

Analysis of The Effect of Problem Based Learning on Mathematical Problem Solving Abilities Based Gender at SMP Negeri 1 Rantau Selatan

Sri Endang Wahyuni

Mathematics Education Student, Faculty of Mathematics and Education, State University of Medan (20221), 20221 North Sumatera, Indonesia
Email: sriendang826@gmail.com

Diterima 1 November 2021, disetujui untuk publikasi 2 Desember 2021

Abstrak. *This study aims to : 1) describe what the students mathematical problem solving ability using problem based learning model better than using conventional method, 2) describe the differences in the mathematical problem solving ability between male and female using the problem based learning model. This research uses quantitative research. Type of research is a semi experiment/quasi experiment. This research conducted in SMP Negeri 1 Rantau Selatan, Labuhanbatu. The time of research conducted on second semester academic year 2020/2021. The research instrument instead to obtain a valid instrumen like validity test and realibility test. The result of the research are the mathematical problem solving ability of students who are taught using a problem based learning model is better than students who are taught using a conventional learning method. The mathematical problem solving ability of students who are taught by problem based learning model in female is better than the mathematical problem solving abilities of students in male. Gender can not affect to mathematical problem solving ability with uses problem based learning and conventional method. (Jurnal Fibonacci, 02(2): 62 - 66, 2021)*

Kata Kunci: Problem Based Learning, Mathematics Problem Solving Ability, Gender

Introduction

Education is an activity carried out by humans to change themselves into better individuals. Education is very important role in the process of building the quality of a nation. The educational process occurs in the family, school, and community. Education is one aspect of improving human resources which is continuously improved and renovated from all aspects. This can be seen from the education implementation system which emphasizes not only the quantity aspect but also the quality aspect. Efforts to improve in terms of quality always made from time to time, both facilities and infrastructure. Professionalism of educators, as well as improving the quality of students.

Mathematics is the study of quantity, structure, shape, and changes in a number. Teaching and learning activities are the main activities for every human being. Even learning is a necessity for every human being to continue with life. Mathematics with its various roles makes it a very important science, and one of the roles of mathematics is as a thinking tool to lead students to understand the mathematical concepts they are studying. Mathematics is one of the subjects taught at every level of education both in elementary schools, junior high schools, senior high schools, and colleges. So that mathematics is

seen as a science of ways of thinking to understand the world around.

Mathematical problem solving ability is a means to hone the ability to think logically, creatively, analytically, and critically, so as to develop a mindset in solving a mathematical problem. The Mathematical problem solving ability is the ability that a person has and solves mathematical problems related to the real world. There are four indicators in solving the problem, namely understanding the problem, Devising a Plan, Carrying out the Plan, and looking back.

Literature Review

Mathematical Critical Thinking Ability

A. Problem Based Learning

Problem based learning is a learning model that helps students understand a material, which allows students to develop thinking skills can be optimized through the group work process in the problem based learning model, so that students can empower, hone, test and develop their thinking skills on an ongoing basis. Success in solving a mathematical problem can not be separated from how a person can understand the meaning of the problem given and is able to translate and interpretation the language and symbols of mathematical symbols.

Translating a problem into mathematical symbols, ideas or concepts as well as mathematical language and relations is one of the characteristics that exist in mathematical communication skills.

Problem based learning has the advantage to be selected and applied in schools. The advantages of this model are that students are encouraged to have the ability to solve problems in real situations, students have the ability to build their own knowledge in learning activities, learning focuses on problems so that material that has nothing to do with students does not need to be studied (reducing student burdens by memorizing and storing information), scientific activity occurs in students through group work, students are accustomed to using sources of knowledge (library, internet, interviews and observations), students have the ability to assess their own learning progress, students have the ability to assess their own learning progress, students have the ability to communicate scientific activities in discussion activities or the percentage of their work and individual student learning difficulties can be overcome through group work.

