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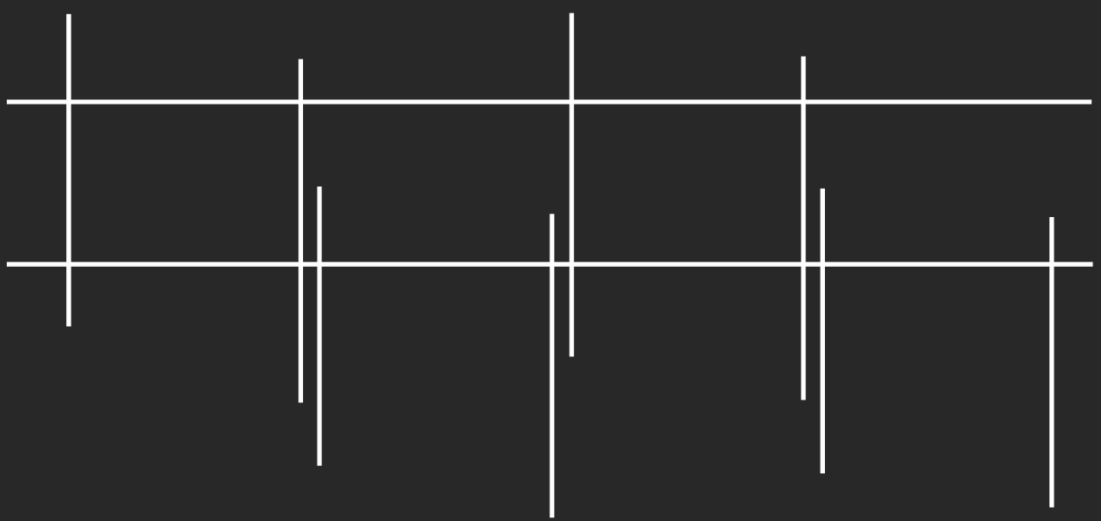
ICMSCSME 2015

International Conference On Mathematics, Statistics, Computer Science, and Mathematics Education

Proceeding Papers



Exploring Mathematics and its Application in the Future

2 - 3 October 2015
Hasanuddin University
Makassar, Indonesia

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(*ICMSCSME*) *2015*

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FOREWORD FROM CHAIRPERSON OF ICMSCSME 2015

Assalamu ‘alaikum warahmatullahi wabarakatuh
And sincerely greetings to all.

It is my great pleasure to welcome all our invited speakers and participants to International Conference on Mathematics, Statistics, Computer Sciences, and Mathematics Educations 2015 (ICMSCSME 2015) jointly organized by Mathematics Department Faculty of Mathematics & Natural Sciences Hasanuddin University, and Indonesian Mathematical Society (IndoMS) Sulawesi Region.

The conference is attended by around 200 participants, they are from Nepal, Philippines, India, Slovakia, Malaysia, and Indonesia.

It is hoped that the ICMSCSME 2015 will catalyze and increase academic and research collaborations between institutions involved, internationally and also locally. I sincerely hope that this will spur further advancement of scientific research and fruitful collaborations between organizations.

Finally, I would like to congratulate all the speakers and participants for their participation in this ICMSCSME 2015. On behalf of the conferences organizing committee, I would like to take this opportunity to thank all who have contributed either directly of indirectly to the success of the event for their generous contributions.

Finally, to all ICMSCSME 2015 committee thumbs up for a job well done. May Allah’s blessing be upon you, Aamin.

Thank you,
Wassalam,

Dr. Nurdin
Chair of ICMSCSME 2015

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FOREWORD BY DEAN OF MATHEMATICS AND NATURAL SCIENCES FACULTY HASANUDDIN UNIVERSITY

I would like to congratulate the Mathematics Department, Mathematics and Natural Sciences Faculty, Hasanuddin University and Indonesian Mathematical Society Region Sulawesi (IndoMS) for successfully organizing this joint conference of the International Conference on Mathematics, Statistics, Computer Sciences, and Education Mathematics 2015 (ICMSCSEM-2015) and the South East Asian Mathematical Society School (SEAMS School) on Coding and Graphs 2015.

