

The Effect of Realistic Mathematics Approach on Students' Mathematical Communication Ability

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Abstract

The purpose of this research was to find out whether there is an influence from the realistic mathematics approach on students' mathematical communication ability. The results of the analysis test prove that the realistic mathematics approach model influences students' mathematical communication skills. The hypothesis test also shows that the realistic mathematics approach model influences the communication skills of students' mathematical problems. This can be shown from the results of the normality test in the control class, namely $L_{\text{count}}=0.144 < 0.154=L_{\text{table}}$, and the normality test in the experimental class, namely $L_{\text{count}}=0.146 < 0.149=L_{\text{table}}$, so that the data is normally distributed, then from the results of the homogeneity test, namely $F_{\text{count}}=1.17 < 4.14=F_{\text{table}}$, so the data from the two groups is homogeneous. In addition, the hypothesis test also showed that there was a difference between the control class which was not given treatment and the experimental class which was treated using a realistic mathematics approach.

Keywords: linear equation system, mathematical communication, realistic mathematics education.

1 INTRODUCTION

Mathematical communication is one of the important abilities that must be developed in learning mathematics, but in reality this ability is often neglected. Mathematical communication is the ability of students to understand, express and interpret mathematical ideas both orally and in writing. In addition, mathematical communication also includes the ability to use language approaches and mathematical representations Prayitno, Suwarson and Siswono (2013). The formulation of competency attitudes, knowledge and skills used in the 2013 curriculum emphasizes the importance of creativity and communication. While currently the teacher's tendency in learning is to dominate class communication by explaining concepts, showing examples, and guiding questions and answers (Qohar, 2011). Teachers do not provide many opportunities for students to communicate their thoughts, ideas and ideas. The ideal teacher helps his students to learn by not prioritizing answers but how to reflect on them, characterize and discuss problems, and how they take their own initiative, form or find valid answers (Yuniarti, 2014).

In the pre-research conducted by the author at SMP Negeri 2 Cikarang Barat. It is known that the number of teaching staff is 35 teachers with a total of 300 students in each batch, where some class VIII students at SMP Negeri 2 Cikarang Barat for mathematics lessons still do not have a place in the hearts of students. This was proven in the results of the Odd Semester Final Assessment for the 2021/2022 academic year, which stated that the highest score for the odd semester math exam for class VIII SMP Negeri 2 Cikarang Barat was 87, the lowest score was 20, while the average was 54.33. The results show a low category which certainly does not meet the standard of success that has been set, namely 70. In general, students think that mathematics is a subject that is difficult to understand so that not a few students are afraid of mathematics. Under these

circumstances and also the lack of enthusiasm of students results in low mathematics learning outcomes. An activity that can be applied to develop students' communication skills, among others, is by implementing appropriate learning, such as one of which is realistic mathematics learning (Astuti, 2016; Noviarni, 2014).

Based on previous studies, research on the effect of a realistic approach has not focused on how learning tools are made to support the development of students' mathematical communication abilities. Starting from the background above, the PMR mathematics learning approach that supports students' mathematical communication skills needs to be developed in an effort to make learning a system of linear equations of two variables meaningful, not boring, increase student activity and arouse student motivation.

Following up on the problems that occurred, a study was conducted on the Effect of a Realistic mathematics approach on Students' Mathematical Communication Ability on the Material of the Two Variable Linear Equation System for class VIII SMP Negeri 2 Cikarang Barat. This study also aims to determine whether there is an effect of the realistic mathematics approach taken on the mathematical communication skills of class VIII students on the material system of two-variable linear equations.

2 RESEARCH METHODS

In this study, the method that researchers will use is the experimental method. The experimental research method is the purest quantitative research, because all quantitative research principles can be applied to this method (Hermawan, 2019). This research was manipulate and make observations.

The variables utilized in this study are categorized into two types: independent variables and dependent variables. Independent variables, namely variables that influence and become the cause of the dependent variable. The independent variable in this study is the effect of a realistic mathematics approach. The dependent variable, namely the variable that is influenced by the independent variable. The dependent variable in this study was the students' mathematical communication skills on the material system of linear equations with two variables for class VIII students at SMP Negeri 2 Cikarang Barat.

