

CHAPTER I

INTRODUCTION

1.1 Background of the Study

Education is a human need because education contains a potential development process, including intelligence, skills, and individual personality according to the community in which he lives. Humans will then use these potentials to deal with the problems that exist in the life they face and the changes that occur due to advances in science and technology.

Law Number 20 of 2003 concerning the National Education System states that national education functions to develop the potential or skills needed in the nation and state-society and shape the character and civilization of a dignified nation in the context of the intellectual life of the nation. National education aims to develop the potential of students to become human beings who are faithful, knowledgeable, capable, creative, independent, and become democratic and responsible citizens. As stated by Trianto (2011: 1), namely:

“Education that is able to support development in the future is education that is able to develop the potential of students, so that those concerned are able to face and solve the problems of life they face. Education must touch the potential conscience and competence potential of students. The concept of education is even more important when a person must be able to apply what is learned in school to face the problems faced in everyday life today and in the future.”

The functions and objectives of education above show clear that education is a tool to develop the resources that exist in students to face the changing times that are getting faster. Good quality education is very much needed so that human resources are qualified and able to face the development of science and technology. The formulation of educational objectives above is also the main reference for learning in all fields of study, including mathematics.

Mathematics is one of the most important subjects in the world of education. Mathematics is also a science that has an important role in developing thinking skills, problem-solving in everyday life, and the advancement of science and technology. Mathematics is one of the subjects given at every level of education, from elementary to tertiary education. Hasratuddin (2015) reveals that mathematics is one of the most important sciences in everyday life and supports the development

of human resources and contains thinking suggestions to develop logical, systematic, objective, critical, and rational thinking tools and is very competent in shaping personality. Someone, so it needs to be learned by everyone and nurtured from an early age.

Seeing the importance of learning mathematics, students must have a good understanding of mathematics. The 2013 curriculum emphasizes that the objectives of learning mathematics must be directed to more comprehensive goals in accordance with the demands of the 2013 curriculum, namely: (1) understanding mathematical concepts, explaining the interrelationships between concepts and applying concepts or algorithms, in a flexible, accurate, efficient, and precise manner, in solution to problem; (2) using reasoning on patterns and traits, performing mathematical manipulations in making generalizations, compiling evidence, or explaining mathematical ideas and statements; (3) solving problems which include the ability to understand problems, design mathematical models, complete models and interpret the solutions obtained; (4) communicating ideas with symbols, tables, diagrams, or other media to clarify the situation or problem; (5) have an attitude of appreciating the usefulness of mathematics in life, namely having curiosity, attention, and interest in learning mathematics, as well as a tenacious and confident attitude in problem solving (Kamarullah, 2017:29).

The thinking ability strongly influences the purpose of learning mathematics described above. Krulik and Rudnick in Mahmuzah (2015:65) classify thinking skills which include, 1) memorizing (recall thinking), 2) basic (basic thinking), 3) critical (critical thinking), 4) creative (creative thinking). Furthermore, King in Mahmuzah (2015:65) groups the four levels of thinking into two thinking skills, namely basic thinking skills and higher-order thinking skills. Basic thinking skills are only limited to routine and mechanical things, such as memorizing and repeating information that has been obtained. Meanwhile, higher-order thinking skills include problem-solving, decision making, critical thinking, and creative thinking skills. That shows that one of the higher-order thinking skills is critical thinking skills.

Critical thinking skills are very important for students to master; as stated in Permendikbud no. 21 of 2016 on the content standards of primary and secondary education, there is one point that is expected that students can demonstrate the skills

of reasoning, processing, and presenting creatively, productively, critically, independently, collaboratively and communicatively.

But in reality, the achievement ability of Indonesian students is relatively low, especially in the critical thinking points of students in the field of mathematics. This is justified by the results of national studies and international studies (such as PISA and TIMSS), namely the achievement of Indonesian students is only ranked 38th out of 42 countries in the world that participated in the Trends in International Mathematics and Science Study (TIMSS) in 2011 and when participating in the 2015 TIMSS which then the achievement of Indonesian students in mathematics was ranked 44 out of 49 countries with a score of 397. Not much different from the results of the 2018 Program for International Student Assessment (PISA) study, which showed that the mathematical ability of Indonesian students was ranked 73 out of 79 countries in the world. It is known that Indonesian students master routine questions, simple computing, and measure knowledge of facts in daily contexts. These results certainly show that Indonesia is very far behind other countries.