I give me great pleasure to welcome all distinguished guests, invited speakers, invited lecturer, and participants to UNHAS and Makassar Indonesia. For some of you, this visit may probably be your first visit to Makassar and I wish you SELAMAT DATANG. I hope your brief visit to Makassar, in particular Makassar will be a memorable and fruitful one.

UNHAS is committed towards fulfilling the strategy set forth in the National Higher Education Plan for Indonesia Higher Education Institution. This conference demonstrates the commitment of UNHAS to promote internationalization as one of its main agenda. International research collaboration commitment includes collaboration in building new findings, teaching, and learning, and service activities to create opportunities for collaborative efforts, thus enhancing research and possible research exchange.

It is the aspiration of UNHAS to be an established research university and UNHAS is continuously promoting international research collaboration. I sincerely hope that this joint conference will be a platform where international research collaborations can be fostered and consequently nurtured.

Hopefully is of benefit to all readers.

Yours faithfully,

Dr.Eng. Amiruddin

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Proceeding of International Conference on Mathematics, Statistics, Computer Sciences, and Mathematics Education (*ICMSCSME*) *2015*
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Developing Students' Mathematical Communication Through Realistic Mathematics Learning

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ABSTRACT

The purpose of this study is to determine the achievement and improvement of students' mathematical communication ability in Bengkulu City Junior High School through realistic mathematics learning. The method used is a quasi-experimental non-equivalent control group design. The results of this study as follows. The realistic mathematics learning is more effective in the achievement and improvement of students' mathematical communication ability than conventional learning. The magnitude of the achievement of students' mathematical communication ability in realistic mathematics learning is 63,96 and conventional learning is 47,46. Meanwhile, the magnitude of the improvement of students' mathematical communication ability is realistic mathematics learning is 0,51 and conventional learning is 0,24 .

Keyword: mathematical communication ability, realistic mathematics learning.

1. Introduction

The mathematical communication ability in secondary schools receive less attention from teachers. Teachers tend to emphasize on numeracy, problem solving, and reasoning. So that weak students' mathematical communication ability. Students are less able to communicate mathematical ideas clearly and correctly, both orally and in writing. Rohaeti [1] research results, Wihatma [2], Purniati [3] concluded that the ability of mathematical communications junior secondary students is low.

The mathematical communication skills is one of the standards in the process of learning mathematics in school. Van De Wall, Karp, Jennifer, and Williams [4] suggested 5 standards in mathematics learning process are: 1. problem solving, 2. reasoning and proof, 3. communication, 4. connection, and 5. representation. The standard process communication capabilities provide restrictions on communication aspects that are taught in school. The mathematical communication skills is the ability of students to communicate mathematical ideas to others.

Baroody [5] explained that mathematics learning should help students to communicate mathematical ideas through five aspects: representing, listening,

reading, discussing, and writing. Baroody [5] also explained that the importance of communication in the mathematics learning, because mathematics as language and mathematics learning as a social activity. As a language, mathematics is used in conveying the idea by using symbols and understanding which has a single meaning. Mathematics is used in schools in mathematics produces a wide range of activities of students and teachers in discussing mathematics. In addition to classroom activities (schools), mathematics is also used by the communities in their social activities. As in trading activity, agriculture, mining and others.

To overcome the disadvantages of students mathematical communication abilty is necessary to change the learning, from conventional learning to non-conventional learning. Firdaus [6] explained that the non-conventional learning increases students' mathematical communication ability. One of the non-conventional learning is realistic mathematics learning (RML). Considers that the realistic mathematics learning of mathematics as a human activity. As an activity, mathematics as a tool that allows the interaction between humans.