The design used in this research is quasi-experimental research. Quasi-experimental research is a design involving two groups, one group as the experimental class and one group as the control class. The type of design in this study namely pretest–posttest control grup design. Implementation of research on this type of design, namely by providing pretest as an initial assessment to determine the initial state before using Realistic Mathematics Learning, then the two groups were given treatment. the experimental group was treated using realistic mathematics which would be tested for its effectiveness and the control class was also treated with conventional learning models. At the end of the experiment, the two groups were given the final test or posttest to find out whether all the subject matter that has been delivered can be well understood by students and as a comparison between pretest and posttest both experimental class and control class.

The instrument in this study was a shaped test pretest and posttest. Pretest used to measure students' initial knowledge before being given action. Posttest used to determine student achievement after being given action (Sukendra & Atmaja, 2020). This test instrument was given to the control class and the experimental class where the tests given to the two classes were the same.

This research was conducted at SMP Negeri 2 Cikarang Barat which is located at Jl. Pure lake village, West Cikarang District, Bekasi Regency. It is known that the number of teaching staff is 35 teachers with the number of students in each generation of 300 students. The approach used in this study is divided into 2, namely Student Responses to Mathematical Communication and The Effect of a Mathematical Realistic Approach. The data that has been collected is then analyzed using a partial approach and a correlational approach. Before the instrument is used, the instrument is analyzed first. Instrument item analysis consists of validity test, reliability test, level of difficulty, and differential power.

3 RESULT AND DISCUSSION

The results of data analysis and discussion of research data are used to determine the effect of a realistic approach on students' mathematical communication skills in the subject matter of the Two-Variable Equation System. In detail, the systematics of writing in this chapter is divided into several sub-headings, namely data description, data analysis, hypothesis testing and discussion.

3.1 Description of Research Results Data

Data from the research results in the experimental class and control class were obtained by distributing test instruments totaling 6 questions in the form of essays. Based on the results of calculations using the Microsoft Excel program, the average score of the experimental class was obtained on the two-variable equation system material. Mean = 47.47; median = 46.18; mode = 56.5 ; variance = 53.34; standard deviation = 7.30 ; the highest score is 58 and the lowest score is 35. The frequency distribution of research data in the experimental class can be seen in Table 1.

Table 1. Frequency Distribution of Experiment Class Research Results

Class	be	x_i	$f_i \cdot x_i$	x_i^2	$f_i \cdot x_i^2$
35 – 38	4	36.5	146	1332.25	5329
39 – 42	7	40.5	283.5	1640.25	11481.8
43 – 46	7	44.5	311.5	1980.25	13861.8
47 – 50	5	48.5	242.5	2352.25	11761.3
51 – 54	0	52.5	0	2756.25	0
55 – 58	12	56.5	678	3192.25	38307
Total	35	279	1661.5	13253.5	80740.8

To simplify the interpretation of the frequency distribution on Table 1, the following will be presented in the form of a histogram graph (Figure 1).

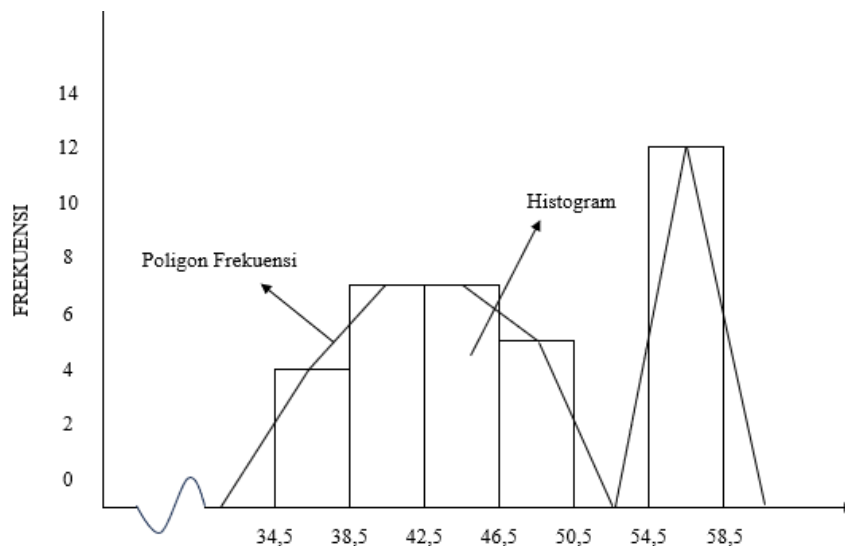


Figure 1. Histogram Graph of Experiment Class Research Results

Next is the data from the control class research. Based on the results of calculations using the program Microsoft Excel obtained the average value of the control class score on the material system of equations of two variables mean = 31.16; median = 29.06; mode = 40.1; variance = 65.61; standard deviation = 8.1; the highest score = 45 and the lowest

score = 20. The frequency distribution of research data in the control class can be seen in Table 2.