The goal of problem based learning is problem solving. In the context of mathematics, a problem is something that can not be solved or solved by routine procedures or procedures that have been exemplified before. Problem solving activities are cognitive activities that contain a combination of knowledge and skills. Mathematical problem solving ability to analyze and use them in different situations. Problem solving also helps students improve their ability to analyze and use them in different situations. Problem solving also helps students learn about facts, skills, concepts and principles of illustration of the application of mathematical objects and the relationship between these objects.

B. Mathematical Problem Solving Ability

Polya (Hartono, 2014: 2) argues that there are two kinds of mathematical problems, namely: (1) problems to find where we try to construct all types of objects or information that can be used to solve these problems, and (2) problems to prove where we will show one of the truths of the statement that is, the statement is true or false. Problems of this type prioritize the hypothesis or conclusion of a theorem whose truth must be proven.

According to Sumarmo, "Problem solving is a process to overcome difficulties encountered to achieve a desired goal. Solving a problem is a basic activity for humans because in carrying out human life, you will definitely face the problems. mathematics education experts claim that a problem is a statement that must be answered or

responded to, but they also claim that not all automatic statements will be a problem.

Mathematics is one of the subjects included in the primary and secondary education curriculum. According to Permendiknas Number 22 of 2006 (Depdiknas, 2006) states that mathematics lessons aim to make students have the ability to: (1) understand mathematical concepts, explain the relationship between concepts and apply concepts or algorithms in a flexible, accurate, efficient, and precise way, in solving problem; (2) using reasoning on patterns and properties, performing mathematical manipulations in making generalizations, compiling evidence, or explaining mathematical ideas and statements; (3) problem solving, which includes: the ability to understand problems, design mathematical models, solve models and interpret the solutions obtained; (4) communicating ideas with symbols, tables, diagrams, or other media to clarify the situation or problem, and (5) having an attitude of appreciating the usefulness of mathematics in life, namely: having curiosity, attention, and interest in studying mathematics and being resilient and confident in problem solving.

C. Gender

Basically, humans are created differently, one of which is gender differences namely men and women. Of these differences, the teacher must realize and pay attention that each gender has its own characteristics. Regarding gender differences, gender is the formation of the attitudes of each male students and female students from social environment. Some researchers explained that men are more developed in their left brain so that they are able to think logically, think abstractly, and think analytically, whereas in women their right brain is more developed, so that they tend to be active in artistic, holistic, imaginative, intuitive thinking, and some visual abilities.

Gunarsah in Davita (2020: 3), the differences in the specificities of male and female in terms of psychology. The description above indicates the need to conduct research on the profile of mathematical reasoning in solving problems by paying attention to gender differences.

Gender differences not only result in differences in ability in mathematics, but the way of obtaining mathematical knowledge is also related to gender differences. Some researchers believe that the influence of gender factors (the effect of differences in male and female) in mathematics is due to biological differences in the brains of male and female which are known through observations, that female generally excel in the fields language and writing, while male are

superior in mathematics because of their better spatial abilities. Experts generally agree that learning outcomes caused by gender differences are the result of gender bias in home and school environment. Although male and female have different characteristics, teachers must give students the same opportunities and encouragement in learning, so that students do not feel differentiated in the learning process.

Research Methodology

This Research will be conducted in SMP Negeri 1 Rantau Selatan, Labuhanbatu. The time of this research will be conducted on second semester academic year 2020/2021. The population in this research is all students of class VIII grade students of SMP Negeri 1 Rantau Selatan. Sampling in this research is VIII – 1 grade and VIII – 3 grade students of SMP Negeri 1 Rantau Selatan in Academic Year 2020/2021

The sample is used to get a picture of the population. As a basis for determining the number of samples in this study, it is adjusted to the opinion of Sugiyono (2017: 126) who argues that “the number of sample members is often expressed by the sample size that is expected to 100% represent the population is the same as the number of members of the population itself”. If the number of samples is bigger to the population, then the chance of generalization error is bigger and vice versa, the smaller the sample size is from the population, the bigger the generalization error will be.

