

CHAPTER I

INTRODUCTION

1.1 Backgorund

Educational progress is a necessity in the life of society, a nation, and the world. Education is the process of changing the attitudes and behaviors of a person or group of people in an effort to mature humans through teaching and training. The father of Indonesian education, Ki Hajar Dewantara, stated that education is an effort to promote the growth of character, both inner strength and character, and the mind (intellect) of children. According to Anwar (2017), education is a process in order to influence students so that they are able to adapt as best as possible to their environment and thus cause changes in themselves so that they function in social life. Based on this, it can be concluded that education is the process of changing a person's behavior into that of an adult human being who is able to live independently and become a member of society, where a person is taught various things related to the process of self-development. Education cannot be separated from learning problems because learning is the essence of the educational process.

Suardi (2018) states that "learning is assistance provided by educators so that the process of acquiring knowledge can occur, mastering skills and character, and forming the attitude of students". In other words, learning is a process of helping students become someone who is knowledgeable, has good character, and has skills. The learning process is experienced throughout the life of a human being and applies anywhere and anytime.

In the learning process, mathematics is one aspect that is taught to students. Rahmiati (2017) stated that mathematics is one of the subjects that plays an important role in the success of educational programs because mathematics is part of academic education and basic science for other sciences. Mathematics is an exact science that forms the basis of all knowledge studied. Mathematics is one of the most important sciences to be taught to students because mathematics has an important role in human life. Mathematics also continues to develop over time and the changing times so that mathematics is very important to learn.

Seeing the importance of learning mathematics, mathematics is one of the subjects taught at all levels of education, from kindergarten to university. In line with the opinion of Mufidah, L., Effendi, D., & Purwanti, T., 2013) who said that "Mathematics is always taught from the elementary, junior high and high school levels with the aim that students have the ability to think logically, analytically, systematically, critical, and creative". Appendix to the Minister of Education and Culture No. 58 of 2014 states that mathematics subjects aim to enable students to: (1) understand mathematical concepts, (2) solve problems, (3) use mathematical reasoning, (4) communicate problems systematically, and (5) behave and behave accordingly with grades in math. In line with that, NCTM also stated several objectives of learning mathematics in schools, namely to increase: (1) the ability to understand concepts, (2) the ability to solve problems, and (3) students' self-confidence (NCTM, 2000).

Based on the objectives of learning mathematics that have been described, the ability to communicate mathematics is an important goal that must be achieved in learning mathematics. According to the results of research conducted by the National Council Teachers of Mathematics (NCTM, 2000), mathematical communication skills are the ability to deal with problems, both in mathematics and in everyday life, in language or mathematical symbols and create a model of a situation through writing, objects (concrete objects, pictures, graphs), and algebraic methods.

Indicators of mathematical communication skills according to T. Haris Multazam (Sahrul et al., 2020), namely: (1) Drawing, which is an indicator that reflects real objects, pictures, and diagrams in mathematical ideas. (2) Mathematical expression, namely indicators that express everyday life in language or mathematical symbols. (3) Written text, namely indicators that provide answers using their own language, create problems using mathematical models in the form of: spoken, written, concrete, graphic, and algebraic, explain and make questions about previously studied mathematical problems, listen, discuss, and write about mathematical problems, make conjectures, construct arguments, and generalize.

The importance of communication skills in learning mathematics was also stated by Susanti et al. (2018), who stated that "Mathematical communication is

the delivery of mathematical ideas themselves; thus, through communication, it is expected that students understand mathematics, which has an important role in learning mathematics, and to support and understand students to learn actively".

The mathematical communication ability of each individual will affect the process and learning outcomes involved. According to Baroody (Asikin, 2013: 204), there are two important reasons why communication in mathematics needs to be developed among students. First, mathematics as language, meaning that mathematics is not just a tool to aid thinking, a tool for finding patterns, solving problems, or drawing conclusions, but mathematics is also a valuable tool for communicating ideas clearly, precisely, and carefully. Second, mathematics learning is a social activity, meaning that as a social activity in learning mathematics, mathematics is also a vehicle for interaction between students and communication between teachers and students.

From the explanation above, it can be concluded that mathematical communication skills are very important in the learning process. Students are not only required to convey their mathematical ideas verbally but also in writing using diagrams, tables, and symbols. If students are able to communicate ideas clearly and are able to solve various problems, then it is very helpful in the learning process. Students who have good mathematical communication skills will have success in learning mathematics. Conversely, if students do not have good mathematical communication skills, it is very difficult for them to understand material or mathematical concepts, so the goals of learning mathematics that have been set are not successful.

