

## THE ABILITY OF STUDENTS TO USE MATHEMATICAL WRITINGS COMMUNICATION USING PMRI APPROACH IN SMP YSP PUSRI PALEMBANG

Ahsani Takwim<sup>1</sup>, Darmawijoyo<sup>2</sup>, and Yusuf Hartono<sup>2</sup>

<sup>1</sup>Alumna, <sup>2</sup> Advisor of Academic Department of Mathematics Education, Sriwijaya University  
Jalan Raya Palembang-Prabumulih KM 32 Indralaya  
E-mail: ahsanitakwim@ymail.com

### Abstract

The aim of this research is to describe the ability of students to use mathematical writings communication using PMRI approach. The research subjects were students of class VIII. 1 junior YSP PUSRI Palembang. subjects in this study are 34 students. The learning process is done based on the principles and characteristics PMRI approach. Collecting data the ability of students to use mathematical writings communication is done through tests. Data communication skills of students writing mathematics derived from test results at the end of the material. Based on the results of this study concluded that the communication skills of students writing mathematics on mathematics using PMRI approach classified in good category.

**Key words:** PMRI, Communication Skills Writing Mathematics.

### INTRODUCTION

Mathematics is one of the important lessons that has been learned since the primary level to higher education. Math is useful to equip students in critical thinking, logical, mathematical, systematic, creative, and teamwork skill. Apart from having abstract nature, to understand mathematics, it is need to be systematic, because it is always necessary pre-requisite knowledge in understanding the new concepts of the lessons. In some developed countries, the math is very reliable in the advancement of science and technology.

Darmawijoyo (2006) said that learning mathematics should follow the dynamics of the development of today's evolving technology and future technology trends which is incidentally a tool for social activities in modern era. Therefore, teaching mathematics should use the newest approachment which is suitable with current situation.

Beginning 2006/2007, Indonesia imposed a state of KTSP (Kurikulum Tingkat Satuan Pendidikan/Curriculum of United Competency) in the field of education, which is a refinement of the curriculum KBK (Kurikulum Berbasis Kompetensi/Curriculum Based on Competency). The purposes of learning mathematics are (Depdiknas, 2006):

1. To understand mathematical concepts, explain the relationship between concepts and apply concepts or algorithms, flexibly, accurately, efficiently, and appropriately, in solving the problem.
2. To use reasonable thinking on the pattern and nature, do mathematical manipulation in making generalizations, compile evidence, or explain mathematical ideas and statements.
3. To solve problems that include the ability to understand the problem, devise a mathematical model, solve the model and interpret the obtained solution.

- 4 .To communicate ideas with symbols , tables , diagrams , or other media to clarify the situation or problem .
- 5 .To have respect for the usage of mathematics in life , namely to have curiosity , concern , and interest in studying mathematics , as well as a tenacious attitude and confidence in solving problems.

Ilma ( 2011) said that the mathematical communication is one of the capabilities that should be possessed by students because it is a very important part in mathematics . Pugalee ( Ilma , 2011) states that if students are given the opportunity to communicate about math , the students will try to improve the skills and mindset which are crucial in the development of writing skills and reading mathematics or mathematical literacy .

The importance of communication skills makes each learning of mathematics process required to have math communication skills enhancement for students .

Realistic Mathematics Approachment Indonesia ( PMRI ) is a suitable approachment to tackle the problem. Because PMRI approachment can train students to be able to reflect daily problems in symbolic form matematika. Research on Realistic Mathematics Approachment Indonesia ( PMRI ) learning of mathematics has ever undertaken by Nilawati ( 2012) to the junior high school students . From the results of research conducted by Nilawati , students' understanding of the concept is quite satisfactory , their ability to belong to the category of very good by 43.4 % , 33.3 % good category , and the category of 23.3 % enough . In this study, researchers want to conduct research on PMRI , but look at the other aspect is the communication skills of students in learning mathematics. In mathematic communication can be divided into two , namely oral and written communication, but researchers only limit on communication skills writing math or writing skills as part of teaching mathematics . This is because according to Emig (1983 ) that divides the writing process on the characteristics of a good learning process , as follows :

- 1 . Writing is an integrative capability that includes hand , eye , and brain were performed simultaneously .
- 2 . Writing can provide immediate feedback and reinforcement which is a key requirement in the reformulation and reinterpretation .
- 3 . Writing is a covering construction connectivity deliberate on how semantic connections
- 4 . Writing is a way to control yourself because connecting circumstances of past, present and future through analysis and synthesis .

Based on the background of the problem , the research problem can be formulated in the form of the following question : How does writing a mathematical description of the communication abilities of students in junior high PMRI approach YSP Pusri Palembang ?

