Problem Solving Learning Model as an Alternative to Mathematics Learning that Can Foster Student Learning Independence at SMK Panca Budi

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Abstract. *The Problem-Solving Learning Model is one of the learning models that can develop problem-solving skills and student learning independence where this model is developed based on Polya theory known as problem-solving steps, namely: identifying problem information/understanding problems, planning problem-solving strategies, using problem-solving strategies and re-examining solutions or solutions to problems that have been generated. The Use of the Problem-Solving Learning Model to Improve the Problem-Solving Ability of Pancabudi Private Vocational School Students for the 2023/2024 Academic Year. The purpose of this research is to determine the effectiveness of learning using the Problem-Solving learning model. This research is located at SMK Swasta Pancabudi where the class applies the Problem Solving learning model which will be compared with different classes using the classical learning model.*

Keywords: *Learning Model, Problem Solving, SMK Panca Budi.*

INTRODUCTION

The learning that has been carried out so far is learning that is focused and prioritized by the teacher. Students or students do not have the opportunity to find alternative solutions to problems related to learning material so they are passive and wait for information to come from the teacher without wanting to find their learning material related to the problems presented in the problems presented related to mathematics material or subjects. Solving skills in basic mathematics are very instrumental in solving

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a problem of everyday life related to mathematics. The concept of knowledge that must be mastered first is basic mathematics so that mathematics knowledge a hierarchical or interrelated between the material that is in the same way as the previous material. The problem that arises as a result of learning is that there is a deficiency in maximizing the learning process so that in delivering material from learning tends to generalize without considering for participants who are not able. Learning should be prepared so as to achieve maximum learning objectives. Some problems that are often encountered when delivering learning are the inability to solve a problem contained in the problem so that basic mathematical skills are not mastered and have an impact on not achieving the desired learning results or objectives.

LITERATURE REVIEW

Mathematics learning prioritizes mathematical problem-solving ability as its heart in mathematics learning itself. With the ability to solve mathematical problems possessed by students, students will have basic skills that are meaningful more than just the ability to think and can make solving strategies that can be made from problems that will be given next. To become a good problem solver, students must have a strong base in terms of conceptual understanding of the subject matter to be given, as expressed by Ormrod (2008: 400). Students usually solve problems more effectively if they have a comprehensive knowledge base and are well integrated and relevant. Problems are often encountered in life. Sometimes in vocational education, there are problems for the lower class, not a problem for the higher class. A problem is a conflict in completing a learning activity. But problems must be solved so that the thinking process continues to develop. The more students who can solve problems in each math problem, the more varied students will be in solving math learning problems in any form that is routine or non-routine. Problem-solving ability concerns some of the skills possessed by a problem solver, while the skills that need to be developed to improve problem-solving abilities are as follows: understanding problems, planning problem-solving strategies, implementing problem-solving strategies, and re-checking the correctness of problem-solving. The above statement is in line with the opinion (Ruseffendi, 1991) Problem-solving is a higher degree of learning and is more complex than rule formation. Applying the formula $c^2 = a^2 + b^2$ to a right triangle is learning rule formation (application) but this is not the type of problem -solving. Something is a problem for a person when it is new according to the

condition that solves the problem (the stage of his mental development) and he has knowledge of the prerequisites. The application of the Problem-Solving method through the learning process so that learning becomes not boring. The expected learning model is certainly one that can maximize the results of the learning. The problem-solving method provides solutions to learning that are often used so that learning can be interpreted where students can maximize the objectives of the learning. The results of learning mathematics can be applied in everyday life. So that learning can be done optimally. The steps of applying the Problem Solving method, for students who are not yet able to think at a higher level can be designed as follows:

1. There is a clear problem to solve, this problem must grow from students according to their level of ability.
2. Find data or information that can be used to solve the problem. For example, by reading books, asking, discussing, and others.
3. Establish a provisional answer to the problem. With this answer, of course, based on the data obtained in the second step above.
4. Testing the correctness of the answer while in this step must solve the problem so that it is sure that the answer is appropriate or not suitable To test the correctness of this answer, other methods such as demonstrations, tasks, discussions, and others are needed
5. Concluding means that students must conclude the answer to the problem.

Using the teaching steps of the Problem-Solving method makes it easier for teachers to carry out the learning process in class so that in presenting problems done by students later it will be carried out by the problem-solving procedure. In line with the above opinion, problem-solving ability is an important ability possessed by students by having good problem-solving skills, students will become good problem to make students can be solvers in everyday life

RESEARCH METHOD(S)

This research is a quasi-experimental. A quasi-experimental method is a design that consists of a control group but does not fully function to control outside variables that affect the conduct of the experiment. The researcher in this case grouped samples based on preconceived classes and existing classes. So this research uses pseudo-experimental methods with existing classes without forming new classes. This study aims to

examine the problem-solving ability and learning independence of students who are influenced by learning using the Problem-Solving learning model.

The research was conducted at SMK Swasta Pancabudi located in Medan City, Sei Sikambing District, Jl. Jend. Gatot Subroto Km 4.5 Medan with a research schedule starting from January to April 2024. The population in this study is the overall number of students in SMK Swasta Pancabudi consisting of SMA and SMK majors. Based on observations made by the research team with teachers at SMK Swasta Pembangunan Pancabudi, the overall sample data for class X-1 was 36 students and class X-2 was 34 students. Both classes will be chosen which class will be used a class that will be given or applied to learn using problem-solving and the other class becomes a conventional class. After the draw, the class that will become an experimental class or the class that will be given problem-solving learning is the second class, namely the first class symbolized by class X-1 (experiment). Data collection techniques are methods used to data as real material and used in the data analysis stage. Data collection techniques used to collect real material used in research. Data collection techniques used for quantitative research are as follows: observation, questionnaire, interview, documentation test, and so on.

