving ability of students who received learning with REACT strategy at a high level of mathematical ability category better than students who received conventional learning, whereas the category of medium and low mathematical ability, improvement of mathematical problem-solving ability of students the earn no more REACT strategy better than students who received conventional learning.
3. Learning with REACT strategy effective in improving mathematical problem solving skills, particularly in the high-ability students and are based on the results of the calculation with ES.

Bibliography

BSNP.(2006). *Panduan Pengembangan Silabus Kurikulum Tingkat Satuan Pendidikan (KTSP)*.Jakarta : CV. Laksana Mandiri.

Cord. (1999). *Teaching Mathematics Contextually*. Texas: CORD Communications,Inc.

Crawford. (2001). *Teaching Contextually*. Texas: CCI Publishing, Inc.

Komalasari, K. (2010). *Pembelajaran Kontekstual: Konsep dan Aplikasi*. Bandung : Refika Aditama.

Marzano,RJ. (2006). A Theory-Base Meta-Analysis of Research on Instruction.[Online]. Tersedia: http://www.mcrel.org [27 Januari 2007]

Meltzer, D.E (2002). The Relationship between mathemathics Preparation and Conceptual Leaarning Gain in Physics: A Possible “Hidden Va ɜl” in Diagnostics Pretest Scores. In American Journal of Physics.[Online].Vol. 70. Page (12) 1259-1268. Tersedia: http://www.physics.iastate.edu/per/docs/AJP-Des-2002-Vol.70-1259-1268.pdf. [15 Maret 2006]

Muclish, M. (2011).*KTSP Pembelajaran Berbasis Kompetensi dan Kontekstual*.Jakarta : Bumi Aksara.

NCTM.(2000). *Principles and Standards for School Mathematics*. Reston, VA: NCTM.

OECD (2010*), PISA 2009 Results: What Students Know and Can Do: Student Performance in Mathematics and Science (Volume I)*, OECD Publishing. [Online]. Tersedia http://dx.doi.org/10.1787/978964091450-en

Patrick Gonzales. (2009). Highlights from TIMSS 2007 Mathematics and science achievment of U.S. Fourth and Eight-Grade Students in an International Context.[Online].Tersedia http://nces.ed.gov. [26 Februari 2011]

Ruseffendi, E.T. (1993). *Statistik Dasar untuk Penelitian*. Bandung: Depertemen Pendidikan dan Kebudayaan Direktorat Jendral pendidikan Tinggi.

Ruseffendi, E.T. (2003). *Dasar-dasar Penelitian Pendidikan dan Bidang Noneksakta Lainnya.*Semarang: Unnes Press.

Ruseffendi, E.T. (2006). *Pengantar kepada Membantu Guru Mengembangkan Kompetensinya dalam pembelajaran matematika untuk meningkatkan CBSA*.Bandung : Tarsito.

Subagiana.(2009). *Peningkatan Kemampuan Pemahaman dan Komunikasi Matematis Sisiwa SMP Digunakan Model Pembelajaran Kooperatif Tipe Team-Assisted Individualization (TAI) dengan Pendekatan Kontekstual*. Bandung: PPS UPI (Tesis tidak diterbitkan).

Sugiyono. (2010). *Metode Penelitian Pendidikan, Pendekatan Kuantitatif, Kualitatif dan R&D*. Bandung: Alfabeta.