DEVELOPING SKILLS RESOLUTION MATHEMATICAL PRIMARY SCHOOL STUDENTS

Research Team: Lambertus; Anwar Bey; Mustamin Anggo; Fahinu;
Muhammad Sudia, & Kadir.
Lecturer of Mathematics and Education
Haluoleo University- Indonesia
Email: lambertus_59@yahoo.co.id

Abstract: This study aims to assess the increase in mathematical problem-solving ability between groups of students learning using Realistic Mathematics Approach with a group of students who use the Learning Conventional reviewed based on: (a) the level of student ability, and (b). as a whole. In addition, even this study will assess the activity of students in the learning process, especially the performance and the pattern of responses that the students, in resolving issues or problems that are given to groups of students using realistic mathematical approach. This experimental study involving 4 classes (two groups of students) are treated the group of experiments (using the approach of realistic mathematics learning), and the untreated control group (using conventional learning). The results obtained: (1) Overall, the increase in mathematical problem-solving ability of students learning mathematics realistic approach is better than the students who used the conventional learning; (2) Improvement of mathematical problem-solving ability of students whose learning using realistic mathematical approach is better than the students who used the conventional learning, for high ability students, medium, and low; (3) There are differences in mathematical problem solving abilities increase student learning using realistic mathematical approach for high ability students, medium, and low; (4) Improving the mathematical problem-solving ability of students learning mathematics realistic approach, the students were better ability than students of high ability and low ability; (5) Activity in the learning process using a realistic mathematical approach showed that the students are very active, which is to reach an average percentage of 82.32%. Student activity demonstrated in accomplishing a matter of mathematical problem solving skills to explain that the group of students who are learning to use his mastery of realistic mathematics approach indicator to understand the problem, making a plan of settlement, and to re-examine the steps work and the results obtained, it is very good, but the students' mastery indicators effect the settlement (do the calculations) will be in the category of pretty.

Keywords: Developing, Problem Solving Ability.

INTRODUCTION

Important aspects that contribute to the success of mathematics education is the role of learning in order to develop students' thinking skills. Therefore, efforts to improve the learning process of mathematics, especially on developing thinking skills and mathematical problem solving skills needed to be done early and on an ongoing basis. Because developing thinking skills such as

creative thinking, critical, and problem solving is needed in the study of mathematics, other sciences and technologies, and the development of students.

Mathematics is the basic science that is useful in helping a person to solve a variety of problems both in mathematics itself, other sciences, as well as in everyday life. Thus in mathematics learning, problem-solving skills are essential. This is in accordance with the opinion Soedjadi (1999) that in mathematical problem-solving ability for someone will help the success of the person in everyday life. The importance of problem solving skills are also put forward by Branca (in Krulik and Rays, 1980), namely: (1) the ability of problem solving is a general purpose learning of mathematics, even as the heart of mathematics, (2) solving the problem can include methods, procedures and strategies or ways used is a core process and major in mathematics curriculum, and (3) solving the basic skills in learning mathematics. Based on the above opinion, it can be said in mathematical problem-solving ability is very important to be owned by a student and also one of the factors that determine the outcome of students' mathematics learning.

Problem solving in mathematics is essentially a high-level thought processes. Branca (in Krulik and Rays, 1980) states that problem solving can be viewed as a basic ability, as a process, and as a destination. Furthermore, according Sumarmo (1994) problem solving as the basic capabilities, is the answer to the question is very complex, even more complex than the sense of solving the problem itself.. Problem solving as a process, an activity that is more about the importance of procedure steps, strategies and characteristics that are taken to resolve the problem so that students can find answers to questions and not just the answer itself. Problem solving as a goal, a skill that must be achieved by students. Capabilities include: identifying the elements that are known, asked, as well as the adequacy of the required elements; formulate problems from everyday situations in mathematics; implement strategies to solve similar problems or new problems inside or outside of mathematics; explain or interpret the results as the origin of the problem; construct and solve mathematical models to real problems and use mathematical significantly.

