Problem-Based Learning As An Effort To Improve Student Learning Outcomes

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Abstract:This research aims to determine the outcome of problem-based learning in conjunction with the improvement of the learning outcomes of SMA Negeri 2 Namlea, Buru Regency in the 2018/2019 school year. This research is a quasi experiment research with the design of pretest-posttest control group Design. The population in this research is the grade XI students of Chemistry which amounted to 3 classes and samples in this study there are 2 classes that are students of class XI IMIA3 as experimental classes and students of class XI IMIA2 as control class. Data is obtained from test results, polls and student activities. Data processing using Kolmogorov-Smirnov test normality, test homogenity, test Paired sample t test, and test independent sample T test. The results showed that there was an increase in students ' mathematical learning outcomes after using problem-based learning in the class XI IMIA3 SMA Negeri 2 Namlea. This is based on the analysis results of inferential statistics (test Paired Sample T Test) obtained the significance value. 000 < 0.05 which means there is an increase in the average student's value after being taught using problem-based learning in the class XI students IMIA3 SMA Negeri 2 Namlea.

Keywords: Learning, Problem Based, Mathematics, Learning Outcomes, Students

1 INTRODUCTION

In today's global information era, all parties allow abundant, fast, and easy information from various sources and from around the world. For that, humans are required to have the ability to acquire, choose, manage, and follow up on that information to be utilized in a dynamic, challenging, and full of competition.This ability can be developed through learning mathematics because the purpose of learning mathematics in schools according to Depdiknas (2004) is: (1) to practice thinking and reason to draw conclusions, (2) Develop activities Creative that involves imagination, intuition, and discovery by developing divergent, original, curiosity, predictability and suspicion thinking, and dabbling, (3) Developing problem-solving skills, and (4) developing capabilities Convey information and communicate ideas[1]. In activities/learning activities, teachers should be aware that everyone has the optimal and different ways to learn and understand new information, that students need to be taught the other ways of the standard learning methods that have been To maximize the information they can understand in teaching and learning activities [2]. The more activity and learning outcomes the higher the success rate in the economic learning process that integrates with character education [3]. Based on the observation done there is a problem in the form of activity of learning results XI IMIA3 low students compared with other classes. In addition, teachers still use conventional methods or lectures [4]. When in class students tend to just record only and the teacher explained too much, in the process of learning the teacher only gives definitions, concepts, formulas then practice the question so that students do not understand what is learned and the students are less given Opportunities to solve the problems or questions given by the teacher. Mathematical subjects are one of the subjects that learners must learn at the basic and intermediate level. Mathematics subjects need to be given to all learners ranging from elementary school to equip students with logical, analytical, systematic, critical, and creative thinking skills, as well as the ability to cooperate [5]. Looking at the current conditions, learners are very struggling to solve a problem given by educators, although they are still in accordance with the material they have provided because they do not yet know the structured steps Used to resolve the issue [6]. One of the alternative models of learning that can be applied is a problem based learning model (problem based learning). Through mathematical learning by implementing a problem-based learning model, learners are more trained to solve problems scientifically, structuring and systematic. Through a problem-based learning model, students are used to learn from the actual and factual problems in daily life, and students are also used to learn groups and discussions, as well as learn to study issues, seek the relevant information, compile the information obtained, review the existing Solutions alternatives, propose alternative solutions and compose the completion action. So students can understand the theory deeply through an empirical learning practice experience [7]. Sears and Hersh [8], suggest some of PBM's characteristics: (a) The problem must be related to the curriculum, (b) unstructured problems, non-single solutions, and gradual processes, (c) Students solve problems and teachers as Facilitator, (d) Students are only given guidelines for identifying problems, and are not given formulas to solve problems, and (e) Authentic performance-based assessments Pierce and Jones [9] classify PBM in two levels, low level and level High. PBM is a low level if it only contains a few of the characteristics above, and PBM is at a high level if students are actively involved in activities that reflect the characteristics of PBM.

2. LITERATURE REVIEW

Problem-based learning has been known since the time of John Dewey, which is now starting to be raised because general-reviewed learning is comprised of presenting to students an authentic and meaningful problem situation that can provide Students to investigate and Incuiri [10]. In essence, mathematics as a structured and systematic science implies that the concepts and principles of mathematics are intertwined with each other. As the implication, then in learning mathematics to achieve a meaningful understanding of students must have adequate mathematical connection capability[11]. The ability of mathematical connections is the ability to associate the concept of mathematical concepts between concepts in mathematics itself and associate the concept of mathematics with concepts in other fields [12]. The strong connection between mathematical concepts implicates that aspects of mathematical connections also contain other mathematical aspects or vice versa. In the school mathematics curriculum, reasoning and mathematical connections are two basic mathematical abilities that must be mastered by high school students. Reasoning is the process of thinking in the process of drawing conclusions. Broadly, there are two types of reasoning, the inductive reasoning, also known as induction