Table 2. Frequency Distribution of Control Class Research Results

Class	be	x_i	$f_i \cdot x_i$	x_i^2	$f_i \cdot x_i^2$
19 – 22	6	20.5	123	420.25	2521.5
23 – 26	6	24.5	147	600.25	3601.5
27 – 30	7	28.5	199.5	812.25	5685.75
31 – 34	0	32.5	0	1056.25	0
35 – 38	4	36.5	146	1332.25	5329
39 – 42	8	40.5	324	1640.25	13112.2
43 – 46	2	44.5	89	1980.25	3960.5
Total	33	227.5	1028.5	7841.75	34220.3

To simplify the interpretation of the frequency distribution table for the control class above, the following will be presented in the form of a histogram graph (Figure 2).

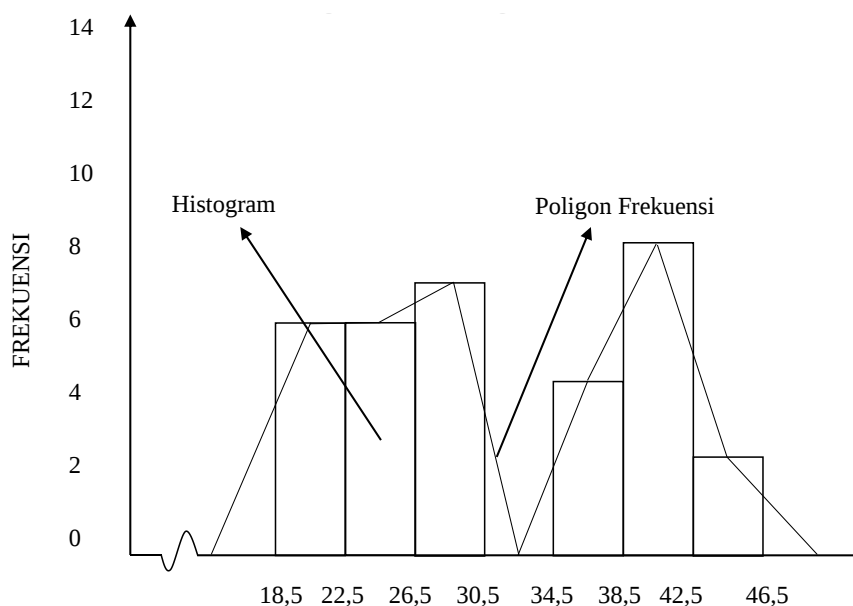


Figure 2. Histogram Graph of Control Class Research Results

3.2 Normality test

The normality test is carried out with the aim of assessing the distribution of data in a group of data or variables that are normally distributed or not. The normality test in this study was divided into two test groups, namely the normality test in the control class and the normality test in the experimental class with a significance level of $\alpha=0.05$ and the test criteria.

Normal distribution if the value $L_{count} < L_{table}$. and not normally distributed if $L_{count} > L_{table}$. Table 3 preseted the result of normality test in the experimental class.

Table 3. Experimental Class Normality Test

Class	N	L_{count}	$L_{table} (\alpha=0.05)$	Criteria	Information
Experiment	35	0,1467	0,149	$L_{count} < L_{table}$	Normal Distribution

Based on Table 3, the value of $L_{count}=0.134$, while the value of L_{table} for the Lilliefors test at a significance of $\alpha=0.05$ ($N=35$) is $L_{table}=0.149$. These results show that $L_{count} < L_{table}$ which means that the sample data comes from a normally distributed population.