According to Polya (in Hudoyo, 2001) is a problem solving in an effort to find a way out of a difficulty, achieve a goal which is not immediately achievable. From that sense it appears that in solving the problem to a problem, so it takes effort to find a way out. Understanding the way out is an attempt to solve the problem by using a combination of prior knowledge, such as: the use of measures, rules, and concepts. In connection with mathematics as one of the basic science that is more concerned with the process than the end result, meaning that the answers given someone in solving mathematical problems, to note where the answer was obtained, including the correct use of steps, rules and concepts. Dahar (1996) said that problem solving is an activity that apply or incorporate the concepts and rules that have been there before, resulting in a higher level rules. The importance of the use of steps to solve a problem, show that the answer to solving the problem is not easily obtained, but must go through a variety of procedural steps and was able to link the concepts that have been there before.

Develop problem-solving skills in students, is likely to be more attractive when preceded by proposing issues related to everyday life, known and experienced by students. Because by giving the problems familiar to him, the students will be challenged. By using the experience and knowledge he has, he will try to find a solution / way out of the problem. Polya (in Hudoyo, 2001) states that in mathematics there are two problems, namely the problem of finding and trouble to prove. The most important part to solve the problem of finding is: What to look for? How is the data known? And how is the condition? The important part is to solve the problem of proving the hypothesis and conclusion of a theorem to be proved. The activities were classified as problem solving in mathematics include the completion of story problems in textbooks, completion of non-

routine questions or solving problems puzzle, the application of mathematics to problems in the real world, to create and test conjectures. Further Polya suggests a four-step problem-solving, namely: understanding the problem, make a plan or settlement, perform calculations, and to re-examine the calculation results have been obtained previously.

About what criteria should be owned by a student, so that he can be categorized as a good problem solvers, Suydam (in Hamzah, 2003) proposed ten criteria, namely: (1) able to understand the concepts and terminology; (2) was able to examine the relationship, differences and analogies; (3) is able to select the correct procedures and variables; (4) able to understand the concept of inconsistency; (5) were able to make estimates and analysis; (6) were able to visualize the data; (7) able to make generalizations; (8) were able to use a variety of strategies; (9) has a high score and a good relationship with other students; and (10) have low scores on tests of anxiety.

Education Unit Level Curriculum 2006, clearly states that the study of mathematics is necessary to develop thinking skills and mathematical problem solving (Department of Education, 2006). Yet the implementation of learning mathematics in primary schools, the development of thinking skills and problem solving generally received less attention. Most teachers teach mtematika using the usual way (traditional) to focus exclusively on the training and application of the algorithm of mathematical symbols. Learning like this would not support the development of thinking skills mathematical problem-solving ability, and consequently low student math learning outcomes.

Taking into account the demands of the curriculum, the development of mathematical problem solving abilities should be done early, and its implementation should be supported by appropriate learning approaches and enables to develop these skills. In this case study that uses a realistic mathematical approach seems to have the potential to develop students' mathematical problem solving ability.

Learning the use of realistic mathematics approach, starting from working on issues directly in everyday life (realistic mathematics). Through working on mathematical problems known and takes place in real life, students' understanding of math concepts and build them with instinct, instinct, reasoning power, and concepts that are already known. They form their own structures of mathematical knowledge through the help of teachers by discussing the possible alternative answers. Building and understanding mathematical concepts like this that can support the development of mathematical problem-solving abilities of the students.

The formation and understanding of mathematical concepts by working on problems that occur in everyday life will give students several advantages, namely: (1) students can better understand the close connection between mathematics and the circumstances, conditions and events in their environment, because a lot of habits around them which contains elements of mathematics; (2) independence of the students woke up, because skilled students solve problems independently using existing capabilities in him (instinct, reason, and logic). This is where life skills (life skills) that students can develop; (3) students build their understanding of mathematical knowledge independently to cultivate confidence in bermatematika proportional and students are not afraid of math (Armanto, 2001). With the development of these abilities, are expected to contribute to improving the quality of mathematics education, especially in elementary school, which in turn will be the basis of their life in the future hope of the nation as a human being.

His study aims to: (1) Assess the comprehensive upgrading of mathematical problem solving among groups of students who are learning to use the realistic mathematics approach with a group of students who are learning using the conventional learning review is based on: (a) the level of student ability, and (b). as a whole; (2) Review the comprehensive activity of students in the

learning process, especially the performance and the pattern of responses that the students, in resolving issues or problems that are given to groups of students who use the realistic mathematics approach; (3) Review the comprehensive responses students on the use of realistic mathematics approach.