Some research indicates that the RML is able to enhance the students' learning activities. Both physical and mental activity. Because RML includes a variety of physical and mental activity. Such discussion, reflection, and discovery of concepts and algorithms. Khasanah [7] found that the Indonesian Realistic Mathematics Education (IRME) can increase student activity in learning around the flat and wide awake. Likewise, research Al Muhari [8] produce that IRME can improve students' creativity.

1.1. The Researc Problem

a. Is there an increase in students' mathematical communication ability is taught through realistic mathematics learning?
b. Is student achievement mathematical communication ability is taught through realistic mathematics learning higher than conventional learning?

2. Theory

2.1 The Mathematical Communication Ability

Literally, the communication means of sending and receiving news or messages between two or more people (Surayin [9]). This means, in communication contains three components, namely the content of the message/news, the process of sending/receiving messages, and the people who send/receive the message. In the context of mathematics learning, the contents of the message/news in the communication, namely mathematics. Suriasumantri [10] suggested that mathematics is a language that symbolizes the meaning of a series of statements that we want to convey. Shaped mathematical symbols that have specific meanings. These symbols may include facts, concepts, principles and algorithms. Examples fact is bilngan π, variable as a concept, the pythagorean theorem as a principle, and steps to resolve the arithmetic operation two numbers is an algorithm.

By the term, Greenes and Schulman [11] suggested a mathematical understanding of communication as an ability to: a. stating mathematical ideas through speech, writing, demonstration, and describe it visually, b. understand, interpret, and assess the ideas presented in writing, verbal, or visual, c. construct,

interpret, and connect the various representations of ideas and relationships. Based on this understanding, mathematical communication more detail. The message content/news in the form of mathematical ideas. The process of sending/receiving the message content/news in the form of written, oral, representations. National Council of Teachers of Mathematics [12] describes the shape of the communication process mathematically as: create illustrations and interpretations, talk or discuss, listen or hear, write, and read. Form of activity the process is declared, understand, interpret, and connecting the message content (mathematics).

The mathematical communication abilty is an ability to communicate mathematically. Hulukati [13], describes the communication of mathematics as a student's ability to express, interpret, evaluate ideas and mathematical notation through written, oral, and demonstrate it verbally. From understanding the mathematical communications capabilities have characteristics. Sumarmo [14], describes the characteristics of mathematical communication abilty as follows:

a. Make the connection real objects, drawings, and diagrams into a mathematical idea.
b. Explaining ideas, situations and mathematical relationships orally and in writing with real objects, images, graphics, and images.
c. Declare a daily occurrence in the language or mathematical symbols.
d. Listening, discussing, and writing about mathematics, reading with understanding a mathematical representation.
e. Make a conjecture, make the argument, a definition and generalization.
f. Explain and make inquiries about mathematics.

Van De Wall, Karp, Jennifer, and William [4] sugested an indicator of the ability of mathematical communications student at the school as follows:

a. Organinize student mathematical thinking through communication.
b. Communicating student mathematical thinking coherently and clearly to friends teachers.
c. Analyze and evaluate the mathematical thinking.
d. Using the language of mathematical ideas precisely.

These indicators show the communication skills to a student or a teacher. While the National Council of Teachers of Mathematics [12] describes indicators mathematicak communication ability as follows:

a. Revealed the mathematical ideas in writing or verbally.
b. A definition and make generalitations.
c. Presenting mathematics with understanding.
d. Explaining mathematical questions.
e. Appreciate the power and beauty of mathematics.

According Hendriana [15], about the communication activities related to activities reflecting mathematical cognitive processes, describing the procedure, described metacognition, and communicate with others about mathematics. Activities in mathematical communication is recorded mathematically and represent something with the symbol. While communicates with mathematics as follows: mathematics as a

means of solving the problem, look for alternative solutions, interpret arguments, and use mathematical problem solving.