The aims of this research is to get description of student's skill in mathematical writing for junior high PMRI approach in YSP Pusri Palembang.

## **THEORITICAL BACKGROUND**

### **Indonesian Realistic Mathematics Education**

Realistic mathematics learning is equivalent Realistic Mathematics Education (RME), an approach of learning mathematics that is developed by Freudenthal in the Netherlands.

Realistic mathematics learning concepts is presented by Treffers ( in Zulkardi , 2002) in the following statement " *The key idea of RME is that children should be given the opportunity to reinvent*

---

*mathematics under the guidance of an adult ( teacher ) . In addition , the formal mathematical knowledge can be developed from the children's informal knowledge" .*

### **Principles of PMRI**

- 1 . Guided reinvention and didactical phenomenology
- 2 . Progressive mathematization
- 3 . Self - developed models

### **Characteristicsof PMRI**

Treffers ( in Zulkardi , 2002) identified five characteristics of Realistic Mathematics Education :

- 1 . Use of Contextual Problems  
Contextual issues as an application and as a starting point from which the desired math may arise .
- 2 . Use of Models or Bridging by Vertical Instruments  
Attention is directed to the development of the model , schema , and symbolizes the transfer of the mathematical formula or formally.
- 3 . Use of Student 's Contribution  
Major contribution that is expected of the teaching and learningis they can lead themselves to their informal methods towards more formal method.
- 4 . Interactivity  
Learning Processof students is not a solo activity but rather a process that occurs in a social context . Students can communicate a problem that shape social interaction in the form of a class discussion or small groups to compare and reflect on their work . Under these conditions allows students to exchange ideas and argument.
- 5 . Intertwining of Learning Strands  
Linkage some other topic to topic in an integrated learning is important to students have.

### **Mathematics Communication**

Depdiknas( 2006) says that mathematics communicationis ability / skill of a student to be able to represent and interpret mathematical ideas verbally , in writing , or demonstrate what in a math sum is.

When an information of mathematical concept is given by a teacher to a student or students to get themselves through reading , then when it is going transformation of mathematical information from the communicator to communicant.Respond which is given by communicant is the communicant intrepretation of that information. In mathematics , the quality of the interpretation and response are often to be a problem as a result of the characteristics of mathematics itself which is loaded with terms and simbol. Because of it , the ability to communicate in mathematics become special demands .

Principles and Standards for SchoolMathematics ( NCTM , 2000) in (Ilma , 2011) states that the standard capabilities which should be mastered by students to demonstrate mathematical communication skills are as the followings :

- 1 . To organize and consolidate mathematical thinking by communicating to other student.
- 2 . Expressing mathematical ideas coherently and clearly to other students , teachers , and others .

- 3 . Improving or expanding the students' knowledge of mathematical thinking and strategies by thinking the quality ideas of other students.
- 4 . Using mathematical language appropriately in various mathematical expression.

### **Communication Ability Posts Math**

TEAMS Educational Resources ( 2013) explains that the communicating of ideas and understanding helps students to explain concepts and help students correct way of thinking . Writing is another way to help students in learning and understanding math problems and concepts . Writing will force students to think more deeply about the issues and processes in solving a problem . Teachers and students can use writing as a tool to see the level of their understanding of concepts as well as an assessment tool.

Mathematical communication includes written and verbal communication or verbal . Written communication can be the use of words , images , tables , etc., that illustrate the thinking of students . Written communication can also be a description of the problem solving or mathematical proof that describes the student's ability to organize a variety of concepts to solve problems

TEAMS Educational Resources ( 2013) mentions that writing communication skills or writing skills as part of the teaching of mathematics is important , because :

- 1 . Ability of writing requires organization and clarify the way of thinking .
- 2 . NCTM Standard 2 : mathematics as communication also includes the ability to write .
- 3 . Assessment can be made on students' understanding
- 4 . Teachers can find out the students' horizons in thinking .

In this research is limited on communication skills of students in writing mathematics .Then the indicators used are as the following :

- 1 . Students are able to organize and consolidate mathematics thinking .

According to Indonesian Dictionary, organizing means arranging and composing parts (people , etc) so that the whole becomes a unity. Then, consolidating means reinforce or strengthen ( relationships , unity , etc. ) . So the purpose of this indicator is that students can make provisional estimates konjekur against a discourse then formulate the steps to be performed by an argument . After that , the student should also be able to formulate a definition of the argument in order to generalize the discourse.

- 2 . Expressing mathematical ideas coherently .