Data collection is done to ensure valid data and theories that correspond to reality. (Sugiyono, 2016) said the data collection technique is the most strategic step in research by the real conditions in the research place so that the purpose of data collection is obtained according to the needs in the stages of the research process. In conducting this research, the research used data collection techniques, namely in the form of interviews, initial tests, and final tests then documentation. In the study, a hypothesis will be formulated that can be tested using the t-test (independent) and the closeness test called the linear correlation test (Product Moment correlation). Independent Hypothesis Test (t-test) The t-test used a hypothesis test with a significant level of 0.05. The t-test is one of the parametric statistical tests so it has assumptions that must be met, namely mortality and homogeneity. The calculated t value must also meet the test criteria that will be compared with the table t value. The t-test conducted in a study aims to observe whether or not there is a difference between the control class and the experimental class if it is associated with mathematical problem-solving abilities where the control class is

given conventional or classical learning while the experimental class is given treatment by applying to learn using a problem- solving learning model guided by Polya theory.

FINDINGS AND DUSCUSSION

This study used an experimental class and a control class where both were given instruments or data collectors that were examined at the beginning before learning and at the end after learning. The goal is to be known to be effective in improving mathematical problem solving skills in the experimental class or there is no significant improvement between the experimental class and the control class. The control class is a class that still maintains classical learning in its teaching and learning activities, in this case using the lecture method by providing examples of questions that can be directly analogized by students to answer questions similar to the example questions presented. In this case, learning is included in classical learning by using lectures as a teaching method. The control class given the questions will be the same as the pretest questions given to the experimental class.

Table 1. Experimental Class Pretest Data

Interval Pretest Value	Frekuency	Presensi	Presensi in Persen
50 -56	2	0,05	0,5%
57-63	7	0,19	1,9%
64-70	14	0,38	3,8%
71-77	0	0	0%
78-84	6	0,16	1,6%
85-91	7	0,19	1,9%

From Table 1 it can be seen that the experimental class pretest data is divided into 6 classes with the length of class 7 starting from the first class 50-56 with frequency 2, second class 57 – 63 frequency 7, third class 64 – 70 frequency 14, fourth class 71-77 frequency 0, fifth class 78 – 84 with frequency 6 and sixth class 85 – 91 with frequency 7. For attendance 0.5%, 1.9%, 3.8%, 0%, 1.6%, and 1.9% respectively. It can be seen that the most scores obtained by students in the experimental class are in the interval 64 – 70, which is as many as 14 people.

Table 2. Control Class Pretest Data

Interval Pretest Value	Frekuency	Presensi	Presensi in Persen
50 -56	5	0,147	1,47%
57-63	5	0,147	1,47%
64-70	11	0,323	3,23%
71-77	3	0,088	0,08%
78-84	5	0,147	1,47%
85-91	5	0,147	1,47%

Above, it can be noted that the pretest scores that most often arise from the control class are at the interval of values 64-70, which is as many as 11 people, while the pretest scores that are slightly obtained by students in the control class are at intervals 71-77, which is as many as 3 people.

Table 3. Experimental Class Postes Data

Interval	Frekuency
65-70	4
71-76	2
77-82	7
83-88	3
89-94	11
95-100	9

From Table 4.13. The values obtained from the experimental class posttest are as follows. For the interval of values 65-70 obtained a frequency of 4 students, grades in the interval 71-76 obtained a frequency of 2 people, values in the interval of 77-82 obtained by students with a frequency of 7 students, interval grades from 83-88 obtained by students with a total of 3 people, scores in the interval 89-94 obtained by 11 students and grades contained in the interval 95-100 there were as many as 9 people. For more details, the posted value data in the experimental class are presented in the form of graphs below in Figure 4.3

In this study, the experimental class was also given posttest questions after being given conventional learning with expository methods where researchers wanted to see the

improvement that occurred when learning still maintained old learning in the control class.

Table 4. The Postes Value Data For The Control Class Are As Follows:

Interval	Frekuenci
50-57	2
58-65	6
66-73	4
74-81	14
82-89	1
90-97	5
98-105	2

In table 4.15. Above the post value of the control, class is presented in the form of a grade interval with grouping values at intervals, it can be narrated for grades 50 – 57 obtained by 2 students, for grades 58-65 obtained by 6 students, for grades 66 -73 obtained by 4 students, grades 74 – 81 obtained by 14 students, grades 82 – 89 obtained by 1 student, For grades 90 – 97 obtained by 5 students and grades 98 – 105 obtained by 2 students.

CONCLUSION AND RECOMMENDATION

Based on the results of data analysis and research findings during Problem-Solving learning, several conclusions are obtained which are answers to the questions asked in the problem statement. These conclusions are as follows:

1. There is an increase in the mathematical problem-solving ability of students who obtain the Problem-Solving learning model.
2. There is an increase in the learning independence of students who obtain the Problem-Solving learning model.
3. There is no interaction between students' initial abilities and the Problem-Solving learning model to improve mathematical problem-solving skills.
4. There is no interaction between students' initial abilities and the Problem-Solving learning model to increase student learning independence.

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