This type of research is a semi experiment/quasi experiment. This study aims to the determine the effect of the Problem Based Learning model on students' Mathematics Problem Solving Ability in class VIII of SMP Negeri 1 Rantau Selatan on the Statistic Material. Therefore, this study uses an Two Way ANOVA test, because you want to see whether or not the Problem Based Learning model affects students' Mathematical Problem Solving Ability in the Statistic Material.

Data Collection Techniques. Data collection techniques are the most important step in research, because the main purpose of this research is to get data (Sugiyono, 2018: 308). In this study, the data collection technique was in the form of an essay test given to student.

Research Instrument Test. The instrumen test is intended to obtain a valid instrumen so that the instrument captures the data needed to answer the problem under study with the research objectives being formulates. After the trial, the

next stage is the testing phase for validity and realibility.

Hypothesis Testing. The data obtained from the measurement results are then analyzed to determine whether the results are in accordance with the expected hypothesis. As for answering the research hypothesis used non parametric statistic. Non Parametric statistic are used to test a two – sampled hypothesis when the data is in the form of interval or ratio can not normal distribution.

Result and Discussion

The Result of Mathematical Problem Solving Ability

The student's initial mathematical ability is obtained from the results of the test with the material that has been studied before. In this case, the test problem is given in the form of a description of 5 questions. The Preliminary Math Ability Test aims to determine the initial math abilities of students grouped into high, moderate, and low-skilled student s before learning takes place, as well as knowing the average similarities between the Experiment class and the Control class.

Table. The Average and Standard Deviation

Kelas	N	MEAN	SD
Experiment	30	73.333333	13.21789105
Control	30	73.33333	9.58926603

Furthermore, to be able to conclude how the initial mathematical ability of students in both classes statistically then first conducted a normality test and homogeneity test then test the average similarity of the initial mathematical ability. The following are outlined the results of the test of the Data of Early Mathematical Capabilities.

The Result Of Mathematical Problem Solving Ability

Students' mathematical problem-solving abilities are derived from the results of pretests and posttests given in Experimet classes and Control classes. The pretest and posttest results for both classes are described as follows.

Table The Result of Pretest

STATISTICS	LEARNING	
	EXPERIMENT	CONTROL
Σ	2380	2300
$\bar{X}$	79,33333333	76,66666667
SD	24,34427403	21,06366922

Based on the posttest results given after learning in both classes, then the calculation of averages and standard deviation test results of mathematical problem solving skills of students. The posttest results can be seen in the following table below

Table The Result of Posttest

STATISTIC S	LEARNING	
	EXPERIMENT	CONTROL
Σ	2360	2380
$\bar{X}$	86.33333333	79.33333333
SD	16.17433756	24.34427

Improvement Of The Result Of Mathematical Problem Solving Ability

The average improvement in the results of mathematical problem-solving tests obtained from the results of pretest and posttest in the Experiment class given the Problem Based Learning learning model can be seen in the following Table below

Table The Result of Mathematical Problem Solving Ability

STATISTICS	LEARNING	
	PRETEST	POST TEST
Σ	2380	2360
$\bar{X}$	79.33333333	86.33333333
SD	24.34427403	16.17433756

Table showed an increase in the results of students' mathematical problem-solving ability tests in the experimental class where the average posttest result was higher than the average pretest result of $86.33 > 79.33$. This showed an average increase in the results of mathematical problem-solving tests in experimental class.

Hypothesis

Based on the results of normality and homogeneity tests on mathematical problem-solving ability data obtained that pretest and posttest data on mathematical problem solving skills of both classes come from populations that are normal distributed and have homogeneous variance, then further analysis of learning models on students' mathematical problem-solving abilities as well as the interaction between learning and the initial ability of mathematics students to mathematical problem solving skills. Students' mathematical problem-solving abilities are grouped into three categories: students who have early math skills are high, medium and low. Here's the hypothesis.

