The Improving Mathematical Communication Ability Through Realistic Mathematical Approach Based on Toba Batak Culture

Aman Sanusi Siregar

State University of Medan

Mathematics Education Study Program

Medan, Indonesia

sanusisiregar7@gmail.com

Abstract— **This purpose of this research to know: (1) The improving of mathematical communication ability through realistic mathematics approach based on Toba Batak culture is higher than students who are given regular learning, (2) there is no interaction between learning approach with Initial Ability of Mathematics (KAM) in improvement of students' mathematical communication ability. This research type is quasi experiment. This research was conducted at SMP N 2 Dolok Panribuan. The population in this study is all students of class VII. Based on the results of the analysis, the research results are obtained: (1) improving of mathematical communication ability through realistic mathematics approach based on Toba Batak culture is higher than students who are given regular learning, (2) there is no interaction between learning and student's early ability improving the ability of mathematical communication. Recommended by the teachers can use realistic mathematics approach based Batak Toba culture by presenting issues related to local culture as an alternative learning.**

Keywords: Mathematical communication ability, Realistic Mathematical Approach Based on Toba Batak Culture

I. INTRODUCTION

The virtue in learning mathematics is the learning process. "the learning process should provide many benefits for students so that they can develop their full potential" [6]. Through the process of learning mathematics can also develop the character of each student so that it produces productive, creative, innovative, and affective students through strengthening integrated attitudes, skills and knowledge. The end result is an improvement and balance between students' abilities and character.

It means that is basic math skills of students who have been formulated as follows: (1) mathematical communication, (2) mathematical reasoning, (3) mathematical problem solving, (4) mathematical connections , (5) positive attitudes toward mathematics [4].One ability that is very important to be considered in mathematics learning is students'

mathematical communication skills Mathematical communication skills need to be mastered by students because in the world of education can not be separated from the role of communication. Mathematical communication skills need to be the focus of attention in learning mathematics, because through communication, students can organize and consolidate their mathematical thinking and students can explore mathematical ideas

In fact students' mathematical communication skills are still not satisfactory. This can be seen from the low mathematical communication skills shown in the studies of obtained "the mathematical communication skills of students in class IX-1 of SMP Negeri 3 Labuhan Batu Upper Hulu is still low, because 13.33% of students class IX-1 which is able to explain mathematical ideas in writing with pictures, diagrams, tables or algebra and for categories of students able to express everyday language events or mathematical symbols as much as 26.76% " [11]. Likewise the results of other studies obtained that "students of class VII MTs have low mathematical communication skills, most of them only answer questions directly, unfocused and unthinkable [13].

There is another factor that allows influencing learning is the readiness and ability of students to take lessons is also determined by the initial ability of mathematics (KAM) owned by students. According that "the initial ability of students is the ability that has been possessed by students before participating in the learning that will be given". Early mathematical abilities (KAM) students are classified into high, medium and low groups. The initial ability of mathematics is a prerequisite that must be possessed by students in order to be able to follow the lessons well and smoothly [2].

Student learning outcomes are inseparable from and how teachers teach and students' responses to mathematics itself. During this time the learning that was carried out still used the usual approach where the process of learning mathematics which was generally carried out in schools (often called traditional learning), namely learning which began with the lecture method then given examples of the questions and finally the evaluation through practice questions. The problems of daily life are sometimes used on certain material but only appear at the end of the discussion or at the time of giving examples. The results of the study by show that

"traditional lecture teaching style shows significantly high student achievement". Traditional teaching has been going on for thousands of years, forming the minds of many ordinary scientists, workers and men and women. Traditional learning has become a proven method, but also has several disadvantages [9].

Although traditional learning is dominantly used in learning, the world of education currently prioritizes student activity. Mathematical learning today should connect mathematical concepts in school with their daily experiences. "Mathematics learning is too formal, lacks connection with meaning, understanding, and application of mathematical concepts, and fails to provide sufficient attention to reasoning and problem solving abilities" [4].