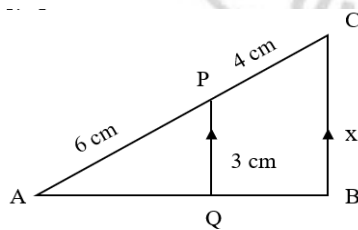
But in fact, students' mathematical ability is still low. This can be proven through the results of the PISA (Program for International Student Assessment) survey. PISA not only provides information on international benchmarks but also on student weaknesses and strengths and the factors that influence them. Based on the results of these test items, Indonesia is ranked 74th, or sixth from the bottom (PISA 2018). The PISA test is a survey that assesses mathematical literacy, where mathematical literacy is defined as students' abilities to analyze, reason, and communicate ideas effectively when they propose, formulate, solve, and interpret solutions to mathematical problems in various situations. Based on the results of

the 2018 PISA test, it can be concluded that students' mathematical communication skills are still relatively low.

This is comparable to the results of a survey conducted by TIMSS (Trends in Mathematics and Science Study), which explained that the learning outcomes of Indonesian students are in 44th place out of 49 countries with an average score of 397. This ranking shows that the learning outcomes of students in mathematics are at the lower category level compared to the international average score of 500. Therefore, it can be concluded that the mathematical communication ability of Indonesian students is low.

Low mathematical communication skills also occur at SMPN 41 Medan. This is supported based on the results of a diagnostic test given by the researcher to measure the level of mathematical communication ability to students with Comparative material in class VII on February 11, 2023. The test consists of 3 description questions which are used to see students' initial mathematical communication skills. Here are some examples of problem solving done by students.

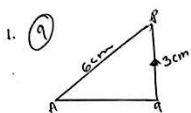
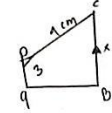

Question : 1. Look at the following picture!



- a. Draw triangles ABC and triangle AQP with each side length.
 - b. Determine the value of x
 - c. Make a conclusion that you get using your own language!
2. A wall clock with an hour hand and minute hand showing 01:35.
 - a. Draw a clock shape that shows the time 01:35
 - b. Find the measure of the angle formed by the hour hand and minute hand when the hand shows 01:35

- c. Make a conclusion that you get from the problem using your own language!

Table 1.1 Diagnostic Test Worksheet

Nu.	Student Answer Sheets	Analysis of Student Answers
1	<p>1. (a)  </p> <p>(b) $x = \frac{6+9}{3}$ $x = \frac{10}{3}$</p> <p>(c)</p>	<p>Based on student answer sheets, it can be seen that students have not been able to draw triangles ABC and AQP and their side lengths correctly. In addition, students also do not know the mathematical symbols contained in the problem given, so students cannot get an x value on the problem given. Students also have not been able to make conclusions using their own language.</p>
2	<p>2. (a) </p> <p>(b) $01.35 = 1 \frac{35}{60}$</p> <p>(c) 30°</p> <p>Setiap jam : 30° derajat $1 \frac{35}{60} \times 30^\circ$ $1 \times 30^\circ + \frac{35}{60} \times 30^\circ$ $30^\circ + 17.5^\circ$ 47.5°</p>	<p>Based on the answer sheet on the side, students are able to reflect real objects in mathematical ideas by drawing a wall clock based on what is asked in the problem. Students can also determine the size of the angle formed on the wall clock correctly, so that it can be seen that they are able to express everyday life in mathematical symbols. However, students have not been able to write conclusions using their own language.</p>

Based on the results of students' work in answering the diagnostic test, it can be analyzed, namely, judging from the data obtained from the 30 students who

took the test, as many as 3 students (10%) had mathematical communication skills with very good qualifications, as many as 3 students (10%) with qualifications well, as many as 6 students (20%) with sufficient qualifications, as many as 15 students (50%) with less qualifications and as many as 3 students (10%) with very poor qualifications. This means that there are still many students belonging to less or low mathematical communication abilities and some are even classified as very low because students cannot describe and model mathematics and make conclusions using their own language. It can be concluded that the mathematical communication skills of class VII students of SMP Negeri 41 Medan are classified as low.

The low ability of students' mathematical communication is caused by several things, one of which is that students have not been directly involved in learning. The learning given by the teacher is expository in nature, where students are given definitions, principles, concepts and examples of questions. This lecture learning method dominates the teacher in the learning process, thus limiting students from acquiring and constructing new information independently.

As stated by Minarni and Husein (2016) in their research that student learning difficulties occur because the expository method (delivery of material verbally from the teacher to students) still dominates learning in the classroom and students are rarely involved in solving math problems. This results in the knowledge that students have is limited to what has been taught by the teacher so that the ability of students to solve the problems they face does not develop optimally.