First Hypothesis

The first hypothesis is to analyze students' mathematical problem-solving abilities between Problem Based Learning models.

Ho: The mathematical problem-solving skills of students who are taught using the Problem Based learning model are the same as students who are taught with a direct Conventional Method

H1: The mathematical problem-solving abilities of students who are taught using Problem Based Learning models are higher than students who are taught with Conventional Method.

Hypothesis Statistics:

$$H_0 : \mu_1 = \mu_2$$

$$H_1 : \mu_1 > \mu_2$$

μ_1 = Mean of Mathematical Problem Solving Ability with Problem Based Learning

μ_2 = Mean of Mathematical Problem Solving Ability with Conventional Method

Criteria Hypothesis Test :

- If the value sig (P – Value) $< \alpha$ ($\alpha = 0.05$), H_0 Rejected
- If the value sig (P – Value) $\geq \alpha$ ($\alpha = 0.05$), H_0 Accepted

The Second Hypothesis

The second hypothesis is to analyze the interaction between Problem Based Learning and the initial ability of mathematics students to mathematical problem-solving abilities.

H_0 : There is no interaction between the Problem Based Learning model and the student's initial mathematical ability to mathematical problem-solving skills

H_1 : There is an interaction between the Problem Based Learning model and the initial ability of mathematics to the ability to solve mathematical problems

Hypothesis Statistic

$H_0: \alpha\beta = 0$

$H_1: \alpha\beta \neq 0$

Criteria Hypothesis Test :

- If the value of sig (p-value) $< \alpha$ ($\alpha = 0.05$), so H_0 Rejected
- If the value of sig (p – value) $\geq \alpha$ ($\alpha = 0.05$), so H_0 Accepted

Hypothesis testing that has been formulated is analyzed using the Two-Track Variance Analysis test with statistics F according to the formula and criteria set.

Conclusion

Based on the results of research and data processing, the following conclusions like :

1. The mathematical problem solving ability of students who are taught using a

problem based learning model is better than students who are taught using a conventional learning method.

2. The mathematical problem solving ability of students who are taught by problem based learning and who are taught Conventional Method Can not Affect Gender. Description between learn with gender 4.16% for number 1; 3.57% for number 2; 3.70% for number 3; 3.70% for number 4; and 3.84% for number 5. In addition to research findings show that Gender can not affect to learning process with uses Mathematical Problem Solving Ability.

References

- Arikunto, S. (2013). *Prosedur Penelitian Suatu Pendekatan Praktik*. Jakarta : Rineka Cipta
- Coberima, Maria. (2020). *Pengaruh Problem Based Learning Terhadap Kemampuan Komunikasi Matematis Siswa Kelas XI SMA*. Volume 2 no. 1. Universitas Nusa Cendana
- Dewi, Nurul Aulia. (2021). *Pengaruh Penerapan Pembelajaran Kooperatif Tipe STAD Terhadap Kemampuan Pemecahan Masalah Matematika*. Volume 15. No. 1. Bandung
- Fatimah, Ade Devi. (2020). *Upaya Peningkatan Kemampuan Pemecahan Masalah Matematis Siswa MTS Melalui Model Pembelajaran Kooperatif Tipe STAD*. Volume 1. No 1
- Fernando, dkk. 2020. *Studi Analisis Keterampilan Proses Sains Melalui Penerapan Model Pembelajaran Cooperative Ditinjau Dari Perspektif Gender*. Voume 19. No 20. Uinsuska Riau
- Kamauko, Nofita. M. (2020). *Efektivitas problem based learning untuk meningkatkan kemampuan pemecahan masalah siswa pada materi trigonometri*. Volume 4. No. 1. Universitas Nusa Cendana
- Latifah, Syntra Siti. (2020). *Think Pair Share Sebagai Model Pembelajaran Kooperatif Untuk Peningkatan Kemampuan Pemecahan Masalah Matematis*. Volume 9. Nomor 1