2.2. The Realistic Mathematics Learning (Rml)

Haji and Abdullah [16] suggested learning realistic mathematics as a systematic pattern in designing mathematical learning effective to achieve the goal of learning mathematics by relying on the creativity of the students in doing doing mathematics who view mathematics as a human activity through problem-solving activities contextual, formulate models , linking various topics, interact with a variety of sources, utilizing a variety of his own potential, discuss, reflect, take advantage of the phenomenon of education, explore, and finally found the (invention) concepts (principles) and mathematical algorithms. From that sense, has the characteristics of realistic mathematics learning. Treffers [17] describes five characteristics of realistic mathematics learning, namely: 1. The use of context, 2. The use of models, 3. The use of students', 4. The interactive character of teaching process, and 5. The intertwinement of varios learning strands.

3. Methodology

3.1. Sample and Population

The sample is students of class VIIa SMPN 24 Bengkulu City consisting of 19 students. The sample comes from a population of students of class VII SMPN 24 Bengkulu City consisting of 85 students (Haji and Abdullah [16]).

3.2. Instrument Validity and Realibility

The mathematical communication ability test consists of 3 items. The results of the analysis of mathematical communication ability tests using software Anates as follows (Haji and Abdullah [16]): mean = 60.79, standard deviation = 22.75, XY correlation = 0.71, reliability test = 0.83, item test = 3, and the number of subjects = 19.

3.3. Research Design

This study use a quasi-experimental design by the non-equivalent control group (Cohen, Manion and Morrison [18]):

Experimental	O1 X	O2
Control	O3	O4

X is a treatment as realistic mathematics learnining.

3.4. Data Analysis

Analysis of the achievement of mathematical communication skills using Mann Whitney test, if the data is not normally distributed. When the normal distribution of data using t-test. Where as the improvement of communication mathematical ability analysis using test N-Gein.

4. Results and Discussion

5.1 The Increasing Students Mathematical Communication Abilty Through Realistic Mathematics Learning

Hypothesis test results showed that there is an increase students mathematical communication abilty taught through realistic mathematics learning. As shown in Table 1. Increasing students mathematical communication abilty taught through the learning of mathematics realistically is 0.51. While increasing communication skills of students who are taught mathematics through conventional learning of 0.24. Increasing students mathematical communication ability greater than the students who are taught through conventional learning.

Tabel 1. Test Results of t–test

Data Group	*N*	Average	Average Difference	*t*	*df*	*Sig.* (2-way)	H_0
N-*gain* Experiment Group	27	0,51	0,27	3,396	49	0,001	Rejected
N-*gain* Control Group	24	0,24					

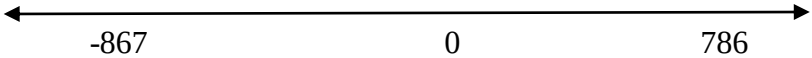
Source: Haji and Abdullah [16]

The increasing students mathematical communication is taught through realistic mathematics learning happen, because learning realistic mathematics to motivate students to conduct discussions on their friends and teachers in solving contextual problems and in finding a concept in mathematics. As in solving the following problems, known integers 786 and -867. Where larger numbers? Why? As many as 95% of students who are taught through realistic mathematics learning the correct answer to these problems. The results of their discussions as follows:

Student A : 786 is greater than -867, as a positive number greater than negative numbers.

Student B : Try to point out that the positive numbers greater than negative numbers.

Student A : Well, I would point out that the number 786 is greater than -867, using the image of the number line as follows:



Student B : Why -867 numbers located on the left number 786 and between the two of these numbers are zeros?

Student A : Because the number -867 is a negative number, while the number 786 is a positive number. Numbers 0 outweigh the negative numbers and smaller than positive numbers.

Student B : Oh, then I agree.

A total of 73%, the students taught by conventional teaching experience difficulty in resolving the matter. A total of 62%, the student answers incorrectly. They say -867 is greater than 786. Since the number 8 at -867 is greater than the number 7 at 786. The discussion activity in less developed conventional learning. Generally, each student solved the problems.