Another obstacle is the unavailability of teaching materials that can be used to stimulate students to solve problems. The teaching materials used by the school contain summaries of material, sample questions, and practice questions which only train students to memorize formulas and imitate the completion of the examples of questions presented. The teaching materials used do not relate to real contexts in everyday life so that students feel bored and have difficulty solving the given mathematical problems. According to Nurmita (2017), the arrangement of

teaching materials like this certainly does not go through the construction of knowledge because students are faced directly with abstract things. Presentation of this teaching material will only make students easily forget and do not understand mathematical concepts properly.

Based on the problems described above, solutions and innovations are needed in learning mathematics. Teachers should carry out the process of learning mathematics by looking at the factors that influence mathematical communication skills. Mathematics learning activities should be directed so that students are directly involved in learning activities that encourage increased mathematical communication. In addition, teachers must be able to develop teaching materials that are used so that students do not feel bored and bored when learning mathematics. One way is to develop Student Worksheets that can stimulate students to improve their mathematical communication skills by associating real contexts in everyday life.

As expected, the LKPD allows students to achieve learning goals. LKPD acts as a tool to become a bridge between teachers and students. With the LKPD, the learning process is not teacher-centered, and students can work with existing guidelines so that they find something new for them and have a good impression of the material presented. Based on this explanation, it appears that the use of LKPD is very important to be applied in classroom learning.

The development of LKPD certainly requires a learning approach that can be used as a basis or reference in the development process, one of which is the Realistic Mathematics Education. According to some literature, learning using the RME approach can improve students' mathematical problem-solving abilities. One of them is "Development of Learning Materials Based on a Realistic Mathematical Education to Improve Students' Mathematical Problem Solving Ability and Self-Efficacy" (Lavenia Ulandari, 2019), which states that material developed based on a Realistic Mathematics Education can improve students' mathematical problem solving abilities. This interprets the learning material with a realistic mathematics education, which is important to note in an effort to maximize student achievement. Other supporting literature includes the results of

a study entitled "Development of Learning Devices with a Realistic Mathematical Education to Improve Problem Solving Ability and Mathematical Connection Ability of SMP 32 Medan Students," which shows that the ability to solve students' mathematical problems has increased by applying learning support tools developed using the realistic math education.

Realistic Mathematics Education (PMR) is a mathematics learning developed by a group of mathematicians at the Freudenthal Institute, University of Utrecht in the Netherlands since 1971 and is based on the statement of Hans Freudenthal whose name is the name of the university. Freudenthal (in Suryanto, 2010) states that mathematics is a human form that underlies the development of Realistic Mathematics Education. In PMR, the teacher's role is only as a guide and facilitator so that students can reconstruct mathematical ideas and concepts. The Realistic Mathematical Approach emphasizes mathematics on the search for meaningful knowledge associated with realistic (real) everyday life. Learning that uses real contexts in everyday life can be linked to the culture that surrounds students.

Culture is something that cannot be separated from everyday life. Culture is that complex whole which includes knowledge, belief, art, morals, law, customs and any other capabilities acquired by man as a member of society. From this definition, it can be concluded that culture is something that will influence the level of human knowledge and behavior in everyday life.

Mathematics is very closely related to everyday life and community culture (Darmayasa, Wahyudin, & Mulyana, 2018). According to Mustamine, if children learn mathematics apart from their daily experiences, they will quickly forget and cannot apply mathematics (Mustamin, 2017). Therefore, mathematics lessons should be linked to everyday experiences to get better learning results. In addition, this can be used as a strategy to create a learning environment that integrates culture as part of the learning process.

Culture-based learning is learning that allows teachers and students to actively participate based on the culture they are familiar with so that optimal learning results can be obtained. The culture-based learning process is not just about transferring or conveying culture or cultural embodiment but using culture

to make students able to create meaning and creativity to achieve a deep understanding of the subjects they study. Culture-based learning can be divided into three types: learning about culture, learning with culture, and learning through culture (Goldberg, 2000). Activities in culture-based learning are not designed just to make students more active but are made to facilitate social interaction and meaningful learning. Meaningfulness in this case is obtained from the results of social interaction between knowledge and students' initial experiences with the new information they learn. Culture-based learning can be realized in many ways, one of which is by using ethnomathematics.