METHODS

This study is an experiment in elementary school, the learning of mathematics subject matter: (1) Measurement of time, angle, distance and keceparan; (2) The area of a simple flat wake. In the experimental group, researchers treated learning by using realistic mathematical approach, which aims to look at the symptoms or the impact on students related to mathematical problem solving ability.

The population in this study were all elementary school students as the city of Kendari, Public and Private Elementary. Selection of elementary students as research subjects based on the following considerations: (1) the level of cognitive development of elementary school students are still at the stage of concrete operations, so that the application of realistic mathematics approach will greatly help students to understand the material given math and desired skills development; (2) based on the results of previous studies, that the implementation of realistic mathematics approach in elementary school a positive impact on student activity, attitudes and student learning outcomes.

Samples were taken from the school's ability. Criteria to determine the level of ranking the schools based on the amount of the value of national final examination, which created the Department of Education Southeast Sulawesi. The proportion of high school rank, medium, and low are as follows: 20% of high rank, was 50%, and 30% lower. Determination of 50% for the school being ranked by reason in order to achieve the opportunity to get students of heterogeneous ability. Based on these proportions, obtained as much as 59 elementary schools middle level (medium). Furthermore, to determine the study sample, randomly selected two primary capabilities were.

Furthermore, to determine differences in mathematical problem-solving ability of students between learning using the conventional learning us of realistic mathematics approach research design as follows:

O X O

O O

Remarks:
X: The implementation of realistic mathematics learning
O: Measurement of mathematical problem solving ability test

In this design, the experimental group was treated with the approach of learning realistic mathematics approach (X), and a control group learning with conventional learning approach, then each group was given a pretest and posttest (O). No special treatment is given to the control group.

RESULTS

Data Analysis Problem Solving Ability

Problem solving ability test given to the experimental group or the control group, each performed twice, before giving treatment (pretest) and after treatment (post-test). Of pretest and posttest scores, then calculated the normalized gain (N-Gain) good problem-solving abilities in the

experimental class and the control class. Average N-Gain normalized obtained from this calculation is the portrait increase mathematical problem-solving ability of students whose learning us of realistic mathematics approach and learning us of conventional learning. Description of the calculation results can be seen in the following table.

Table 1: N-Gain Group for Problem Solving Ability

Group	N	Problem Solving Ability			
		$\overline{X}$	Deviation Std.	Min.	Max.
Experiment	77	0,536	0,206	-0,071	0,921
Control	76	0,246	0,146	-0,024	0,538

In this study also analyzed the ability of students based on prior knowledge of mathematics, namely the student's ability level is high, medium, and low. Description N-gain, standard deviation, maximum and minimum values problem-solving abilities of the three above capabilities can be seen in the following table.

Table 2: N-Gain Problem Solving Ability Experimental Group and Control Group Based on early mathematics ability

Group	Prior knowledge of mathematics	Problem Solving Ability			
		$\overline{X}$	Dev. Std.	Min.	Max.
Experiment	High	0,747	0,223	-0,071	0,921
	Moderate	0,550	0,141	0,111	0,800
	Law	0,356	0,097	0,212	0,551
Control (76)	High	0,430	0,070	0,308	0,538
	Moderate	0,203	0,116	-0,024	0,525
	Law	0,149	0,090	0,039	0,367

Data Analysis Problem Solving Ability Based Learning

Prior to hypothesis testing is done, first tested the prerequisites, namely: test for normality and homogeneity of variance of the two groups of samples. From the results obtained by analysis of the Kolmogorov-Smirnov Z values for experimental and control groups respectively 0.542 and 0.929 with an asymptotic significance value respectively 0.931 and 0.354. Asymptotic significance value is greater than the significance level of 0.05, so it can be concluded that the two data sets

come from populations that are normally distributed. Furthermore, the value of Levene's test of statistical significance 0.004 significance value is less than the significance level of 0.05. So it can disimpulka that the variance of the two different data sets. This means that the two sets of data have a variance that is not homogeneous.

Because the variance of the two sets of data are not homogeneous, so to determine the presence or absence of significant differences in the average calculation of the two groups of data with statistical analysis t-test '. Summary results of t-test analysis' two sets of data are presented in the following table.

