

Development of Authentic Mathematics Assessment in Application of Problem Based Learning Model to Improve Problem Solving Ability and Understanding of Student Mathematics Concept at Namorambe Secondary Private Middle School Junior High

Authentic Assessment Mathematics Problem Based Learning Problem Solving Problems And Concept Understanding

Kartika Sari

Department of Mathematics Education
State University of Medan
Medan, Indonesia

Corresponding email: kartikasar2408@gmail.com

Asmin

Department of Mathematics Education
State University of Medan
Medan, Indonesia

Bornok Sinaga

Department of Mathematics Education
State University of Medan
Medan, Indonesia

Abstract— Development of Authentic Mathematics Assessment in the application of Problem Based Learning Model to Improve Problem Solving Ability and Understanding Student Concept. Thesis. Graduate Program of Medan State University, 2015. The root of the problem in this research is the fact of mastery of mathematical concepts of students is not satisfactory, and the orientation of mathematics learning that happened during this less emphasis on the effort to enable students to construct knowledge, so that students are less understanding of the concept and unable to solve the problem. To overcome these problems, in this study developed a learning device based on problems that can enable students to construct mathematical knowledge. This type of research is a research development with the aim to produce learning tools based on valid and effective problems, along with all the research instruments associated with the application of these devices in learning mathematics on the subject of comparison and scale for students of grade VII P. This research was conducted through two stages, namely the first stage of learning-oriented instructional apparatus based on problems with reference to the Four-D development model, and the second stage tested the learning tool of 34 students of SMP Negeri Namorambe Private High School with four meetings. The design in trial using one group pretest-posttest design. The findings of the research are: learning tools that are produced, in the form of: learning plan, student textbook, teacher manual, student activity sheet, concept comprehension test, and authentic assessment instrument have fulfilled good / valid criteria, the

effectiveness of instructional tools is summarized based on: the percentage of many students who understand the concept of the minimum is 85.29% of the 34 students who take the test, the achievement of the ideal time percentage for each category of student and teacher activity, the average value of the teacher's ability category to manage the learning is 3.54, including the good category, the student and teacher responses to the components and learning activities are positive .

Keyword: *authentic assessment mathematics problem based learning problem solving problems and concept understanding*

I. INTRODUCTION

Science and technology will surely continue to grow, for that if we do not want to miss compared to other countries then the mastery of strong mathematics since early is a solution, because mathematics is a universal science underlying the development of modern technology, has an important role in various disciplines and developing the human mind power. In line with the above opinion, the national research council (NRC, 1989) of the United States has expressed the importance of mathematics in the following statement: Mathematics is the key to opportunity. " Mathematics is the key to opportunities, for a successful

student to learn will open the door of a brilliant career. For the citizens, mathematics will support the right decision-making. For a State, mathematics will prepare its citizens to compete and compete in the field of economics and technology. From the above opinion it can be understood that mathematics integrates with the pattern of human life or mathematics is part of human life, so that math is needed in everyday activities. In the 2006 curriculum (KTSP), it is asserted that the purpose of teaching mathematics lessons in the school outline, that students have the ability to understand mathematical concepts, using reasoning patterns and traits, solve problems, communicate ideas, have an appreciation of the use of mathematics in life by using the concept -the mathematical concept (MoNE, 2006).

By studying the role and objectives of mathematics learning, it is logical that mathematics lessons should be given to all students from basic education to higher education, and it is imperative that knowledge of mathematics should be improved for every individual, especially learners. This is useful to equip students with logical, analytical, systematic, critical, and creative thinking skills, as well as collaborative skills. Such competencies are required to enable students to acquire, manage, and utilize information to survive in an ever-changing, uncertain, and competitive state (MoNE, 2006).

Understanding the concept is one of the skills or mathematical skills that are expected to be achieved in learning mathematics that is by showing understanding of the concepts studied, explaining the interconnection between concepts and applying the concept of algorithms flexibly, accurately, efficiently and appropriately in problem solving (MoNE, 2003). Joyce (2009) states that a student is said to have understood a concept when able to explain a definition in its own words according to its characteristics, essential features, able to make, mention examples and not examples, and be able to describe their thinking or solve the problem. A good understanding of the concept will also influence the power of other students 'math, because if students can not understand other students' mathematical concepts, because if students can not understand the mathematical concept well, then students can not understand the mathematical concept well, it can not analyze the problem, so students can not afford to solve the problem. Meanwhile, conceptual understanding is needed to give birth to new ideas or ideas as well as real work. Learning gained by students in school should be an experience that can be used for the provision of life and to survive. The task of a teacher here is not just a teaching (teaching) but more emphasis on learning (learning) and educate. Learning is not only emphasized on the science alone. The direction of learning should focus on learning, as formulated by UNESCO (Sanjaya 2010), namely: (1) learning to know, which also means learning to learn; (2) learning to do; (3) learning to be; and learning to live together. Experience can contribute to what a person is learning, so that it can solve every problem faced. About one-third of Indonesian students (33.1%) can only work on the problem if

the questions from the contextual question are given explicitly and all the data needed to do the questions is given exactly. Only 0.1% of Indonesian students are able to develop and work on mathematical commodities.