4.2 The Achievement Students Mathematical Communication Ability Through Realistic Mathematics Learning

Mann Whitney test results showed that accepting the hypothesis that there are differences in the achievement of mathematical communication skills of students taught using realistic mathematics learning with conventional learning. Achievement of mathematical communication skills of students who are taught through realistic mathematics learning is greater than students taught through conventional learning. Mathematical communication skills of students who are taught through realistic mathematics learning at 63.96, while students taught through conventional learning at 47.46. This is shown in Table 2 below.

Table 2. Results of *Mann-Whitney-Test*

Data Group	Evarage	*U Mann Whitney*	*Z*	*Sig.* (2-way)	H_0
Pretest of Experiments Group	32,33	221,500	-1,950	0,051	Received
Pretest of Control Group	32,00				
Postets of Experiments Group	63,96	149,500	-3,306	0,001	Rejected
Postest of Control Group	47,46				

Source: Haji and Abdullah [16]

The students mathematical communication ability who are taught through realistic mathematics learning faster than students taught through conventional learning. Due to the realistic mathematics learning, student reflection and discovery activities. Through reflection, students have the opportunity to correct the error or lack of inaccuracy in resolving a problem. The reflection of student activities conducted by reviewing the things he had done. Students communicate with itself. Similarly, the discovery activity. Students communicate with a friend or teacher. As in finding the circumference of the triangle. Students use a rope to rounded triangular-shaped object. So that the students concluded that the circumference of a triangle is the sum of the three sides. Through this understanding, as much as 77% of students can answer correctly the following question. The circumference of a long triangle sides (a + 6) cm, 28 cm and 12 cm is 180 cm. What is value of a? Answer that question is a = 134. One way to answer that question as follows:

The three sides of the triangle drawn in a line along the length.

(a + 6) cm 28 cm 12 cm

a + 6 + 28 + 12 = 180 cm

6 + 28 + 12 = 46

a = 180 – 46 = 134

Image increasing and achievement of mathematical communication ability who are taught through realistic mathematics learning as well as through conventional learning is shown in Figure 1 below.

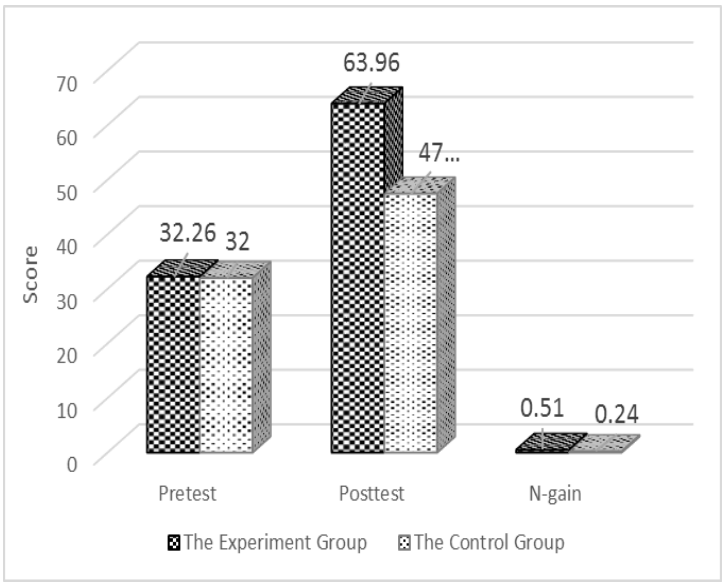


Figure 1. Increasing and Achievement Students Mathematical Communication Ability

Source: Haji and Abdullah [16]

5. Conclusion and Suggestion

The results of this study are:

a. There is an increase of students mathematical communication ability are taught through Realistic Mathematics Learning at 0.51.
b. The achievement of students mathematical communication ability taught through Realistic Mathematics Learning higher than students taught through Conventional Learning. Realistic Mathematics Learning achievement through at 63.96, while the achievement by conventional learning at 47.46.

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