

## Developing Mathematical Problem Solving Skills Of Students Junior High School Through Contextual Learning

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### ABSTRACT

This research involve 3 Junior High School in Pekanbaru that representation of high level, medium level, and low level. Focus of this research are to know about : (1) Raising of student mathematical problem solving skills in experiment group comparison with students in control group; (2) interaction about learning and school levels with mathematics problem solving.

Method of this research is quasi experiment with 2 groups. They are experiment and control group. Experiment group using contextual learning and control group using expository learning. Pretest and posttest are using to get data. Mathematical problem solving skills in this research consist of 3 part. They are ability of assosiation, analyse, and generalize in mathematics. Assosiation as lowest level, analyse as medium level, and generalize as highest level.

Research finding are mean of raising student mathematical problem solving skills in low level is better than student mathematical problem solving skills in medium level. Student mathematical problem solving skills just achieve in assosiation as lowest level. They are interaction between highest school level and medium school level, and then between highest school level and lowest school level with contextual and expository learning about raising of student mathematical problem solving skills. For medium school level and lowest school level did not have interaction.

**Keyword** : Mathematical Problem Solving Skills, Contextual Learning, Expository Learning

### A. BACKGROUND OF THE PROBLEM

There are some indicators that indicates that the quality of education in Indonesia is revealed by Kunandar (2007), namely: (1) graduate from high school or college are not ready to enter the workforce due to lack of their competence, (2) ranking the Human Development Index (HDI) Indonesia is still low (in 2004 ranked 111 of 117 countries and 2005 under Vietnam ranked 110 with a rating of 108), (3) reports the International Educational Achievement (IEA) showed that elementary students' reading abilities Indonesia ranks 38 of 39 countries surveyed, (4) academic quality among nations through the Programme for International Student Assessment (PISA) 2003 showed that of the 41 countries surveyed for mathematics was ranked 39th. The low quality of education in Indonesia is often an obstacle and a big problem especially if the parties are closely related in education little attention to the condition.

The learning process of mathematics is closely related to the development of mathematical ability. In connection with this, the National Council of Teachers of Mathematics (NCTM) revealed that the knowledge, understanding, and other mathematical ability can be developed starting from kindergarten, and is done in a sustainable manner. To develop these competencies, the NCTM content standards have set the academic content that students need to have (numbers and operations, algebra, geometry, measurement, data analysis, and opportunities). Explicitly, the academic content to be described as the ability of the students in learning. In line with this, the NCTM standards have also been set up process that includes problem-solving abilities,

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reasoning and proof, communication, connections, and mathematical representations (NCTM, 2000).

Based on the problem, it is known that one of the developed mathematical ability is the ability of solving the problem. It is known also that the ability of the subjects contained in the destination according to the NCTM mathematics. This suggests that these capabilities need to be developed and owned by the student.

Capabilities are still experiencing problems in its development is the mathematical problem solving skills. Several studies have shown such results. As well as research conducted by Garofalo and Lester (in Wahyudin, 2008) showed that the lack of mathematical knowledge is often not the cause of the problem-solving failures, but rather caused by ineffective in utilizing existing knowledge of students before. In this case, students have mathematical knowledge, it's just not accurate and not skilled in use.

When given a mathematical problem that is not routine, students' difficulties by thinking to solve them using common solutions used when solving routine problems. In fact the problem of different contexts. Students give up and not eager to solve the problem by assuming that the students do not have knowledge about the given problem. In fact, if the student is able to represent the problem becomes simpler, it will help clarify the problem to the expected solution. In addition, students must also be careful in connecting the material being studied by the material or concepts that have been studied previously. So that students can take advantage of the knowledge he had.

Meanwhile, the NCTM (2000) states that solving the problem is the focus of inquiry and applications that must be established entirely on the curriculum in providing context for the application of learning mathematical ideas. Solving problems is not only a goal of learning mathematics but also a way to do something.

Solving problems is an integral part of the overall learning of mathematics and not a separate part of mathematics (NCTM, 2000: 52). Therefore, solving the problem is not an easy ability to have, because to achieve problem solving skills need some other capabilities that support.

