Building problem solving skill based on evaluation

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Abstract. The purpose of learning mathematics among others is that students have the ability to solve problems. But in reality these goals can't be achieved well. The purpose of this research is to build students problem solving abilities by optimizing the ability of teachers in the evaluation process of mathematics learning. The method used is qualitative research using open questionnaire and interview. The subjects of the study were mathematics teachers who were gathered in Teacher Discussion Subjects (TDS) Mathematics of Junior High School of West Bangka Regency. The result of the questionnaire shows that 9 of 21 math teachers have a little understanding about mathematics learning objectives (23.81%), teachers have submitted the material according to the curriculum in various ways (57.14%), teachers understand what is meant by math problems (9.52%), and the math teachers have done and achieve the goal of mathematics learning (14.29%). Interview results, in general teachers are not convinced that the purpose of learning mathematics can be achieved because during this evaluation questions developed most according to the example, has not developed innovative problem-based problems so that students are critical, creative and capable of solving problems.

1. Introduction

The implementation of Curriculum 2013 Indonesia is expected to produce a productive human being, creative, innovative, affective done through the strengthening of attitudes, skills and knowledge are integrated. In this case, curriculum development focused on competence and character formation of the students, a blend of knowledge, skills, and attitudes that can be demonstrated to the students as a form of understanding of the concepts learned. Enforcement Curriculum 2013 enables teachers to assess learning outcomes of students in the process of achieving the learning objectives, which reflect the mastery and understanding of what is learned [1]. Therefore, the teacher so did the students need to know the criteria of competence and mastery of the character to be used as a standard assessment of learning outcomes, so that the students could prepare themselves through competence and mastery of a number of specific characters, as a prerequisite to proceed to the mastery level of competence and the next character. It is interesting if it can determine the level of students' understanding of math concepts and problem solving ability of students after the implementation of Curriculum 2013. Looking at the background above, in the learning of mathematics particularly necessary to evaluate the learning process that leads toward mathematics proficiency level objectives.

The problem of this study is the evaluation of mathematics learning with the targets of mathematics learning objectives that have been listed in the curriculum, particularly in relation to the critical attitude, creativity, and problem solving capabilities that can be broken down as follows:

a. teacher's knowledge of mathematics learning objectives in the curriculum,

b. whether it had carried out the teacher in the learning process to achieve the goal of learning mathematics,
c. teacher beliefs about the success of the objectives to be achieved by the learning process is carried out, and,
d. teacher's knowledge of the problem in mathematics.
e. ability of teachers to create questions based problem.

A change of paradigm in the study of mathematics was initiated by the National Council of Teachers of Mathematics in America in 1989 with the development of Curriculum and Evaluation Standards for School Mathematics, where problem solving and reasoning become one of the main objectives in school mathematics learning programs including elementary school [2][3]. Learning paradigm change was later adapted into the curriculum in many countries as well as in Indonesia. One of the goals of school mathematics learning is the ability to solve problems. Therefore, an important focus problem solving in school mathematics curriculum started primary school level to high school. By Polya [4], the solution contains about 4-step problem-solving solutions, namely: (1) an understanding of the problem (See); (2) planning problem solving (Plan); (3) carry out planning problem solving (Do); and (4) Checking back settlement (Check).

Meanwhile, according to Schoenfeld [5] there are 5 steps to solve the problem, namely Reading, Analysis, Exploration, Planning / Implementation, and Verification. Artzt & Armor-Thomas [6] has developed a step-by-step troubleshooting of Schoenfeld, becoming Reading, Understanding, Analysis, Exploration, Planning, Implementation, and Verification.

Mathematics is taught at the primary level and secondary education is school math [7]. According to the Ministerial Regulation No. 22 of 2006 [8] one of the goals of mathematics in secondary education is that the students have the ability to understand a mathematical concept, explain the link between concepts and apply concepts or algorithms, are flexible, accurate, efficient, and precise in solution to problem.

In the learning process Curriculum 2013, the scientific approach has begun to lead to measures to achieve the skills and abilities expected. However, if observed comprehensively raised in textbooks with learning model used it is still not able to achieve, especially math learning goals. NCTM (National Council of Teachers of Mathematics) recommended four (4) principles of mathematics, namely:

a. Mathematics as problem solving
b. Mathematics as reasoning.
c. Mathematics as a communication and
d. Mathematics as a relationship [9]

When compared with other countries, such as Singapore. In 1992, Singapore began to emphasize problem-solving in the curriculum. Focused mathematical problem solving in mathematics learning in which involves skill, ability / skills in applying mathematical concepts in a variety of situations problem, as outlined by the Ministry of Education of Singapore, mathematical problem solving is central to mathematics learning. It involves the acquisition and application of mathematics concepts and skills in a wide range of situation. Including non-routine, open-ended and real-word problems[10].

Solving problems as the main purpose of curriculum development in Singapore relies on five (5) components that are interrelated. Five components, namely the concept, skills, processes, attitudes, and metacognition and problem solving.