Table 3: Results of t-test analysis of Problem Solving Ability

Learning Approach	Problem Solving Ability			
	The difference in average N-Gain	t’	Sig. (2-tailed)	H_0
Realistic Mathematics Education with Conventional	0,536 > 0,246	10,048	0,000	Denied

Data Analysis Problem Solving Ability and Knowledge Based Early Learning Math

Data analysis was based learning problem solving skills and ability level of students obtained successively as presented below.

a. Analysis of data on students of high ability. Testing for normality and homogeneity obtained Kolmogorov-Smirnov Z values for the experimental group and a control group of high ability high ability in a row with a value of 1.296 and 0.740 respectively asymptotic significance of 0.070 for the experimental group and 0.740 for the high ability of the control group of high ability. Asymptotic significance value is greater than the significance level of 0.05, so it can be concluded that the two data sets come from populations that are normally distributed. To test the homogeneity of statistical significance value 0.216 Levene test. The significance value is greater than the significance level of 0.05. This means that the two groups of data derived from a homogeneous population bervarian. Furthermore, a summary of the results of the t-test analysis of the two sets of data are presented in the following table.

Table 4: Results of t-Test Analysis Group Experimental High Ability

Learning Approach	Problem Solving Ability			
	The difference in average N-Gain	t	Sig. (2-tailed)	H_0
Realistic Mathematics Education with Conventional	0,747 > 0,430	5,730	0,000	Denied

b. Analysis of data on students' ability to moderate. Testing for normality and homogeneity obtained Kolmogorov-Smirnov Z values for the experimental group and the control group ability was the ability of being successively 0.531 and 0.623 with an asymptotic significance 0.940 respectively for the experimental group and 0,833 being the ability to control the ability of the group was. Asymptotic significance value is greater than the significance level of 0.05, so it can be concluded that the two data sets come from populations that are normally distributed. To test the homogeneity of statistical significance value 0.438 Levene test. The significance value is greater than the significance level of 0.05. This means that the two groups of data derived from a homogeneous population bervarians. Furthermore, a summary of the results of the t-test analysis of the two sets of data are presented in the following table.

Table 5: Results of t-test analysis capability Medium Experiment Group

Learning Approach	Problem Solving Ability			
	The difference in average N-Gain	t	Sig. (2-tailed)	H_0
Realistic Mathematics Education with Conventional	0,55095 > 0,20371	11,948	0,000	Denied

c. The analysis of the low ability students. Testing for normality and homogeneity obtained Kolmogorov-Smirnov Z values for the experimental group and the control group of low ability low ability consecutive 0.624 and 0.596 with an asymptotic significance value of 0.832 respectively for the experimental group and 0.869 for the low ability of the control group of low ability. Asymptotic significance value is greater than the significance level of 0.05, so it can be concluded that the two data sets come from populations that are normally distributed. To test the homogeneity of statistical significance value 0.606 Levene test. The significance value is greater than the significance level of 0.05. This means that the two groups of data derived from a homogeneous population bervarians. Furthermore, a summary of the results of the t-test analysis of the two sets of data are presented in the following table.

Table 6: Results of t-test analysis capability Low Control Group

Learning Approach	Problem Solving Ability			
	The difference in average N-Gain	t	Sig. (2-tailed)	H_0
Realistic Mathematics Education with Conventional	0,356 > 0,149	6,696	0,000	Denied

Analysis of Differences in Knowledge Based Problem Solving Ability Early Math Experiment Group

Analysis of differences in problem solving skills based on prior knowledge of mathematics in question is to see whether the difference in average N-Gain students' prior knowledge groups of

high, medium, and low learning using realistic mathematical approaches are significantly different or not. To see the differences in early mathematics ability of the lines to be used ANOVA and Scheffe test. Before the test is done the difference, first tested the homogeneity of variance obtained by the results of the Levene test the statistical significance of 0.490. The significance value is greater than the significance level of 0.05. This means that all data sets derived from a homogeneous population bervarian.

ANOVA one path to determine differences in levels of student ability in problem solving skills, a summary of the data analysis are presented in the following table.