Several studies describe why Indonesian students are not proficient in mathematical literacy, as seen from the results of the TIMSS and PISA studies. According to Rizta (2013: 231), the picture that appears in the mathematics learning process so far is that the questions given by the teacher emphasize understanding concepts, while higher thinking processes, including reasoning, are rarely trained. The questions contained in TIMSS and PISA are not only at a low cognitive level (remembering, understanding, and applying) but also at a high level (analyzing, generalizing, synthesizing, assessing, solving non-routine problems). The form of similar questions in TIMSS and PISA is rarely found in learning or exams held by schools or the government, so this is the cause of the low mathematics achievement of Indonesian students at the international level. They are reinforced from the cognitive aspects developed in the final exam questions, which are rarely in application or analysis questions.

In line with this opinion, Nurwantoro (2015: 3) said the questions used in the TIMSS and PISA studies consisted of non-routine problems to measure higher-order thinking skills. In dealing with these questions, students must think critically

and creatively. The results of the TIMSS and PISA studies show that the critical thinking ability of Indonesian students is still relatively low.

To overcome this lag, various efforts have been made by the Indonesian government. One of them is by including questions that emphasize high thinking skills based on TIMSS and PISA into the questions tested in the National Standard School Final Examination (UASBN). So for that, it is also necessary to make efforts from mathematics teachers to determine approaches and learning models in teaching to improve students' critical thinking skills because most teachers pay less attention to learning mathematics to hone critical thinking skills.

The learning model applied by the teacher so far is a learning model that relies on the teacher. Using that's model, students' higher-order thinking skills do not develop properly, and students become inactive in learning. Therefore, it is necessary to have another model to improve students' higher-order thinking skills. One of the learning models used is the Problem Based Learning (PBL) model or problem-based learning. Researchers are interested in developing HOTS-oriented learning through this learning model.

Problem Based Learning (PBL) is one of the innovative learning models that can provide active learning conditions for students, involving students to solve a problem through the stages of the scientific method so that students can learn knowledge related to the problem and at the same time have the skills to solve the problem. The problem-based learning model has learning characteristics, such as learning begins with giving problems. Usually, the problems given have a context with the real world. Active group learning formulates problems and provides solutions. This model encourages researchers to apply in learning mathematics to this model. In this learning, students know theories and formulas or solve problems numerically, but mathematics is very close to the real-world context.

In Problem Based Learning, providing real problems in everyday life so that students can improve their abilities, apply concepts in solving real problems in everyday life, and integrate the HOTS concept. Miri, David, & Uri (2009: 363) propose three learning strategies that can be used to develop HOTS, namely: (a) dealing with interdisciplinary real-world cases; (b) encouraging open-ended class discussions, and (c) fostering short inquiry experiments to be performed in groups.

These three strategies are in line with the PBL syntax, so it can be concluded that the PBL model is more suitable for use in learning to develop students' HOTS abilities than another model.

In implementing the 2013 curriculum in the field, there are still some obstacles to its implementation. One of the schools experiencing these problems is SMP Negeri 3 Medan. From the results of an interview with one of the mathematics teachers at SMP Negeri 3 Medan who teaches in class VII, some of the obstacles expressed include the teacher not being able to make a learning device that is following the demands and recommends in the 2013 curriculum, so that it has not been maximized in generating students' critical and creative thinking skills and increasing students' thinking levels following the demands of the 2013 curriculum, also strengthened in the implementation of the HOTS literacy pretest, which can be categorized as low. This problem was also strengthened based on the results of initial observations made by researchers on 30 students of class VII-A SMP Negeri 3 Medan by giving a diagnostic test of 2 questions and obtaining unsatisfactory results.

