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Improvement of Mathematical Communication Skills and Student Learning Motivation Through Realistic Mathematics Education Approaches

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***Abstract*: This study aims to see students 'mathematical communication skills and student learning motivation through a realistic mathematics education learning approach, describing the process of students' answers in solving mathematical communication problems. This study is a quasi-experimental research . The research subjects were students of class VIII SMP Negeri 1 Binjai. Then two classes were randomly selected. The experimental class was given PMR learning treatment and the control class with ordinary learning. The instruments used consisted of: a test of mathematical communication skills and a student motivation questionnaire.The purpose of this study was to determine whether: improvement in mathematical communication skills of students who obtained learning with the Realistic Mathematical Approach (PMR) was higher than students who received Conventional learning, increased learning motivation of students who obtained learning with PMR higher than students who obtain Conventional learning, there is an interaction between learning models with students' initial mathematical abilities to increase students' mathematical communication skills, there is an interaction between learning models with students' initial mathematical abilities towards increasing student motivation. The results of this study have explained in detail the research procedures for improving communication skills and student motivation through a realistic mathematics education approach.**

Keywords: Mathematical communication, Learning Motivation, Realistic Mathematic Education

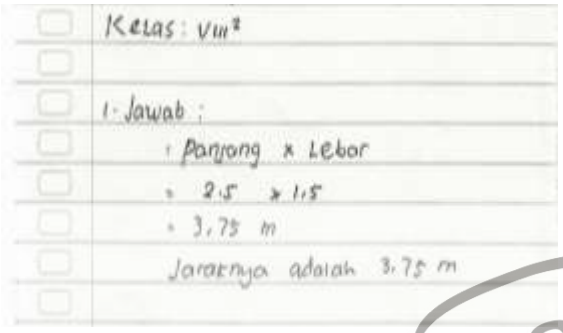
I. INTRODUCTION

Education is all aspects of life in choosing and fostering a good life in accordance with human dignity. Education is a conscious and planned effort to create an atmosphere of learning and learning process so that students actively develop their potential to have spiritual spiritual strength, self-control, personality, noble moral intelligence, and the skills needed by the people of the nation and state [1]. It aims to face the challenges of the development of information technology more rapidly. Along with the times, technological advances are increasingly rapidly demanding education to continue to develop and be able to produce high-quality human resources who are able to think critically, creatively, systematically, communicate, be able to solve problems, and have good morals.

One important aspect in learning mathematics is to improve mathematical communication skills. In everyday life a person can not be separated from a communication. Communication can take place between individuals, groups, social, and so forth. In other words, communication is the delivery of messages both verbally and in writing. In teaching and learning activities, communication skills are needed in achieving learning objectives, one of them is in learning mathematics. According to Baroody stated there are two reasons to focus on mathematical communication [2]. The first reason is mathematics is an essential language for mathematics itself. Mathematics is not only a thinking tool that helps students to develop patterns, solve problems and draw conclusions, but also as a tool for communicating thoughts, varying ideas clearly, precisely and concisely. The second reason is learning to teach mathematics is a social activity that involves at least two parties, namely teachers and students. Communicating with friends is an important activity to develop communication skills so students can learn like a mathematician and can solve problems successfully.

The communication that is expected to be established during learning is effective communication that supports the teaching and learning process. Effective communication is shared meaning, shared understanding where its success lies in openness, listening effectively and understanding. Learning mathematics that does not actively involve students will cause students to not be able to use their mathematical communication skills, The task of the teacher is not only as a provider of information (knowledge transfer) but also as a stimulus for students to learn in order to construct their own knowledge. Therefore mathematical communication skills play an important role in helping students build relationships between abstract language and mathematical language symbols that need to be developed early.

Based on observations made at SMP Negeri 1 Binjai, it was found that many students were passive during the learning process so the teaching and learning process was less effective. This learning process seems to cause a learning atmosphere that is not optimal. So students have not been able to communicate mathematically. Even though some mathematics material requires students to communicate the results of their thoughts to others verbally and in writing. One of them is the Phytagoras. Following are the observations obtained



Students are not able to model inward matematika

Based on the results of preliminary observations conducted by researchers at SMP Negeri 1 Private Junior High School in Binjai where students' mathematical communication based on indicators explains the ideas or situations of an image or graphic given in their own words in written form (writing); state a situation with pictures or graphics (draw); and state the situation in the form of mathematical models (Mathematical Expressions) are also still relatively low. From the problems given by researchers to students of class VIII-2 SMP Negeri 1 researchers observed many students who had difficulty in solving problems. According to the factors causing learning difficulties are divided into two, namely internal and external factors [3].