Table 7: ANOVA One Path Problem Solving Ability Group Experiment Knowledge Based Early Math

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	1.507	2	0.753	32.284	0.000
Withen Groups	1.727	74	0.023		
Total	3.234	76			

DISCUSSION

Based on data analysis, hypothesis testing and the results of research related to mathematical problem-solving ability of students, it is concluded that in general, there are significant differences increase problem solving skills between the groups of students whose learning using realistic mathematical approach (experimental group) with a group of students who use conventional learning (control group). By considering the average value of the two groups of N-Gain can be concluded that the average value of the N-Gain group problem-solving ability of students whose learning using realistic mathematical approach is higher than the average value of the N-Gain group of students who used the conventional learning good as a whole and is based on prior knowledge of high, medium, low.

The conclusions show that the learning using realistic mathematical approach is superior to using conventional learning. It stands to reason, because in realistic mathematics learning approach starts from the filing of the real problems in accordance with the experience and knowledge level of the students, so that students are immediately engaged in meaningful learning. Learning that uses a realistic mathematical approach familiarize students solve problems (problem) by following the steps in solving the problem systematically through the steps of: (1) understanding the problem; (2) develop a strategy or plan of settlement; (3) perform calculations or workmanship; and (4) to re-examine the truth of the way or steps to resolve and answer. The ability of students to create a model of informal hereinafter directed at a formal mathematical model of teacher-contributed to the improvement of problem-solving ability. Moreover, accountability groups, along with individual responsibility on the tasks given, also contributed in improving students' skills in problem solving.

The results of this study also concluded that there are significant differences increase in mathematical problem-solving ability of students whose learning groups using realistic mathematical approach to high ability students, medium, and low. This suggests that learning mathematics realistic approach contributes unequal to all students, but it depends on the work done by the students themselves. Learning with realistic mathematics approach where students embark on contextual issues, trying to decipher the language and symbols that made his own, and then solved the problems, the process is known as horizontal mathematization, which then proceed to the

learning vertical mathematization. With such a process is that each child can use their own way which may be different from others. Where the knowledge of each individual to develop optimally. Even this way will create a learning atmosphere in the classroom is a democratic, free to students actively in the learning process does not feel afraid to make mistakes if they ask or answer questions.

Furthermore, the results of research related to problem-solving abilities even this conclude that the differences in the level of students 'mathematical ability of high, medium, low and significantly influence the improvement of students' mathematical problem solving skills; and learning differences significantly affect the increase in mathematical problem solving ability. This conclusion reinforces the reason that realistic mathematics learning approach is superior in improving students' mathematical problem solving ability than those using conventional learning.

Of the four indicators of problem solving abilities that are arranged in eight items, from the results of student work demonstrate that students experimental group was superior to control group students. This is evident from the results of the students' work on problems related to the indicator to understand the problem, the control group students have difficulty describing about the situation, while the experimental group students have difficulty describing the situation does not matter. The results of student work on a matter relating to the planning indicator problem solving / problem, the control group students had difficulty in making the strategy or how and steps to solve problems, while the experimental group did not experience any difficulties, the experimental group's work actually led to many variations of problem solving. The results of student work on problems related to the resolution of the indicator is based on the completion of the planning is made, the results of the evaluation showed that the experimental group students are superior in resolving this problem, but in working on the experimental group still experiencing difficulties, while the control group generally experience difficulty (not master) on a large number of angles in a triangle. Similarly, the control group students had difficulty determining the base triangle (not in full control of the rules determining the area of a triangle), but there is something quite interesting because the response of the experimental group students on this matter is very varied. The results of student work on problems related to re-examine indicators of work / results, generally two groups (experimental and control) had no trouble, but the results of the evaluation showed the experimental group is superior to the control group.

The advantages of the experimental group students even this is supported by the activities of students in the learning process during the experiment. Observed during the experiments showed that the percentage of students each learning activity tends to increase, until at the end of the meeting in this experiment several student activities related to mathematical problem-solving ability of students such as: actions / activities to manipulate real objects; response / response to contextual issues; attention to his contribution; express opinions / communicate ideas; making models, schemes, graphs; give explanation / answer a question a friend / teacher; ask questions to the teacher / to his friend; problem solving strategy plan; finding algorithm completion of a matter; perform horizontal mathematization; perform vertical mathematization; find formal mathematics; reflection; create linkages / apply mathematical knowledge; to generalize; and work on the problems in general practice increased at each meeting. Until the last meeting of the average activity of the students of these components reached 87.23% are very active.