The facts on the ground show that students' mathematical problem solving ability is still low. This is based on the results of research Sugandi (2002) and Wardani (2002), that the classical, math problem solving ability has not reached the level of learning completeness. The low level of mathematical problem solving ability in Indonesia can also be seen from the results of international math competitions such as The Third International Mathematics and Science Study (TIMSS) in 2007. Indonesian grader of fifth grade (class V)

II. METHOD

Science and technology will surely continue to grow, for that if we do not want to miss by other countries then the mastery of the mathematics is a universal science underlying the development of modern technology, has an important role in various disciplines and developing the human mind power. In line with the above opinion, the national research council (NRC, 1989: 1) of the United States has expressed the importance of mathematics in the following statement: Mathematics is the key to opportunity. " Mathematics is the key to chance, for a successful student to learn will open the door of a brilliant career. For the citizens, mathematics will support the right decision-making. For a State, mathematics will prepare its citizens to compete and compete in the field of economics and technology. From the above opinion it can be understood that mathematics integrates with the pattern of human life, so that math is needed in everyday activities. In the 2006 curriculum (KTSP), it is asserted that the purpose of teaching mathematical concepts, using reasoning patterns and traits, solve problems, communicate ideas, have an appreciation of the use of mathematics in life by using the concept -the mathematical concept (MoNE, 2006).

By studying the role and objectives of mathematics learning, it is logical that mathematics lessons should be given to all students from basic education to higher education, and it is imperative that knowledge of mathematics should be improved for every individual, especially learners. This is useful to equip students with logical, analytical, systematic, critical, and creative thinking skills, as well as collaborative skills. Such competencies are required to enable students to acquire, manage, and utilize information to survive in an ever-changing, uncertain, and competitive state (MoNE, 2006).

Understanding the concept of algorithms flexibly, accurately, efficiently and appropriately in problem solving (MoNE, 2003). Joyce (2009) states that a student is said to have understood a concept in its own words according to its characteristics, essential features, able to make, mention and examples their thinking or solve the problem. A good understanding of the concept will also influence the power of other students 'math, because if students can not understand

other students' mathematical concepts, because if students can not understand the mathematical concept well, then students can not understand the mathematical concept well, it can not analyze the problem, so students can not afford to solve the problem. Meanwhile, conceptual understanding is needed to give birth to new ideas or ideas as well as real work. Learning gained by students in school should be an experience that can be used for the provision of life and to survive. The task of a teacher here is not just a teaching (teaching) but more emphasis on learning (learning) and educate. Learning is not only emphasized on the science alone. The direction of learning should focus on learning, as formulated by UNESCO (Sanjaya 2010), namely: (1) learning to learn, which means learning to learn; (2) learning to do; (3) learning to be; and learning to live together. Experience can contribute to what a person is learning, so that it can solve every problem faced. About one-third of Indonesian students (33.1%) can be found on the questions and answers. Only 0.1% of Indonesian students are able to develop and work on mathematical commodities.

The facts on the ground show that students' mathematical problem solving ability is still low. This is based on the results of research Sugandi (2002) and Wardani (2002), that the classical, math problem solving ability has not reached the level of learning completeness. The low level of mathematical problem solving ability in Indonesia can be seen from the results of international math competitions such as The Third International Mathematics and Science Study (TIMSS) in 2007. Indonesian grader of fifth grade (class V)

III. RESULTS

Based on the result of postes understanding of mathematics concept of students on trial I there are 24 students who take the test has a value with the predicate "minimum B-" or equal to 73.53% of 34 students and in trial II there are 29 students who take the test has a value with the predicate " at least B- "or 85.29% of 34 students. This shows an understanding of the mathematical concepts of students using learning tools developed with the orientation of the problem-based learning model has increased from trial I to trial II. These findings are similar to the research conducted by Hasanah (2004) which concludes that the achievement of average score of mathematic understanding ability of students who get problem based learning with representation approach is better than the achievement of average score of students' mathematical understanding ability that get ordinary learning.

