



THE EFFECT OF *THE PROBLEM BASED LEARNING MODEL* ON MATHEMATICAL PROBLEM-SOLVING ABILITY

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Abstract

This research aims to determine the effect of the Problem Based Learning (PBL) learning model on students' mathematical problem-solving abilities. The research method used is a quasi-experimental method. The sampling technique uses simple random sampling technique. The instrument in this research was a test of mathematical problem-solving ability in the form of an essay with 10 questions. Data analysis techniques were carried out using correlation tests and simple regression tests. The results of the research show that 1) there is a positive influence of the Problem Based Learning learning model on the mathematical problem solving abilities of students at SMK Putra Pelita Tenjolaya 2) the average value of students' mathematical problem solving abilities on the main material of the Linear Program which is taught using the Problem Based Learning learning model (PBL) is greater than the average value of students' mathematical problem solving abilities who use the Expository learning model.

Keywords: *Problem Based Learning, Problem Solving Ability.*

INTRODUCTION

Education has the aim, among others, to optimize all the potential of students in order to create skills as a provision when in the community, which will later become a valuable asset for the nation and state. Thus, education is considered important as a perpetrator of change and development in society. In real situations and conditions, the potential of students is still considered not optimal to be achieved by education, especially in formal education. In formal education, mathematics is one of the subjects that until now is still considered difficult by students. The results of tests and evaluations in 2018 conducted by the *Programme for International Students Assessment* (PISA) reported that the average math score reached 379 with the *Organisation for Economic Cooperation and Development* (OECD) average score of 487 (kemendibud.go.id). The same thing was also explained by Putri, et al (2022:164) based on the results of the 2018 PISA test, Indonesia ranked the bottom 6 or ranked 74 out of 79. Therefore, PISA states that Indonesia is still relatively low in material mastery

Basically, learning should be student-centered. Students are no longer required to listen and write given by the teacher, but students are also the ones who seek information from the material they will learn. In addition, students must learn according to their own ways and learning styles, not follow the teacher's rules completely. This encourages students to think creatively and be responsible for what they learn. Thus, students can solve problems faced both related to school and problems that occur in community life.

However, in reality, based on observations in various schools in Bogor Regency, learning is still teacher-centered, meaning that learning is only fixated on what is conveyed by the teacher and is less related to the daily lives of students. Many

teachers only look at the results of students' work, not the process, not many students are blamed for the answers because the way of working is different from that given by the teacher. In addition, teachers do not carry out meaningful learning because students only listen, record and memorize, as a result of which students' learning patterns tend to be passive and students' creativity in solving problems is hampered so that learning outcomes tend to be low.

This is contrary to the opinion of Hamalik (2014:171) "effective learning is learning that provides opportunities for students to learn independently, so that in carrying out learning activities students are able to gain their own understanding". So, effective learning can be carried out if teachers can choose a learning method or approach that helps develop students' mathematical problem-solving skills. To teach students according to their learning methods and styles so that learning goals can be achieved optimally with various learning models (Saad & Ghani, 2008: 120). In practice, teachers must remember that there is no single learning model that is most appropriate for all conditions and situations. Therefore, in choosing the right learning model, it must pay attention to the condition of the students, the nature of the teaching materials, the facilities and media available and the condition of the teacher himself.

There are several factors that affect the success of students in solving a math problem. Among them are factors from within (*internal*) and from outside (*external*) of the students. Factors from within individual students include physical factors, psychological factors and so on, while external factors include family factors, school environment and community environment. One of the causes of difficulty in solving mathematical problems is factors from outside the students, namely factors in the school environment that can interfere with learning activities that result in learning difficulties in solving a problem (Rusman, 2013: 124). The students' views when learning is starting to get bored because the learning model used is always the same in the form of lectures. So that students are saturated in the process of teaching and learning activities which causes students' mindsets to not develop. Thus, in schools, it is necessary to develop a learning model that can improve students' mathematical problem-solving skills.

The Problem Based Learning (PBL) learning model is a learning model in which students are faced with a real problem that students have experienced (Ardianti, 2021:28) and the Expository learning model is a learning model that emphasizes the process of verbally delivering material or lesson materials from a teacher to a group of students with the intention that students master the material optimally (Sanjaya in Siswondo & Agustina, 2021:35), these two learning models are usually used due to limited time in teaching, can be used in a large number of students and are considered effective because they can control the mastery of students' subject matter and can complete quite a lot of subject matter. Based on this description, the researcher is interested in conducting research on the influence of *the problem-based learning* model on the mathematical problem-solving ability of students of SMK Putra Pelita Tenjolaya.

RESEARCH METHODS

The type of research used in this study is quantitative using *an experimental* method approach. According to Sugiyono (2019:111) that, "the experimental method is a method carried out by experiment, which is a quantitative method, used to determine the influence of *independent variables (treatment)* on *dependent variables (results)* under controlled conditions". As for the implementation, the researcher

involved two groups, namely the experimental group that was treated with *the Problem Based Learning* model and the control group that was treated with expository learning. From each of these groups, it is then based on the level of mathematical problem-solving ability that students have.

The affordable population used in this study is 70 students in class X of SMK Putra Pelita Tenjolaya with a sample of 60 students divided into 2 classes, namely experimental and control classes, using *simple random sampling techniques*, where each subject in the population has the same opportunity to be selected as a sample member (Morissan, 2016: 45). Sampling in this study was carried out by voting.