In addition, the experimental group students even this advantage is supported by the responses (response) given by the students to (1) the learning device: the display and serving student activity sheets, images, tables, issues of student activity sheets, and about- exercises; (2) the implementation of realistic mathematics approach: learning to use everyday problems; draw about

the situation; make the idea of settlement; using simple props; group discussions (expressing opinions, asking questions, and giving feedback); (3) activities related to problem solving: understanding the problem with writing what is known, and what is being asked; about the settlement plan; settle; and re-examine the results obtained jobs; (4) The teacher: teacher performance in the classroom; way teachers give explanations; how the teacher asked; assisting teachers in the group (5) props used in the study, all groups of students of high ability, medium, and low in general say happy. This suggests that the use of realistic mathematics approach to learning received a positive response from the students.

CONCLUSION

1. Overall, the increase in mathematical problem-solving ability of students whose learning using realistic mathematical approach is better than the students who used the conventional learning.
2. Increased mathematical problem-solving ability of students whose learning using realistic mathematical approach is better than the students who used the conventional learning, for high ability students, medium, and low.
3. There is a difference in the increase in mathematical problem-solving ability of students whose learning using realistic mathematical approach for high ability students, medium, and low.
4. Increase in mathematical problem-solving ability of students whose learning using realistic mathematical approach, the students were better ability than students of high ability and low ability.
5. Activities of students in the learning process that uses a realistic mathematical approach showed that the students are very active, that is up to an average percentage of 82.32%. Student activity demonstrated in accomplishing a matter of mathematical problem solving skills to explain that the group of students who are learning using realistic mathematical approach is better than the group of students who used the conventional learning, because the group of students who are learning to use his mastery of realistic mathematics approach indicator to understand the problem, making a plan of settlement, and recheck the steps work and the results obtained, it is very good, but the student's mastery of the indicators effect the settlement (do the calculation) is still lacking.

Recommendation

1. Learning realistic mathematics approach, can improve students' mathematical problem-solving ability, and is suitable for all levels of student ability (high, medium, and low). Therefore realistic mathematics approach should be one of the options approach to learning mathematics in schools, in an effort to improve the quality of mathematics education.
2. Increased mathematical problem-solving ability of students learning to use a mathematical approach to the students' abilities are being realistic, it's better than students of high ability and low ability. Therefore, the learning approach is realistic mathematics approach should be able to continue, because it has great potential to develop students' mathematical problem solving skills, ability to remember students being the greatest in number when compared to the high and low ability students.
3. The teacher, particularly primary school teacher who uses a realistic mathematical approach, the learning tools used should consider the following matters: (1) the context of the selected

students really known or at least can not be imagined by the students; (2) learning path established by considering the thinking skills and student learning experiences; (3) used simple props but it really can help and facilitate student understanding of the material being taught.

4. Things that need to be considered during the implementation of learning (learning that uses realistic mathematics approach) are: (1) the sequence of learning: should involve activities in which students create and describe symbolic models of their informal mathematical activity; (2) student activities, such as; asked, express ideas, answering questions from the teacher or other students, explaining that he made the settlement, the settlement that the students understand the other, to express approval or disapproval, asks presence or absence of alternative solutions, and to reflect. Student activity like this should be maintained and dikembengkan constantly, because it is very supportive of the achievement of learning objectives; (3) the teacher's role: as facilitator, which is characterized by its ability to provide learning experiences that encourage students' reasoning processes through an interactive learning environment.
5. The results of this study, it is generally concluded that the learning using realistic mathematical approach can improve students' mathematical problem solving ability. Therefore, it should be used as a reference for policy makers in an effort to reform the curriculum and improving the quality of mathematics education in primary schools.

REFERENCES

Armanto, Dian. (2001). *Aspects of Changes in Elementary Education Mathematics through Realistic Mathematics Education*, Paper. Not published.

Bernardo, Allan B.I., 2001. *Analogical Problem Construction and Transfer in Mathematical Problem Solving, Educational Psycology*. Vol 21, (2).