This means that students can make a model of a discourse and then acquired ideas into written form in a concrete form.

- 3 . Uses mathematical language appropriately in various mathematical expression .

This means that students can change the discourse of everyday events into mathematical language that is informal to formal. So, students are able to use the term , drawings , tables , diagrams , notation or mathematical formulas properly .

### **METHOD**

Research methods that is used in this research is descriptive. Learning in this research is conducted by researchers in relation to learning the material system of linear equations with two variables PMRI approach to train communication skills of student. Subject of mathematical papers were students of junior classes VIII.1 YSP Pusri Palembang. The collecting data technique that is used, is test technique.

## RESULT AND DISCUSSION

This research begins with a preliminary observation which is conducted in junior YSP Pusri in VIII.1 class Palembang. Then, the result of student's writing communication skills math is low. It is seen when students complete word problems, students are less able to reflect existing problems questioned in a language and symbols of mathematics. In this research, the researcher limits the material system of linear equations in two variables using PMRI learning. Students implementation is divided into 7 groups, each consisting of 4-5 students. They are given worksheets that is already valid. Data of writing communication skills mathematics students obtained from the answers to the tests given to students at the fourth meeting.

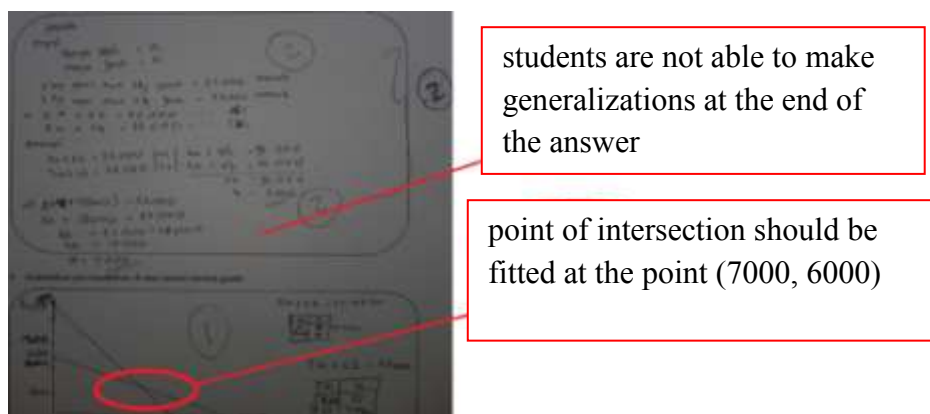
## QUESTIONS AND ANSWER TEST

Test item consists of 3 questions that is valid where the problem solving is in accordance with the communication indicator of mathematical papers. The following will discuss some of the weaknesses of students in general in answering questions at every question.

### Question No. 1 :

Mom bought 2 kg and 3 kg of oranges apples in the fruit shop " Kurnia " for USD 32000.00 , while the father have to pay Rp 33,000 to buy 3 kg of apples and 2 kg of oranges in the same fruit shop . Define :

- Make a mathematical model of the problem above for the price of 1 kg of apples and 1 kg of oranges and complete the model you've made !
- Illustrate the above problems in the form of graphs on the Cartesian plane

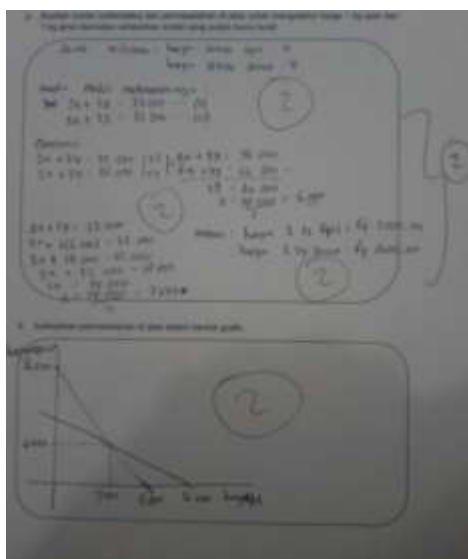


**Picture 1. The student's answer is not properly right.**

In the picture above are the students' answers, seen in **Picture 1**, students are able to make the mathematical model correctly, students are also able to solve problem properly. But students don't write generalizations at the end answer. So in **Picture 1** students do not answer the advent of mathematical papers on communication indicators the descriptor of the students are not able to make generalizations at the end of the answer although at the time students have learned how to conclude the final answer. Students assume that while getting the results, it is no need write the generalization. Total of students that are able to make generalizations about the right the **Question No.1** is 24 people.

In other hand, **Picture 1**, the students are also less precise in making graphs, the students in making the scale on the graph so that the point of intersection is not fitted at the point (7000, 6000).