The data collection technique in this study was carried out using the results of the mathematical problem-solving ability test from both groups of students with the same test, which will be carried out at the end of the subject matter that has been studied (*post test*) of linear program material that has been treated with the *Problem Based Learning* model (experimental group) and those who have been treated with an expository learning model (control group) consisting of 10 description questions where each question item is given a maximum weight of 10. The test was carried out on class X students of SMK Putra Pelita Tenjolaya. This final test is the determinant of the capacity that students have after learning. The instrument has been tested first on students outside the research sample to determine whether each question item is suitable for use or not.

The data analysis techniques in this study include: (1) descriptive analysis by processing and analyzing data, (2) conducting data analysis requirements tests with normality tests and homogeneity tests, (3) conducting hypothesis tests by comparing data between two sample groups or comparing between experimental groups and control groups.

RESULTS AND DISCUSSION

Table 1. *Comparison of Students' Mathematical Problem-Solving Skills between the Experimental Class and the Control Class*

Statistics	Experimental Classes	Control Class
Lowest Score	60	35
Highest Score	100	85
Mean	75,30	60,63
Median	84	62,50
Mood	82,95	64,66
Variance	67,80	122,18
Baku Junction	8,23	11,05

Based on the above data from 30 students in the experimental class, an average score of x was obtained higher than the control class which also consisted of 30 students. Likewise with the median value and the mode value, in the experimental class a higher value was obtained compared to the control class. The lowest and highest scores in the control class were lower than in the experimental class, then the mean, median and mode values in the control class did not show a very large positive, meaning that the number of students who scored below average in the control class was more and the number of students who scored above average.

So it can be found that the average mathematical problem-solving ability of the experimental class students is higher than the average mathematical problem-solving ability of the control class students. It can also be seen that the mean,

median and mode in the experimental class show a positive comparison which means that the number of students who scored below average in the experimental class was less than the number of students who scored above average.

From the data from the processing and research results, the average value for the experimental group with $\bar{X}_1 = 75,3$ variance $S_1^2 = 67,80$ and standard deviation for the control group with $S_1 = 8,23$ $\bar{X}_2 = 60,23$ variance $S_2^2 = 112,18$ and standard deviation was obtained to test the research hypothesis, then the average trial was used with free samples (not paired). $S_2 = 10,59$

Based on the results of the t-test calculation, a value of 6.1898 was obtained while the value was 2.0021. Because of the rejection, thus it can be concluded that there is a significant influence of students' mathematical problem-solving ability on the subject of linear programs that use $t_{hitung} > t_{tabel}$, H_0 the *Problem Based Learning* (PBL) learning model from the expository learning model. From this conclusion, it is said that in this study, the *Problem Based Learning* (PBL) learning model is better than the expository learning model.

The Influence of the *Problem Based Learning* Model on Mathematical Problem-Solving Ability

After conducting research at SMK Putra Pelita Tenjolaya, there are several things that cause students' low mathematical problem-solving skills. Mathematics is often assumed with various things that have negative connotations, ranging from mathematics as a difficult science, the science of memorization about formulas, related to the speed of calculation to the boring and rigid science. The teacher's mistake in the learning process is that the teacher teaches mathematics in a monotonous, uninteresting way, and lacks an innovative learning model. This kind of situation further distances students' interest in learning mathematics. Seeing that students' mathematical problem-solving skills are still low, schools and teachers strive for a learning model that helps students in learning. The learning model in question is *Problem Based Learning*.

Based on the results of descriptive analysis, both mean, median and mode, it showed that there was an influence between the experimental group and the control group. This is shown by the observation that the mathematical problem-solving ability in the experimental group that uses the *Problem Based Learning learning model* is higher than the control group that uses the expository model. These differences in abilities can be seen from the average mathematical problem-solving skills of students obtained. In the hypothesis test at a significant level of 5%, $6.19 > 2.01$ were obtained, then H_0 was rejected and H_a was accepted, so there was a positive influence of the *Problem Based Learning* learning model on the mathematical problem-solving ability of SMK Putra Pelita Tenjolaya students. Thus, from the results obtained above, it can be concluded that learning using the *Problem Based Learning* model is significantly better than the group of students who are taught with the expository learning model on the subject of linear programs.

This is in accordance with the opinion of Yelva, et al. (2019: 639) "the mathematical comprehension ability of students who obtain *Problem Based Learning learning* is significantly better than the mathematical comprehension ability of students with the expository learning model". According to the opinion of Intani, et al (2016:13) "the mathematical problem-solving ability of students who use *Problem Based Learning* is better than the expository model". Supported by Elda & Dewi (2015:56) "The *Problem Based Learning* Model on students' mathematical problem-solving skills fosters a more critical and creative mindset". According to

Aristyaningrum (2015:72), "The *Problem Based Learning* model is better than the mathematical problem-solving ability of students by using the expository learning model because it increases curiosity and is active in solving mathematical problems". From several experts' opinions regarding the influence of the *Problem Based Learning* learning model, it can be concluded that the *Problem Based Learning* learning model is better than the expository learning model.

Based on the description above, it can be said that the use of the *Problem Based Learning* learning model can spur to foster students' critical patterns in improving their mathematical problem-solving skills. With this learning model, it can motivate students to play an active role in the learning process. The application of this model is expected to help and make it easier for students to follow and understand learning, especially mathematics lessons, in a fun way and increase students' creativity.

CONCLUSION

Based on the results of the study, it was concluded that there was a positive influence of the *Problem Based Learning* (PBL) learning model on the mathematical problem-solving ability of students of SMK Putra Pelita Tenjolaya Selatan and the average value of students' mathematical problem-solving abilities in the subject matter of the Linear Program taught using the *Problem Based Learning* learning model (PBL) is greater than the average score of the students' mathematical problem-solving skills taught using the Expository learning model.

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