The results of Sinaga's research (2007) also concluded that the students' learning outcomes have increased the mastery of the material equation and quadratic function, and the system of linear and quadratic equations in trial I of 68%, in the second trial by 70% and in the trial III of 74%. When viewed from the characteristics of problem-based learning, Nurhadi (2003) states that problem-based learning, involving students in the investigation allows students to interpret real-world phenomena and build understanding of the

phenomenon. The results of this study are reinforced by the findings of Suparlan's (2005) research which concludes that the students' mathematical understanding ability that gets problem based learning in the category is better than the students' mathematical understanding ability which gets the usual learning. It thus shows that problem-based learning has the potential to improve students' understanding of mathematical concepts. When viewed from the student activity, there is an increase in the level of active activity of students where in the first test there is 1 category of observation of active activities of students who have not been on the tolerance limits specified, then in trial II all categories of observation of student's active activity is at the specified tolerance limit. Student activity in the learning process will cause the interaction between teacher and student or fellow students, resulting in a conducive classroom atmosphere, and each student involves his or her ability to the fullest. When related to the activity of students in the process of applying problem-based learning model with Piaget's theory (Suparno, 2001) states that social interaction, in learning activities with friends of one group or outside the group has a major influence in children's thinking. Through this interaction, the child will be able to compare the thoughts and knowledge he has established with the thoughts and knowledge of others. In another section of Jhon Dewey (Trianto, 2009: 91) describes learning by problem is the interaction between the stimulus with the response, is the relationship between the two directions of learning and the environment. The environment provides input to students in the form of help and problems, while the brain's nervous system functions to interpret the aid effectively so that the problem can be investigated, analyzed and searched for its solution well. Given the conditions and processes and learning activities above, is expected to provide opportunities and make students as independent learners. The result of this research is in line with Hasanah (2004) concluded that the activity of group of students who get problem based approach with mathematical representation approach is better than student activity which get ordinary learning. The result of Sofyan's (2008) research indicates that student activity in problem solving and mathematical communication is mostly done by students who follow problem based learning open from conventional learning. Sinaga (2007) concludes that there is an increasing category of student activity during the learning process. Based on the results of the data analysis of the ability of teachers to manage learning in the first test, it is concluded that the ability of teachers to manage learning is in good enough criteria, for the second test the ability of teachers to manage the learning is in good criteria for trial II.

When viewed from the existing learning theory, the results of the above research is reasonable. The problem-based learning model follows what Vygotsky (Arends, 2008: 47) puts emphasis on scaffolding, which provides a large amount of help in the form of questions when there is congestion (stagnation of thinking), then reduces the gradual assistance and provides opportunities for students to take on

the greater responsibility as soon as he can do it. Vygotsky also emphasized the role of the teacher at the stage of giving questions that

IV. CONCLUSIONS

The effectiveness of learning tools developed by using problem-based learning model, concluded based on: (i) understanding of mathematical concepts of students obtained percentage 85.29%, (ii) the level of active activity of students meet the ideal time tolerance criteria set, (iii) the ability of teachers managing learning is on good criteria, (iv) student's response to learning device components and learning activities is positive. Increased ability to comprehend the concept of mathematics of students using learning tools based on the problem on the topic of comparison and scale is from the percentage of achieving the ability of understanding the concept of mathematics in the first test of 73.53% increased to 85.29% in trial II. . Level of active activity of student on trial I, there is 1 active activity of student which not yet fulfill the ideal time tolerance criterion specified, whereas in trial II, all active activity of student have fulfilled ideal time tolerance criterion specified .. Values of teacher ability to manage learning on trial I are on pretty good criteria, and in trial II are on good criteria. Student response to learning by using learning tools based on problem is positive (above 80%).

REFERENCES

- [1] Aiken, L. 1997. *Psychological Testing and Assessment*. Ed.9. USA: Allyn and Bacon
- [2] Akbar, S. 2013. *Learning Device Instrument*. Bandung: PT Remaja Rosdakarya.
- [3] Amir, T. M. 2009. *Innovation of Education Through Problem Based Learning*. Jakarta: Kencana Prenada Media Group.
- [4] Ansari, B. I. 2009. *Mathematical Communication*. Banda Aceh: Pena Foundation.
- [5] Arikunto. 1999. *Fundamentals of Educational Evaluation* (Revised Edition), Bandung, Bumi Aksara
- [6] Arends, R. I. 1997. *Classroom Instruction and Management*. New York, Mc Graw-Hill Companies, Inc.