Though the teaching materials worksheet students should have been taught how to draw graphic. They consider the scale of the manufacture is not too important, resulting in cut-off point that they do not get right.



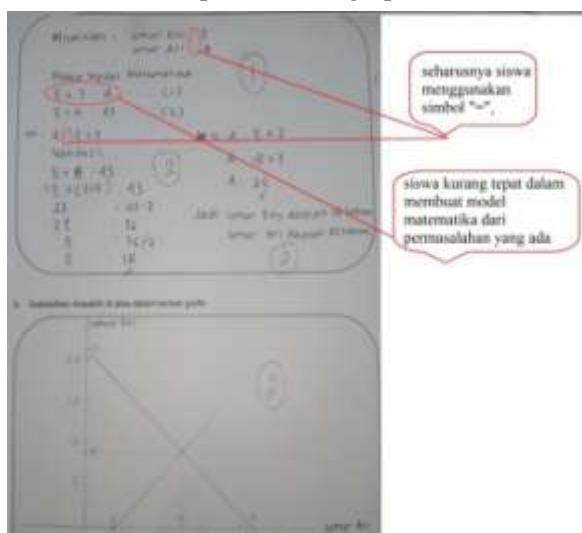
Picture 2. The answer is correct.

In **Picture 2** student's answer is right, each indicator in the settlement of all questions is achieved.

#### Question No. 2:

Eny age 7 years older than the age of Ari. Then, their total age is 43 years.

- Make a mathematical model to determine their age and complete the model, which you made.
- Illustrate the above problems in graphical form.



It should use the symbol "="

student is not properly right in making mathematics model

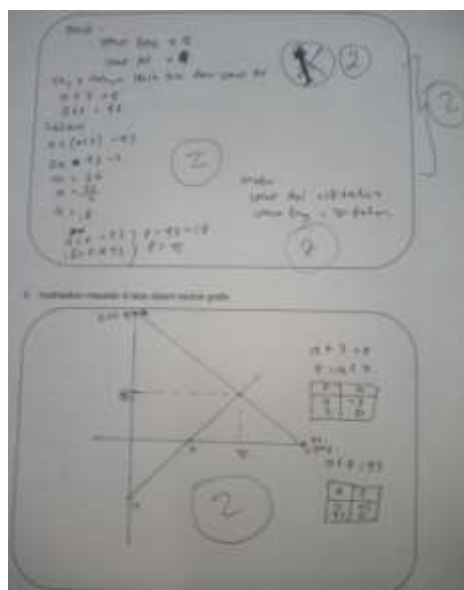
Picture3. Student's answer is not properly correct.

In **Picture 3** above, the answer MR of student is not properly right in making mathematics model from the question. Students are wrong in making models about the age difference Eny and Ari.



MR is wrong in a matter of designing a mathematical model of the statement "Eny age 7 years older than Ari". MR made model be  $E + 7 = A$ , when it should be  $E = A + 7$ . However, MR is still able to perform the completion of the existing models. MR is also able to make generalizations at the end with the correct answer. Here, the MR still get a score descriptors in use formulas and make generalizations at the end of the answer, because MR is less precise in making mathematical models.

MR is also wrong in using mathematical symbols. It should use the symbol "=", but he uses the symbol ":". The students' answers are exactly as the following!



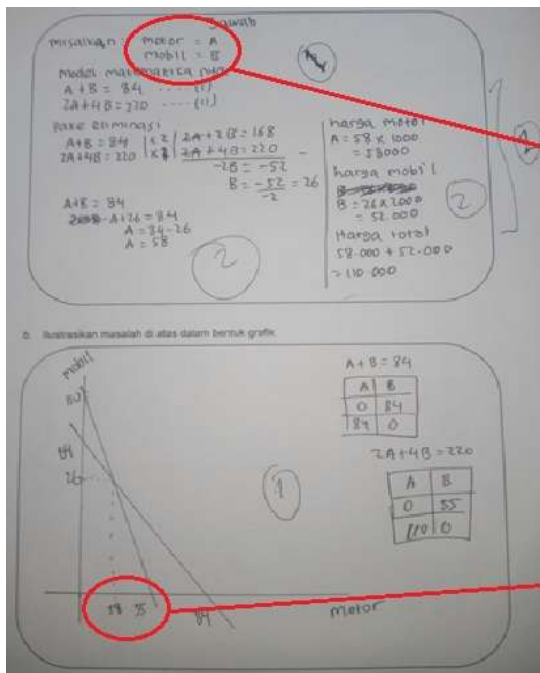
**Picture4. The answer is correct**

From the students' answers in **Picture 4** above shows the students making mathematical models properly. Students are able to make the proper mathematical model to No. 2 as many as 24 students with the percentage 70.59%.