Based on the description of the condition, causing a thought to make the learning of mathematics through contextual learning where one of the purposes of this contextual learning is to provide an overview to the students about the usefulness of mathematics. Learning is done also aims to solve the problems of students in mathematical problem solving. Contextual teaching and learning is one of the chosen and expected to minimize the obstacles or problems in learning. Through contextual learning is applied is expected to create a fun learning activities and meaningful, which is expected to enhance the students' mathematical problem solving skills and have a positive attitude towards mathematics.

## **B. MATERIAL AND METHOD**

This research uses quasi-experimental research using experimental designs form design pretest-posttest control group. Research instruments and data collection techniques used were achievement test in the form of a written test pretest and posttest, and authentic assessment.

The research was conducted at three schools in Pekanbaru, Riau with different school levels (high, medium, low). The population of the research was the entire VIII grade junior high school students in Soweto on 2011/2012 academic year. The sample used was the entire VIII grade junior high school students in IX classes were used in

three schools in Pekanbaru. Sampling technique was purposive sampling to select three schools in Pekanbaru which includes the high school level, medium, and low. Of the three schools were selected from each school two classes and then the two classes were selected randomly into the experimental class and the control class.

The selection of these two classes refer to the research design consisted of experimental and control groups.

The research instrument used was a test of mathematical problem solving skills is the ability of the association, analysis, and generalization. Here are the guidelines for scoring the test problem solving ability.

**Table 1**  
**Test scoring guidelines Mathematical problem solving skills**

SCORE	Criteria
0	No answer / not answer the appropriate questions / no correct
1	Select data relevant to a given problem
2	Linking between the idea and the data are known
3	Create a mathematical representation of a given problem
4	Select and apply problem-solving strategies used
5	Solve problems that are not routinely
6	Checking back answers obtained
7	Interpreting the answers obtained
8	Creating a common form simpler than the answer obtained
9	Make conclusion that obtained solving
Ideal Maximum Score = 9	

Here are the results of the analysis of mathematical problem solving skills test.

**Table 2**  
**Recapitulation Analysis of Mathematical problem solving skills Test**

No Test	Validity	Distinguishing Power	Level Of Difficulty	Reliability
1	Enough	Good	Easy	small
2	Less	Bad	middle	
3	Low	Enough	Middle	
4	Enough	Enogh	Difficult	
5	High	Good	Difficult	
6	Less	Bad	Difficult	

Authentic assessment the research of a check list, incidental record, daily journal, homework, student presentations, written tests, group task. The device used is the syllabus of learning, Lesson Plan, Student Worksheet, and teaching materials. Data collection techniques used are technique test and authentic assessment.

### C. RESULT FINDING AND DISCUSSION

Equality test results mean pretest scores showed no differences mean mathematical problem solving skills. The mean final test for the experimental group three school levels, indicating greater results than the control group mean final test. Each group in all three school levels showed an increase in the mean than the mean pre-test mathematical problem solving skills.

**Table 3**  
**Normality Test Post-Test Scores Mathematical problem solving skills**

School level	Group	Kolmogorov-Smirnov			Conclusion	Explanation
		statistics	df	Sig.		
High	Control	0,137	26	0,200	Accepted H <sub>0</sub>	Normal
	Experiment	0,112	26	0,200	Accepted H <sub>0</sub>	Normal
Middle	Control	0,194	29	0,007	Rejected H <sub>0</sub>	Abnormal
	Experimen	0,173	29	0,027	Rejected H <sub>0</sub>	Abnormal
Low	control	0,143	27	0,165	Accepted H <sub>0</sub>	Normal
	Experiment	0,188	27	0,015	Rejected H <sub>0</sub>	Abnormal
overall	Control	0,151	82	0,000	Rejected H <sub>0</sub>	Abnormal
	Experiment	0,091	82	0,089	Accepted H <sub>0</sub>	Normal

**Table 4**  
**Comparison Test of Normality, Homogeneity, and Test Statistics Differences in Mathematical Problem Solving Capacity**