Cai, J., Brook, Michael. (2006). Looking Back in Problem Solving: *MathematicsTeaching*.

Dahar, RW. (1996). *Theories of Learning*. Bandung: Erlangga.

Fauzan, Ahmad. 2002. *Applying mathemathics education (RME) in teaching geometry in indonesia primary schools*. Tesis Master, University of Twete,Ducth.

Hake, R.R. 1999. *Analyzing Change/Gain Scores Woodland Hills Dept. of Phyhics*. Indiana University. [online]. Tersedia di :http://www. physics.indiana.edu/-sdi/Analyzingchange-Gain.pdf [Accessed Januari 23. 2013].

Hamzah. (2003). *Improving Mathematical Problem Solving Ability Students of SMP Negeri Bandung Through Filing Problems Approach*. Dissertation UPI Bandung. Not published.

Herman, T. 2006. *Problem Based Learning to Increase High-Level Mathematical Thinking Ability Students Junior High School (SMP)*. Dissertation on the PPS Indonesia University of Education, Bandung: Unpublished.

Hudiono, Bambang. 2008. *Open-ended approach Acculturation Problem Solving in Mathematics Representative Power Development in Secondary School Students*. Journal of Basic Education, Vol. 9, N0. 1, March 2008. [Online]. Available at: http://isjd.pdii.lipi.go.id/admin/jurnal/91082329.pdf. Accessed July 16, 2013.

Hudoyo, H. (2001). *Curriculum Development and Learning Mathematics*. Malang: Malang Teachers' Training College.

Kilpatrick, J. 1987. Problem formulating: where do good problems come from ?. In A. H. schoerfeld (Ed). Cognitive Science and mathematics education, Hillsdale, NJ; Erlaum.

Krulik, S., and Rays, R. E. (1980). *Problem Solving in School Mathematics*. Virginia. NCTM.

Lambertus. 2010. *Increased Ability Creative thinking and problem solving Mathematical Approach for Primary Students Mellui Realistic Mathematics*. UPI Bandung.Not published.

Mardliah, Nurul Early Sholihatul. (2012). *Effect of Metacognitive Strategy Learning Mathematics on Mathematical Problem Solving Ability Achievement of Junior High School Students*. Bandung: Indonesia University of Education.

Ministry of Education. (2006). *Complete Guide Education Unit Level Curriculum 2006*.

Jakarta: Ministry of National Education.

NCTM. 2000. Defining Problem Solving. [Online]. Available at: http://www.learner.org/channel/courses/teachingmath/gradesk_2/session_03/sectio_03_a.html. Accessed on 21July 2013.

Noer, Sri Hastuti. 2007. *Open-Ended Learning to Improve the Ability of Mathematical Problem Solving and Creative Thinking Ability*. PPS Thesis University of Indonesia. Bandung: Not published.

Nugroho, Adhi Prasetya. 2010. *Increased Communication Skills and Problem Solving Math Junior High School Students through Cooperative Learning Model Type Think-Talk-Write (TTW)*. Thesis, State University of Yogyakarta. Available at: http://eprints.uny.ac.id/2119/1/SKRIPSI_nyong.pdf. Accessed on June 24, 2013.

Reynolds, C.R., Livingston, R.B., dan Wilson, V. 2008. *Measurement and Assessment in Education*. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Silver, R. E. 1996. *Research on Teaching Mathematical Problem Solving : Some Underrepresented Themes and Needed Directions*. Dalam Edwar A. Silver (editor).*Teaching and Learning Mathematical Problem Solving : Multiple Research*. Lawrence Earlbaum Associates Publisher. New Jersey.

Soedjadi, R. (1999). Utilization and Environmental Realities in Learning Mathematics. Papers. Not published.

Stoyanova, E. 2000. *Empowering students' problem solving via problem posing: The art of framing "Good" questions*. *Australian-Mathematics-Teacher*.

Sumarmo, U. (1994). An Alternative Teaching to Enhance Problem Solving Ability in Teacher and Student in Bandung municipality. Teachers' Training College Bandung. Research Report: Not published.

Web, N.L. and Coxford, A.F. (Eds, 1993). *Assesment in mathematics classroom.* Virginia: NCTM.