Apart from having mathematical communication skills, the most important thing that students must have is the psychological aspect that contributes to one's success in understanding mathematics well. This psychological aspect is the motivation to learn. Motivation is a process that determines the level of activity, intensity, consistency, and general direction of human behavior [4]. Someone is motivated or compelled to do something because of a goal or need to be achieved. Motivation is formulated as encouragement, whether caused by factors from within or outside the student, to achieve certain goals in order to meet or satisfy a need. In the context of learning, these needs are related to the need to learn. Thus, it can be said that students with low achievement are not necessarily due to their low abilities, but may be caused by a lack of encouragement or motivation. Motivation is a condition contained in a person that causes a person to carry out certain activities to achieve certain goals. Knowledge and understanding of learning motivation in students is very useful for teachers to: generate, increase, and maintain students' enthusiasm to learn until success. The success of learning activities is very much determined by the interaction between students and teachers. States that there are 3 learning conditions that can be found in student groups, namely: The first event, students are reluctant to learn because they do not know the usefulness of subjects in school. These students are low motivated, because they lack information. The second event, students' motivation to learn decreased due to external learning disruption. In both events, student learning motivation got better, after the teacher changed the external conditions of student learning. The third incident students have high learning. Such students are generally able to overcome their learning disorders and barriers [5]. Recognizing the importance of mathematical communication, the teacher strives to learn by applying learning models that can provide opportunities and encourage students to practice mathematical communication. One of them is a realistic mathematics education approaches. Realistic mathematics education approaches is a learning approach that uses real world problems [6]. Mathematic realistics education is a learning theory that starts from 'real' matters for students, emphasizes 'process of doing mathematics' skills, discussing and collaborating, arguing with classmates so that they can find themselves ('student inventing' as opposed to 'teacher telling' ') and ultimately use that math to solve both individual and group problems [7]. Through abstraction and formalization students will develop a more complete concept. Then students can apply mathematical concepts to new fields of the real world (applied mathematization). Therefore, to bridge mathematical concepts with children's daily experiences, it is necessary to pay attention to mathematics of everyday experience (mathematization of everyday experience) and the application of mathematics in everyday life.

From the description of the problem above, the researcher is interested in conducting research related to students' mathematical communication processes and student learning motivation. Then the researcher made a research title Improvement Mathematical Communication Skills and Student Learning Motivation Through Realistic Mathematics Education Approaches.

II. Research Methods

This research was conducted at SMP Negeri 1 Binjai, with a quasi-experimental research design. The population is all students of SMP Negeri 1 Binjai in the academic year 2017/2018. The selection of grade VIII students as the study population was based on the following considerations: Many mathematics material topics in grade VIII are more interesting when taught with Realistic Mathematics Education (PMR); In terms of age of VIII graders (age range ranging from 14-15 years), generally students are still at the concrete operational stage; In addition, grade VIII students are chosen because they are assumed to be mature enough to accept reforms in the learning approach carried out by the teacher.

Meanwhile, the selection of SMP Negeri 1 Binjai is based on the consideration that the writer hopes that the teachers in this school can make a realistic mathematics approach as an alternative for learning to provide variations to the learning that has been carried out generally still using conventional learning.

The research sample was determined using cluster sampling technique (group sample selection). Group sampling is a method of random sampling based on groups, not based on its members, provided that members of these groups have the same characteristics [8]. Method used in this study is a research and development or *Reseacrh* and *Development* . Methods of research and development or *Reseacrh* and *Development* is a research method that is used to produce a specific product and test the effectiveness of the product,[9] .

This research and development methodology is closely related to the field of learning technology. Several decades of research in the field of instructional technology have intersected with issues of product development and design, especially media and teaching materials and learning system design.

This experimental research consists of 3 stages: 1). The preparation stage. At this stage, it begins with an introduction that is used to get problem identification, problem formulation and the literature needed, 2). So that it can be determined the research tools used. Second, the preparation stage begins with a research tool, 3). The implementation stage and data analysis. At this stage, it begins with giving a pretest to students, then in the experimental class action is carried out in the form of a learning model, namely the mathematic realistic education and ordinary learning in the control class. Then the teacher and student activities were observed in both learning models and at the end of the study a test was given to the students' communication skills and student learning motivation.

The planning stage starts with the preparation of learning tools and research instruments, giving (KAM, pretest, and postest test questions), making observations with a realistic approach and conventional learning, giving posttest test questions, then analyzing the data. planning stage starts from collecting references related to the product being developed, designing media displays, collecting drug material and characteristics of students at the high school level, to the evaluation stage in the developed learning media.