The framework shows that the mathematical problem solving is the ultimate goal of learning mathematics. While the five components that circled it, contributing to the ability of mathematical problem solving. The goal of the curriculum is presented in the syllabus document outlining the underlying philosophy and objectives of the curriculum along with the charge syllabus based on grade levels.

In the development of the syllabus, the components of the process has suffered additions that focuses on the process of reasoning, communication and connection, as well as applications and modelling or demonstration in addition to heuristics or strategies (heuristics) and thinking (thinking skills). All the ability of these processes to be implemented in the learning of mathematics.

Applications and modelling capability (application and modelling) played a very important role in developing comprehension and math skills [11]. Mathematical modelling (mathematical modelling) is the process of formulating and developing a mathematical model to represent and solve problems.
Through math modelling, students learn to use a variety of data representations and select and apply appropriate methods and tools to solve problems.

In Singapore, the student's ability to solve problems (problem solving) the main goal in the study of mathematics. In the mathematics curriculum in Singapore now, problem solving ability is the purpose of teaching and learning mathematics[12]. Furthermore his argues that teaching by giving problems provide opportunities for students to build mathematical concepts and develop math skills.

Giving a problem in the study of mathematics, will lead students to use heuristics as to investigate and explore the best pattern to accustom them to think critically[13][14]. To solve the problem, students must observe, connecting, questioning, searching for a reason, and draw conclusions. Success in solving the problem is closely related to a person's level of ability and observations to the thinking of students themselves.

Some strategies to improve students' positive attitudes toward math and emotional intelligence growth, namely:

a. The ability and willingness of teachers to change the educational paradigm.
b. Setting the class in learning.
c. Meaningful learning.
d. Invites students to construct their own cognitive

That is, the teacher's role can be optimized if there is the ability and willingness to make changes.

2. Methods
The method used is a qualitative study using open questionnaire and interview. Subjects were teachers who gathered in Mathematics TDS Junior High School West Bangka. Consisting of 21 teachers of mathematics. Analysis of the data by using qualitative descriptive and percentage.

3. Results and Discussion
A study of 21 math teachers joined in Mathematics TDS Junior High School West Bangka associated with the target achievement of learning objectives from the standpoint of mathematics teachers in the learning process, (the questions done in stages) which includes:

a. Teacher's knowledge of mathematics learning objectives in the curriculum.
   Answer to this problem is only 23.81% of teachers who understand or know of mathematics learning objectives in the curriculum. This means that most teachers do not know the purpose of learning mathematics. When asked further with the next question is:

b. What have been done a teacher in the learning process to achieve the goal of learning of mathematics?
   Answer teachers, either already know the purpose of learning math or not; 57.14% of teachers have submitted material according to curriculum in various ways. What is meant is the teacher already menyampaikan material according to curriculum targets of material A to Z, but almost all teachers do not associate it with the purpose of learning mathematics. Teachers do not think and strive in the learning process of mathematics to develop students' skills in terms of creativity, critical attitude, and problem solving skills. They menyempaikan mathematics material in the curriculum, but not associated with the goal of learning mathematics that must be achieved.
   The next question related to what has been done during the process of learning associated with mathematics learning objectives. Before proceeding with the question, first explain what is the purpose of learning mathematics.

c. Teacher's knowledge of the problem in mathematics.
   Answer teachers, 9.52% understand what is meant by a problem in mathematics. That is, most teachers do not understand what is meant by a problem in mathematics. In this case, the knowledge of the teacher that math problem is the same with ordinary matter or a matter of day-to-day. Though the problems vs. different exercises[15][16]

d. Teacher beliefs about the success of the objectives to be achieved by the learning process done.
   Answers to this question, 14.29% of teachers do not believe that that will achieve the goal of learning mathematics.
Last question;
e. The results of a follow-up interview earlier questions; That in daily also questions given to students tend to be equal or similar to the sample, so that from this last answer just realized that during this new teacher conveying the material as it is in the curriculum, without trying to make students critical, creative and accustomed to solve problem.

Teachers who lack understanding about the purpose of learning math become an obstacle in achieving the goal of learning mathematics. When a math teacher does not understand the purpose of learning mathematics, then in the process of learning is done in the classroom, he was merely conveying the material but do not have a clear objective. Teachers already deliver all material in the curriculum, but in the process of delivery does not relate to the learning objectives of mathematics. Teachers do not think and strive in the learning process of mathematics to develop students' skills in terms of creativity, critical attitude, and problem solving skills. This is reflected in the form of evaluations conducted during the learning process, the form of questions provided in the form of routine matters that have not led to the kind of problem the mathematic. So need to develop forms of problem-based evaluation during the learning process.

4. Conclusion
The results showed that in the study of mathematics during this process, the teacher is less touched expected mathematics learning objectives as stated in the curriculum. In general, teachers do not believe that mathematics learning objectives can be achieved by learning models such done so far.

The questions were developed largely in accordance instance, have not developed an innovative problem so that students critical, creative and capable of solving problems. It is therefore necessary to develop innovative evaluation form based problems, which make students have a critical attitude, creative and have the ability in problem solving.

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