The learning gives an impression that is not good for students, because it can cause negative attitudes of students towards mathematics. "Mathematics learning is basically designed to provide continuous enjoyment and comfort for students without imposing anything on them" [3]. But with a teacher-centered approach, students only see mathematics as a set of rules and exercises that bring boredom. There is no benefit to learn mathematics in life because student activities only repeat the procedure or memorize without being given the opportunity to interact more with others, this can give the impression that mathematics is a memorization not to learn to work alone.

One approach to learning that can improve mathematical communication skills and student learning independence is Realistic Mathematics Education (PMR). Student learning processes will only occur if the knowledge learned by students will be meaningful to the students themselves [12]. A realistic mathematical approach is a learning approach that departs from the 'real' things for students, emphasizing skills, discussing and collaborating, arguing with classmates so that they can find themselves and ultimately use mathematics to solve problems both individually and in groups. In this approach the role of the teacher is nothing more than a facilitator, moderator or evaluator while students think, communicate ideas / ideas, practice the nuances of democracy by respecting the opinions of others.

The compatibility between the curriculum and PMR in terms of the objectives of learning mathematics in schools needs to be integrated with the cultural context. Mathematical education must be based on national culture Education is part of culture, education and culture have a reciprocal influence. If culture changes maybe education will also change. Cultural context can be used as a tool for learning to motivate students to apply mathematical concepts, work in groups, and perceived linkages between various subjects [7]. Thus it is possible to have a local cultural context in mathematics learning, meaningful learning process will occur as expected. Here it appears that the role of education in developing culture is very large. So that education and culture are one unit that is very important and cannot be avoided in everyday life. One of the cultures associated with education, especially in mathematics subjects is the Toba Batak culture.

Thus based on the description that has been explained then the purpose of this study, the problems were studied in this

research was how to improve students' mathematical communication skills and learning independence through a realistic mathematical approach based on Toba Batak culture.

II. RESEARCH METHODS

This type of research is quasi-experimental research. This research was conducted in SMP N 2 Dolok Panribuan the second semester of the 2017/2018 academic year. In this study sample selection conducted using cluster random sampling technique. Cluster random sampling, in this sampling, the population is divided into several groups or clusters. Randomly needed clusters were taken by randomization process. Each member in the randomly drawn clusters is the required sample [7]. Based on information from the principal of Dolok Panribuan 2 Public Middle School that all seventh grade students at SMP Negeri 2 Dolok Panribuan have been distributed / divided into each class with even abilities. Which means there are no special classes for smart students

Based on random sampling from 9 grade VII students at Dolok Panribuan 2 Public Middle School, students were chosen as samples of 2 classes, namely class VII-2 as an experimental class which was given learning with a realistic approach based on Toba Batak culture and class VII-3 as a control class who are given learning by being given an ordinary approach. Each number of students in the two classes is 32 students. As for the research design used in this study is the pretest-posttest control group design. Data analysis techniques used are analysis of variance (ANOVA).

III. RESEARCH RESULTS

Pretest is done to determine students' abilities before applying realistic mathematical approaches based on Toba Batak culture and the usual approach. Based on the pretest with 10 items obtained in the class realistic mathematics approach based on Toba Batak culture as many as 32 students, there were 7 students who had high ability, 20 students had moderate ability, and 5 students had low ability. Likewise, in the regular approach class there were 32 students, there were 4 students who had high abilities, 22 students had moderate abilities, and 6 students had low abilities. Before the data were analyzed, the normality of the data was tested using chi-square test and homogeneity test used Fisher's homogeneity assumption (Test-F) as a condition of qualitative analysis. The results obtained that the two classes come from populations that are normally distributed and homogen.