Ethnomathematics is mathematics that is influenced or based on culture. Through the application of ethnomathematics in education, especially mathematics education, it is hoped that later students will be able to better understand mathematics and their culture, and that later it will be easier for educators to instill the cultural values themselves in students, so that cultural values that are part of the national character are instilled since early in students. By incorporating culture into learning mathematics, students can understand learning mathematics more easily and know more about their own culture so that learning objectives can be realized.

Educators must try to create alternatives that can be used to develop teaching materials using real contexts from everyday life and related to the culture around students. One alternative that can be used is to develop student worksheets with a realistic mathematical approach that are adapted to the everyday lives of students with ethnomathematical nuances. PMR-based teaching materials can increase learning motivation because the learning process becomes more interesting. Students' interest in the learning process that uses teaching materials with PMR is due to the presentation of contextual problems that are commonly found by students in their daily activities (Oktaviana, 2020).

LKPD is designed by linking material content with the culture that is inherent in the students themselves. Rohaeti (2011) states, "In order for students to feel that the material they are learning in mathematics is part of themselves, learning mathematics must begin with learning that is contextual from the culture in which the student is located". Therefore learning mathematics really needs to

be a bridge between mathematics and the everyday world based on local culture and school culture.

Based on the problems raised as well as the advantages of the teaching materials developed based on the principles of a Realistic Mathematical Approach (PMR) with ethnomathematics nuances, the researcher believes that it is necessary to "Develop Student Worksheets Based on a RME with Ethnomatematics to Improve Students' Mathematical Communication Ability at SMPN 41 Medan".

1.2 Identification of problems

Based on the background of the problems above, several problems can be identified as follows :

1. The mathematical communication ability at SMPN 41 Medan is low.
2. Teacher-centered learning so that students are not directly involved in learning.
3. Learning in class VII SMP Negeri 41 Medan has not used real-life context.
4. There is no LKPD with a realistic mathematical education that can stimulate students' mathematical problem-solving abilities. The unavailability of student worksheet that can improve students' mathematical communication ability
5. Learning mathematics at SMPN 41 Medan is not related to culture with ethnomathematics nuances.

1.3 Scope of Problem

Based on the background and identification that have been described above, the scope of this research is in class VII SMP Negeri 41 Medan with a total of 30 students. Students will be taught using student worksheets on quadrilaterals and triangles with a realistic mathematics education to improve students' problem-solving abilities. This school is located on Jl. Bunga Ncole Raya No. 129, Namu Gajah, Kec. Medan Tuntungan, Medan City, North Sumatra.

1.4 Limitation of the Problem

Based on the background and problem identification above, as well as limited skills, materials, and time, the limitations of the problems carried out by researchers are :

1. Student worksheet developed to improve students' mathematical communication ability.
2. The materials used in student worksheet are triangles and rectangles.
3. The culture used in ethnomathematics is the Batak Toba 3. The culture used in LKPD is a culture that is often found in North Sumatra, especially the Toba Batak culture.

1.5 Formulation of The Problem

Based on the background, problem definition, and problem formulation that have been described above, the problem formulation in this study is:

1. Does the quality of Student Worksheets that have been developed with a Realistic Mathematical Approach with ethnomathematic nuances to improve students' mathematical communication skills meet the aspects of validity, practicality, and effectiveness?
2. How are students' mathematical communication skills after using Student Worksheets with a Realistic Mathematical Approach with ethnomathematic nuances that have fulfilled the aspects of validity, practicality, and effectiveness?

1.6 The Purpose of The Research

The objectives of this research are:

1. To find out the quality of Student Worksheets with a Realistic Mathematical Approach with ethnomathematics nuances to improve students' mathematical communication skills in Quadrilaterals and Triangles material that has fulfilled the aspects of validity, practicality, and effectiveness.
2. To find out the learning outcomes of students' mathematical communication skills after using Student Worksheets with a Realistic

Mathematical Approach with ethnomathematics nuances that have fulfilled the aspects of validity, practicality, and effectiveness.

1.7 The Benefits of The Research

Based on the research objectives above, the results of this study are expected to provide the following benefits:

1. For teachers

Can be used as learning teaching materials or as a reference in developing and using student worksheets with a realistic mathematical approach with ethnomathematical nuances in the teaching and learning process.

2. For students

Can be used to assist in understanding mathematical material and provide knowledge to solve mathematical problems in everyday life.

3. For schools

It can be used as useful information and as a comparison material for applying Student Worksheets (LKPD) with a realistic mathematical approach and ethnomathematical nuances in teaching and learning activities.

4. For Researchers

It can be used to increase knowledge and experience in developing student worksheets (LKPD) and to utilize a realistic mathematical approach with ethnomathematical nuances in learning.