Table 4. Control Class Normality Test

Class	N	L_{count}	$L_{table} (\alpha=0.05)$	Criteria	Information
Control	33	0,1447	0,154	$L_{count} < L_{table}$	Normal Distribution

Based on Table 4, the value of $L_{count}=0.1447$, while the value of L_{table} for the Lilliefors test at a significance of $\alpha=0.05$ ($N=33$) is $L_{table}=0.154$. These results show that $L_{count} < L_{table}$ which means that the sample data comes from a normally distributed population. So, it can be concluded that the normality test shows that the data is normally distributed and followed by a homogeneity test.

3.3 Homogeneity Test

Homogeneity test is a statistical test procedure intended to show that two or more groups of sample data come from populations that have the same variance. The homogeneity test used in this study is the F (Fisher) test using Microsoft Office Excel.

The results of the homogeneity test obtained the first variance value is 53.34 and the second variance value is 65.61; $F_{count}=1.230$; $F_{table}=1.7936$. From these results it can be concluded that $F_{count} < F_{table}$ so that H_0 is accepted or the two classes come from a homogeneous population.

3.4 Hypothesis testing

Hypothesis testing in each study is used to prove the truth of what has been formulated. The test used to test the hypothesis in this study is the t -test to find out the difference between the experimental group and the control group.

Based on the test criteria, the value of $t_{count}=9.32 > 1.671 = t_{table}$. It can be concluded that there is an influence of a realistic mathematics approach to students' mathematical abilities.

3.5 Discussion of Research Results

The results of the analysis test prove that the realistic mathematics approach model influences students' mathematical communication abilities. The hypothesis test also shows that the realistic mathematics approach model influences the communication skills of students' mathematical problems. This shows that the realistic mathematics approach given by the teacher influences the ability of students' mathematical problems.

Based on the analysis tests and hypothesis tests that have been carried out, it shows that the statistical hypothesis proposed in this study can be accepted. Then there is the influence of a realistic mathematics approach to the communication skills of students' mathematical problems. This can be shown from the results of the normality test, namely $L_{count} < L_{table}$ so that the data is normally distributed, from the results of the homogeneity test, namely $F_{count} < F_{table}$, so that the data from the two groups are homogeneous. In addition, the hypothesis test also showed that there was a difference between the control class which was not given treatment and the experimental class which was treated using a realistic mathematics approach.

The realistic approach model is a problem-based learning model requiring students to have the ability to formulate, apply and interpret mathematical knowledge in everyday life and help solve mathematical problems is one that influences mathematical problemsolving abilities. In solving a problem faced, students must first know and understand the points that are known and asked about the problem, then students must be able to plan a solution to solve the problem, carry out according to plan and draw conclusions from the problem, therefore, a realistic mathematics approach model that influences the communication skills of students' mathematical problems.

4 CONCLUSION

Based on the results of the research that has been done, it is proven that there is a significant influence between the realistic mathematics learning model and the

mathematical communication skills of class VIII students of SMP Negeri 2 Cikarang Barat. This research is a posttest control group design research. Implementation of research on this type of design, namely the class is divided into two groups, namely the control class and the experimental class. both groups were given treatment. the experimental group was treated using a realistic mathematics approach learning model whose effectiveness would be tested and the control class was also treated with a conventional learning model. well understood by students. These results indicate that the realistic mathematics approach model influences the communication skills of students' mathematical problems. students who were given treatment, namely by using a realistic mathematics approach model experienced an increase in their ability to communicate mathematical problems, but students who were not given treatment, did not experience significant changes in their ability to communicate mathematical problems. This matter

Because in the process of solving mathematical problems, students must be able to formulate, apply and interpret problems that occur in everyday life so that students need to be given a realistic mathematics approach model.

This study shows that there is an influence of the realistic mathematics approach model on the communication skills of students' mathematical problems. This can be shown from the results of the normality test in the control class, namely $L_{\text{count}}=0.144 < 0.154 = L_{\text{table}}$ and the normality test in the experimental class, namely $L_{\text{count}}=0.146 < 0.149 = L_{\text{table}}$, so that the data is normally distributed, then from the results of the homogeneity test, namely $F_{\text{count}}=1.17 < 4.14 = F_{\text{table}}$, so the data from the two groups is homogeneous. In addition, the hypothesis test also showed that there was a difference between the control class which was not given treatment and the experimental class which was treated using a realistic mathematics approach.

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