After that, it was analyzed using analysis of variance (ANOVA) to test 4 hypotheses proposed in the study with a two-way variance analysis test. The results of data analysis can be seen in the following table:

TABLE I.   THE RESULTS OF ANOVA TEST ANALYSIS OF MATHEMATICAL COMMUNICATION CAPABILITY

Source Varians	JK	RJK	F_{count}	F_{Table}
Between Columns (R) (Learning Models)	91,790	91,790	4,399	
Between Rows (C) (Student Ability)	76,563	76,563	-	4,000
Interaction (RC)	7,595	7,595	0,728	
In Group (W)	625,990	10,433		

Based on table 1 above shows that the value of F_{count} between rows (Fh_r) = 4,399 > F_{table} = 4,000 which means H_0 is rejected. So there is an increase in students' mathematical communication skills that are given learning through a realistic mathematical approach based on Toba Batak culture rather than students who are given learning through the usual approach. Then from table 1 above also shows that the value of (Fh_{rc}) = 0,728 < F_{tabel} = 4,000 thus H_0 is accepted. So it can be concluded that there is no interaction between the learning approach and the initial ability of mathematics to students' mathematical communication. This result can also be described through the following figure I:
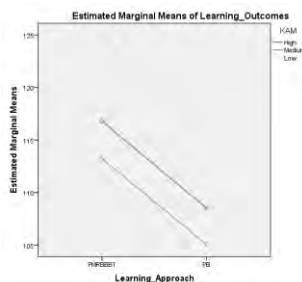

Fig 1 Interaction between Learning and KAM on Student Mathematical Communication Improvement

IV. DISCUSSION

Based on the results of the above research, then the discussion in the study is :

A. Mathematical Communication Abity

Based on the results of the study obtained the average pretest results Mathematical communication skills in the experimental class, namely classes that use mathematics with a realistic approach based on the Toba Batak culture of 14.00 in the control class, namely classes that use regular learning by 14.156. In addition, the average posttest of mathematical communication skills in the experimental class is 17.625, while in the control class is 15.438. This shows that there is an improve in mathematical communication ability in the experimental class and control class.

To measure the magnitude of the improvement of communication skills carried out with the gain index in the experimental class and control class and find the average test results from the index of communication ability in the experimental class is 0.427 while in the control class is 0.24 The level of communication ability in the experimental class is higher in the class control.

In learning activities, students who have mathematical communication ability can help other students who have problems understanding the subject matter. The results obtained in this study indicate that mathematics learning with a realistic mathematical approach based on Toba Batak culture can improve the mathematical communication skills possessed by students.

The results of the study were carried out with the results of research conducted by the title of the research to improving problem solving and communication mathematical ability through the learning of realistic mathematics education for students of state junior high schools in Garut. Thus, based on the results of the study, it was found that the first and the first problem, namely improving the communication ability of students who were taught using a mathematical approach with a better approach than usual [1].

B. Interaction between Learning Models with Students 'Initial Mathematical Abilities towards Improving Students' Mathematical Communication Ability

Based on the average difference, it can be seen that students with low categories gain greater benefits from problem-based learning with the difference in high KAM scores (0.16), medium (0.11) and low (0.36). In this case, 'initial mathematical abilities has no effect on improving students' mathematical communication ability, because students with low 'initial mathematical abilities categories have a greater increase than 'initial mathematical abilities in the high and medium categories. So there is no interaction between learning and students 'initial mathematical abilities towards students' mathematical communication.

Before carrying out the research, the researcher suspected that there was an interaction between the learning model and the students 'initial mathematical ability to improve students' mathematical communication ability, so the researchers hypothesized that there was an interaction between the learning model and the students 'initial mathematical ability to improve students' mathematical communication ability.

However, the results obtained in the study indicate that there is no interaction between the learning model and the students 'initial mathematical ability to improve students' mathematical communication ability. This is known from the results of the two-way ANAVA test obtained from the significance value of 0.902 greater than the significance level of 0.05. So it can be concluded that in this study there is no interaction between learning (PMRBBBT and PB) with the level of initial ability of students (high, medium and low) to improve students' mathematical communication ability.