### Question No. 3

In a parking area, there are 84 vehicles comprising motorcycles ( two-wheeler ) and a car (four wheels) . After the calculated total number of wheels is 220 . If parking fees for motorcycles Rp 1,000 , 00 and USD 2,000.00 for the car , then

- Make a mathematical model of the above problems then make settlement to determine the total amount of money that is received by the parking attendants .
- Illustrate the problems mentioned above in the form of graphs .

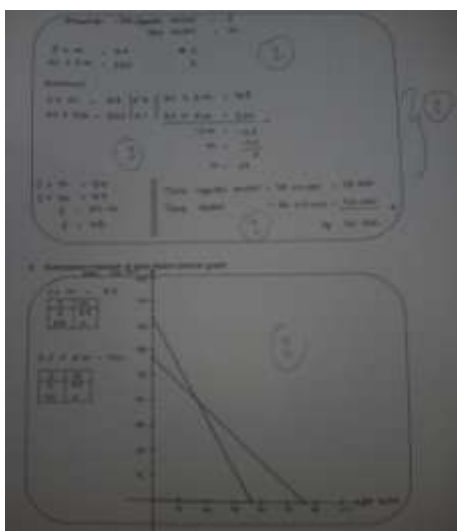


student is less precise in making a mathematical model of the problem. Supposedly that is assumed is the number of cars / motor

student is less precise in making the existing scale in graphic

**Picture5. Student's answer is not properly correct**

In **Picture 5**, RQ is less precise in making a mathematical model of the problem. RQ is wrong in making mathematical model on the number of vehicles motorcycles and cars. Supposedly that is assumed is the number of cars / motor. In PMRI approach while learning, students are trained how to make a mathematical model correctly. However because LKS done by the group, there are some members of the group who did not participate actively in the group. So do the problems at the time of the test, there are still some students who are less precise in making mathematical models. Then for the other descriptors, RQ has been able to write well. But RQ is less precise in making the existing scale in graphic. So, by seeing of existing faults, researcher assume that the RQ is less rigorous and careless. The students' answers are as the following correctly!



**Picture 6. The answer is correct**



In **question No. 3** is a lot of students who have not been able to resolve the matter appropriately, most students are not maximizing the use of time well, so it is not finished. In addition to the question number 3 number of students were able to create a model matematika correctly is 14 students with a percentage of 41.18 %.

### CONCLUSION AND REMARK

Based on the analysis of the data communication on the students writing mathematics test items students can be seen that the overall average of 50 % good categorized and 9 % very good categorized. This is due to the lack of completion of the steps to solve problems so that there are some students who answer only a few indicators of the emergence of writing mathematical communication, and also at the time of the test, students are not maximizing the time that the student has not completed all of the current work on the problems.

With the research that has been obtained, the suggestions can be given are: teacher is expected to design learning materials which can improve students' mathematical communication skills in learning process.

### REFERENCES

- Darmawijoyo. (2009). Kompetensi Matematika dalam Persepektif Matematika dan Pengajaran. *Indonesian Mathematical Society – Journal on Mathematics Education (IndoMS-JME)*, 3 (1), Juni 2009. Palembang: The Indonesian Mathematical Society.
- Depdiknas. (2006). *Kurikulum Tingkat Satuan Pendidikan*. Jakarta: Depdiknas.
- Emig, Janet. (1977). *Writing as mode of learning*. (online) (<http://links.jstor.org/sici?sici=0010-96X%28197705%2928%3A2%3C122%3AWAAMOL%3E2.0.CO%3B2-H>). Pdf, diakses 15 juli 2013).
- Ilma, Ratu. (2011). *Improving Mathematics Communication Ability of Student in Grade 2 Through PMRI Approach*. Yogyakarta: Universitas Negeri Yogyakarta.
- Nilawati, Umi. 2012. *Kemampuan Pemahaman Konsep Siswa pada Pembelajaran Matematika dengan Pendekatan Pendidikan Matematika Realistik Indonesia (PMRI) di Kelas VII SMP Negeri 1 Inderalaya Utara*. Palembang: FKIP Universitas Sriwijaya.
- Teams Educational Resources. 2013. (online). (<http://teams.lacoe.edu/>), diakses 15 juli 2013).
- Zulkardi. (2002). *Developing a Learning Environment on Realistic Mathematics Education for Indonesian Student Teachers. Doctoral Dissertation*. Enschede: University of Twente.