School level	Group	Normality Test	Homogeneity Test	Differences Improved Test Statistics
High	Control	Normal	Homogeneous	<i>t</i> test
	Experiment	Normal		
Middle	Control	Normal	Inhomogeneous	<i>t</i> test
	Experimen	Normal		
Low	Control	Normal	Homogeneous	<i>t</i> test
	Experiment	Normal		
Overall	Control	Abnormal	Homogeneous	<i>Mann Test - Whitney U</i>
	Experiment	Normal		

**Table 5**  
**The mean difference in normalized Gain Test Mathematical problem solving skills**

School level	Group	t <sub>count</sub> or t <sub>count</sub>	Asymp. Sig. (1-tailed)	Conclusion
High	Control	-2,319	0,012	Rejected H <sub>0</sub>
	Experiment			
Middle	control	-0,724*	0,236	Accepted H <sub>0</sub>
	Experiment			
Low	Control	-8,478	0,000	Rejected H <sub>0</sub>
	Experiment			
	Experiment			

Note: \* indicates t-test '

**Table 6**  
**The mean difference in normalized Gain Test Mathematical problem solving skills in Overall**

School Level	Group	Mann-Whitney U	Asymp. Sig. (1-tailed)	Conclusion
Overall	Control	2160,000	0,000	rejected H <sub>0</sub>
	Experiment			

Based on Tables 5 and 6 it is known that the average increase in mathematical problem solving skills through contextual learning better than the average increase in mathematical problem solving skills through expository. Mean difference test results normalized gain at the school level showing the receiving  $H_0$ . In other words, there is no difference in the mean increase in mathematical problem solving skills through contextual learning with a mean improvement of mathematical problem solving skills through expository.

**Table 7**  
**ANOVA Test Results Two Line Interaction Learning and School Level**  
**Upgrades to the Mathematical Problem Solving**

Source of Data	JK	Dk	RJK	F	Sig.	Conclusion
Intercept	27,581	1	27,581	893,030	0,000	
Learning	0,977	1	0,977	31,627	0,000	Rejected $H_0$
School Level	3,121	2	1,560	50,524	0,000	Rejected $H_0$
Learning * school Level	0,465	2	0,232	7,529	0,001	Rejected $H_0$
Errors	4,880	158	0,031			
Total	36,325	164				

Based on Table 7 is known that  $H_0$  is rejected at the level of schools and learning factors and the interaction between learning (expository and contextual) and school level (high, medium, and low). This suggests that learning and school level contributed significantly to the increase in mathematical problem solving skills. The conclusion is the existence of differences in mathematical problem solving capacity building supported by learning factors (contextual learning and expository) and school level (high, medium, and low).

**Table 8**  
**Comparison of Mathematical problem solving skills Difference between**  
**Learning at Every Level Schools**

Learning	School Level	The Mean Difference	F	Sig.	Conclusion
Contextual ><Expository	High><Middle	0,3183	69,251	0,000	Rejected $H_0$
	High><Low	0,2652	42,036	0,000	Rejected $H_0$
	Middle><Low	0,0531	2,385	0,125	Accepted $H_0$

Based on Table 8 is known that the difference in mathematical problem solving skills between high school level and medium school level, and high school level and low school level on contextual learning and expository value (Sig.) which is smaller than  $\alpha = 0.05$ . This suggests that there is interaction between learning and school level (high school level with the medium, and low levels of high school) to increase students' mathematical problem solving skills.

**D. CONCLUSION**

Here are some of the conclusions obtained based on the results of research to develop the ability of contextual learning representations and mathematical problem solving.

1. Increase in mathematical problem-solving ability of students who obtain contextual learning better than students who received expository (at the high school level, low, and overall). At the school level is, the increase in

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mathematical problem-solving ability of students who obtain contextual learning is lower or equal to the increase in mathematical problem-solving ability of students who obtain expository.

2. There is interaction between the high school level and medium-level schools as well as between high and low with learning (contextual learning and expository) to increase students' mathematical problem solving skills. But there is no interaction between the medium and low levels of school by learning to increase mathematical problem solving skills.

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