The results of this study are in line with the results that there is no interaction between learning factors with the factors of students' initial mathematical ability to improve logical thinking ability, mathematical communication ability, and positive attitudes toward mathematics [7].

Thus, based on the results of research and discussion, it was found that the formulation of the second problem was answered and the second hypothesis was rejected, namely there was no interaction between the learning approach and

the students 'initial mathematical ability to improve students' mathematical communication ability.

V. CONCLUSION

The conclusions that can be presented in this research are as follows:

1. The improving of 'mathematical communication ability and students self regulated learning taught through a realistic mathematical approach based on Toba Batak culture is higher than the improving of students' mathematical communication taught through regular learning

2. There is no interaction between the learning approach and the students 'initial mathematical abilities towards improving students' mathematical communication ability and regular learning.

REFERENCE

[1] Annisa, Witri N. 2014. *Peningkatan Kemampuan Pemecahan Masalah Dan Komunikasi Matematik Melalui Pembelajaran Pendidikan Matematika Realistik Untuk Siswa SMP Negeri Di Kabupaten Garut*. Jurnal Pendidikan dan Keguruan Vol. 1 No. 1, artikel 8

[2] Astuti, S. P. 2015. Pengaruh Kemampuan Awal dan Minat Belajar Terhadap Prestasi Belajar Fisika. *Jurnal Formatif* 5(1): 68-75

[3] Laurens, T., Adolfina, F., Rafafy, J. & Leasa, M. 2018. *How Does Realistic Mathematics Education (RME) Improve Students' Mathematics Cognitive Achievement?* EURASIA Journal of Mathematics, Science and Technology Education ISSN: 1305-8223 (online) 1305-8215 (print) 2018 14(2):569-578

[4] National Council of Teachers of Mathematics (NCTM). 2000. *Principles and Standards for School Mathematics*. Reston. VA: NCTM.

[5] National Council of Teachers of Mathematics. 2014. *Principles to Actions: Ensuring Mathematical Success for All*, Reston: nctm.org

[6] Nesusin, N., Intrarakhamhaeng, P., Supadol, P., Piengkes, N. & Poonpipathana, S. 2014. *Development of Lesson Plans by the Lesson Study Approach for the 6th Grade Students in Social Study Subject Based on Open Approach Innovation*. Procedia—Social and Behavioral Sciences, 116, 1411-1415.

[7] Saragih, S. 2007. *Mengembangkan Kemampuan Berpikir Logis dan Komunikasi Matematik Siswa Sekolah Menengah Pertama Melalui Pendekatan Matematika Realistik*. Disertasi tidak diterbitkan. Bandung: Sekolah Pasca Sarjana UPI Bandung.

[8] Saragih, S., E. Napitupulu, E. E. & Fauzi, A. 2016. *Developing Learning Model Based on Local Culture and Instrument for Mathematical Higher Order Thinking Ability*. International Education Studies; Vol. 10, No. 6; 2017. ISSN 1913-9020 E-ISSN 1913-9039. Published by Canadian Center of Science and Education

[9] Schwerdt, G & Wuppermann, A.C. 2010. *Is traditional teaching really all that bad?A within-student between-subject approach*. Program on Education Policy and Governance Working Papers Series

[10] Sudjana. 2005. *Metoda Statistika*. Bandung: Tarsito.

[11] Tiffany, F., Surya, E., Panjaitan, A. & Syahputra, E. (2017). *Analysis Mathematical Communication Skills Student At The Grade Ix Junior High School*. IJARIIE-ISSN(O)-2395-4396(Print) Vol-3 Issue-2 2017

[12] Wijaya, A. 2012. *Pendidikan Matematika Realistik Suatu Alternatif Pendekatan Pembelajaran Matematika*. Yogyakarta: Graha Ilmu.

[13] Yusra, D. A. & Saragih, S. 2016. *The Profile of Communication Mathematics and Students Motivation by Joyful Learning-Based Learning Context Malay Culture*. British Journal of Educaton, Society & Behavioural Science, 15(4) 1-16.