The instrument that has been compiled and developed is tested for expert validity. The instrument was declared feasible after being validated by experts, namely material experts and learning experts. The results of validation by several experts are expected that this instrument is suitable for use in teaching and learning activities. This validity test can be done several times until the validator states it is suitable for use without revision.that has been compiled and developed is subject to expert validity testing. The product is declared feasible after validation by experts, namely media experts, material experts, and learning experts. The results of validation by several experts are expected that this media product is suitable for use in teaching and learning activities. This validity test can be done several times until the validator states it is suitable for use without revision.

The results obtained are an increase in students' mathematical communication skills taught through realistic mathematics education is higher than students taught by conventional learning.

This can be seen from the results of the two-way ANOVA analysis, it can be seen that for the learning factor, Fcount = 18.854 is greater than Fcritical = 3.919 at the significance stage α = 0.05 with 1 x 122 degrees of freedom (0.95F1,122). Therefore, the null hypothesis which states that there is no increase in mathematical communication skills between students who are given a realistic mathematics education approach compared to students who are given a conventional approach is rejected.

The second hypothesis was carried out to test whether there was an interaction between learning and students' initial mathematical abilities towards improving mathematical communication skills.

It can be seen that for the interaction between the approach factor and the ability, it is obtained that Fcount = 2.053 is smaller than Fcritical = 3.070 at the significance stage α = 0.05 with 2 x 122 degrees of freedom (0.95F2,122). Therefore, the null hypothesis which states that there is an interaction between the learning approach and students' mathematical abilities towards the improvement of mathematical communication skills is acceptable.

The third hypothesis was carried out to test whether the increase in the mathematical disposition of students taught through realistic mathematics education was higher than students taught by conventional learning.

It can be seen that for the approach factor, it is obtained that Fcount = 9.155 is greater than Fcritical = 3.919 at the significance stage α = 0.05 with 1 x 122 degrees of freedom (0.95F1,122). Therefore, the null hypothesis which states that there is no increase in learning motivation between students who are given a realistic mathematics education approach compared to students who are given a conventional approach is rejected. In other words, the increase in student motivation to learn through realistic mathematics education is higher than students taught by conventional learning.

The third hypothesis was conducted to test whether there was an interaction between learning and students' initial mathematical abilities towards increasing student learning motivation.

It can be seen that for the interaction between the approach factor and the ability, it is obtained that Fcount = 2,100 is smaller than Fcritical = 3.070 at the significance stage α = 0.05 with 2 x 122 degrees of freedom (0.95F2,122). Therefore, the null hypothesis which states that there is an interaction between the learning approach and students' mathematical abilities on increasing student learning motivation can be accepted.

In the process of student answers in solving test questions

of mathematical communication skills in students taught through realistic mathematics education is better than students taught through conventional learning. This is indicated by the percentage of students' mathematical communication ability tests for the completion of each item on the mathematical communication ability test, where for each item, the complete and correct completion of students taught through realistic mathematics education has a higher percentage than students taught through conventional learning.

III. Results And Discussion

Based on the results of the study, the average gain score of students' mathematical communication abilities given the PMR approach was 0.51205 higher than students who were given the conventional approach of 0.43014. The results of this study indicate that the average increase in mathematical communication skills of students who are given the PMR approach is higher than students who are given the conventional approach. There is an increase in learning motivation between students who give a realistic mathematics education approach and students who are given a conventional approach. From the mean of the two groups, it shows that students who are given a realistic mathematics education approach have higher learning motivation than students who are given a conventional approach. This is indicated by the average gain score of students' learning motivation given the realistic mathematics education approach of 0.38488, higher than students who were given the conventional approach of 0.33413.

IV. Conclusions

Based on the results of the analysis, findings and discussion that have been stated in the previous chapter, several conclusions were obtained regarding learning factors, initial mathematical abilities, mathematical communication skills and student learning motivation. The conclusions are as follows: The increase in mathematical communication skills of students who receive realistic mathematics learning is significantly better than students who receive regular learning. This can be seen in the normalized gain calculation in the experimental class which is higher than the control class. The increase in learning motivation of students who received realistic mathematics learning was significantly better than students who received regular learning. This can be seen in the normalized gain calculation in the experimental class which is higher than in the control class. There is no interaction between learning and students' initial mathematics abilities (high, medium and low) on the improvement of mathematical communication skills. This also implies that the interaction between learning and students' initial mathematics abilities (high, medium and low) does not have a significant joint effect on improving mathematical communication skills. The difference in the increase in mathematical communication skills is caused by differences in the learning used not because of the students' initial mathematical abilities. There is no interaction between learning and students' initial mathematics abilities (high, medium and low) on increasing student motivation. It also means that the interaction between learning and students' initial mathematics abilities (high, medium and low) does not have a significant joint effect on increasing student learning motivation. The difference in the increase in learning motivation is caused by differences in the learning used not because of the students' initial mathematical abilities.

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