That's because students are still in the LOTS (Low Order thinking skills) stage, where they only do the questions/practices given based on the examples/formulas given by the teacher. The concept of higher-order thinking skills or HOTS is a fundamental shift in evaluation reform that aims at promoting thinking skills in learners and taking them away from rote learning (Ramos, Dolipas & Villamor, 2013). Higher levels of students' thinking skills such as analyzing, interpreting, reasoning out, synthesizing, or evaluating the information provided tend to allow them to transfer learning to completely different situations. Various efforts can be made to solve these problems, including developing learning tools that can improve the ability to analyze, evaluate, and create students so that the level of students' HOTS thinking skills increases.

Based on the description of the background above, the researchers are interested in researching with the title "*Development Of Hots Oriented Learning Devices (Higher Order Thinking Skill) Through The Problem-Based Learning Model On Quadrilaterals*".

1.2 Problem Identification

Identification of the problem based on the background of the problem above is as follows:

1. Students' thinking skills are in the LOTS (Low Order thinking skills) stage.
2. Teachers have not been able to create and design learning tools that follow the demands and recommended curriculum 2013 that can improve students' HOTS abilities.

1.3 Scope of Problems

This research needs to be limited because the scope contained has a broad scope. The limitation of the problem in this research is the development of mathematics learning on Quadrilaterals through a Problem Based Learning model in the form of Lesson Plan (RPP), Student Worksheets (LKS), and HOTS test instruments.

1.4 Research Questions

Based on the identification of the problem and its limitations, the formulation of the problem that can be studied in this study are:

1. How is the effectiveness of the HOTS-oriented learning tool through the Problem Based Learning model on Quadrilaterals?
2. How is the validity of the HOTS-oriented learning tools through the Problem Based Learning model on Quadrilaterals?
3. How is the practicality of HOTS-oriented learning tools through the Problem Based Learning model on Quadrilaterals?
4. How do researchers develop and apply HOTS learning through problem-based learning models on Quadrilaterals?

1.5 Study Objectives

The research objectives to be achieved in this study are:

1. To produce and develop HOTS-oriented learning tools through the Problem Based Learning model on Quadrilaterals.

2. To see and describe the validity of HOTS-oriented learning tools developed through the problem-based learning model on Quadrilaterals.
3. To see and describe the practicality of HOTS-oriented learning tools developed through the problem-based learning model on Quadrilaterals
4. To see and describe the effectiveness of HOTS-oriented learning tools developed through the problem-based learning model on Quadrilaterals

1.6 Research Purposes

The results of this study are expected to have the following benefits:

1. For Students
 - Helping students to improve higher-order thinking skills and apply them to solve problems in everyday life.
2. For Teachers
 - Input materials for teachers to apply varied learning strategies to improve higher-order thinking skills with a model of giving concrete problems according to the material being taught.
 - Learning tools developed can assist teachers in the learning process developed, especially in learning mathematics, creating meaning in learning, and increasing student interest in mathematics.
3. For Researchers
 - Applying the knowledge gained from lectures and making innovations in learning regarding effective learning methods to improve students' higher-order thinking skills and the results of developing learning tools are expected to enrich the experience and improve the writer's ability in the field of research.
4. For Other Researchers
 - This research can be used as a reference and contribution of ideas for further research on the Development of Hots Oriented Learning (Higher Order Thinking Skills) Through Problem Based Learning Models.

1.7 Operational Definitions

It is necessary to present several operationally defined terms so that this research becomes focused and there is no misunderstanding of the interpretation of the terms used. The terms used in this study are as follows:

1. Development is a process to produce a product that is described as accurately as possible to get the ideal product.
2. Learning tools are all forms of materials/tools used to assist teachers in carrying out teaching and learning activities in the classroom to achieve predetermined competencies. The learning tools developed in this research are Learning Device Plans (RPP), Student Worksheets (LKPD), and teaching materials.
3. Development of learning tools is a process to obtain good learning tools. The learning tool developed is based on the device development procedure and validated.
4. HOTS (Higher Order Thinking Skill) is thinking higher than simply remembering facts or retelling something heard to others. HOTS requires someone to do something about facts, namely understanding them, inferring them, connecting them with other facts and concepts, categorizing, manipulating, putting facts together in new ways, and applying them in finding new solutions to problems.

The Problem Based Learning (PBL) model is one of the innovative learning models that can provide active learning conditions to students, involving students to solve a problem through the stages of the scientific method so that students can learn knowledge related to the problem and at the same time have problem-solving skills.