and deductive reasoning, which is also known as deduction. The equation between the deduction and induction is that both arguments have a structure, consisting of several premises and one conclusion or conclusive[13]. The difference between deductions and inductions on the basis of withdrawal conclusions and the inference properties is derived. Problem-based Learning (PBM) is a translation of the term problem-based learning [14] [15] [16]. A summary of the authors opinion, formulating understanding. Problem-based learning as a learning approach that begins with presenting a problem designed in contexts that are relevant to the material that will be learned to encourage students: acquiring knowledge and understanding of concepts, Achieving critical thinking, having self-reliance learning, participating skills in group work, and problem solving skills [17]. The problem-based learning model traits are the following 10: (1) Submission of questions or concerns. Problem-based learning organizes learning around questions or problems and is personally meaningful to students. (2) focusing on the association of disciplines. Problem-based learning may focus on certain subjects. The issue posed should be truly authentic. It is intended to be in the resolution of the students to review the problem in many respects or to associate it with other disciplines. (3) Authentic research. In solving the problem, students can conduct investigations through an experiment. Students must: formulate problems, compile hypotheses, gather information, conduct experiments (if needed), analyze data and formulate conclusions. (4) Produce products/works. In problem-based learning, students are required to compile a report on problem-solving and to put them in front of the class[18].

3. METHOD

The research methods used in this study are experimental methods. According to [19] The experimental method is interpreted as a research method used to find the effect of certain treatment on the other under controlled conditions. Experimental research is the most full approach to quantitative research, meaning it meets all requirements to test causal relationships. The purpose of this research is to investigate the possibility of causal relationship. The way it is to apply to one experiment Group a treatment condition then compares the results with a control group that is not subject to treatment conditions. The design used in this research is pretest-posttest control group design, this is in line with the opinion of Sugiyono, [20] stating the design of experimental research including pretest - postest control group design. In this design the two groups were first given a preliminary test (pretest) with the same test. Then the experiment group was given a special treatment i.e. learning using problem-based learning models, while the control class was given the usual treatment using conventional learning [21]. Samples in the study were taken from two classes of all XI classes. The sampling technique is to use Simple Random Sampling (simple random capture techniques), as the individual members of the population have equal and freely chosen opportunities as sample members. The data collection techniques used consist of two types namely test and non test. Tests are arranged in the form of a description, while the non test in the study is a poll and a sheet of activities of students arranged by Likert scale[22]. The data analysis technique used is: (1) test the normality of data by using Kolmogorov-Smirnov with significance 0.05. (2). Test Paired Sample T-Test, used to see the presence or absence of the average difference between the two groups in pairs (related). (3). Independent Sample T Test, this test is used to see there or not the average difference between the two unrelated groups[23].

4. RESULT

Based on the results of research that has been done in SMA Negeri 2 Namlea District Buru. Math test scores are given to students before and after using problem-based learning in the XI class IMIA3 has been processed using SPSS version 23 obtained the following data:

	Eksperimental Classes	
	Pretest	*Posttest*
N	*30*	*30*
Mean	*58.80*	*89.30*
Median	*55.00*	*88.00*
Mode	*50.0*[a]	*86.0*[a]
Std. Deviasi	*11.47*	*5.27*
Variance	*131.61*	*27.80*
Range	*38.0*	*18.0*
Minimum	*44.0*	*82.0*
Maximum	*82.0*	*100.0*
Sum	1764.0	2679.0

Table 1.
Descriptive statistics student grades XI Chemical grade

According to table 1 it appears that before the implementation of the problem-based learning is conducted, preliminary test (pretest) with the lowest value of the result obtained is 44.0 and the highest value is 82.0. The average value obtained is 58.80 with the default deviation of 11.47 meaning, the spread of data is largely in the set of 11.47 of the average. After the problem-based learning is applied, the final Test (posttest) with the lowest value 82.0 and the highest value is 100. The average value obtained is 89.30 with the standard deviation is 5.27. That is, the spread of data in the set is 5.27 from the average. Based on the results of Pretests and posttest on class XI IMIA3 (experimental Class) obtained average value of mathematics increases, ie the average pretests is 58.80 while the average posttest is 89.30. The value of mathematical tests given to students before and after learning by conventional methods in class XI IMIA2 (Control Class) SMA Negeri 2 Namlea obtained the following results:

	Kelas Kontrol	
	Pretest	Posttest
N	30	30
Mean	61.16	85.33
Median	60.50	85.50
Mode	50.0	85.0
Std. Deviasi	10.95	6.71
Variance	120.07	45.05
Range	35.0	23.0
Minimum	45.0	72.0
Maximum	80.0	95.0
Sum	1835.0	2560.0

Table 2.
Descriptive statistics student grades XI IMIA2

According to table 2 it is obtained that the initial test score (pretest) with the lowest value is 45and the highest value is 80.0. The average value obtained is 61.16 with the standard deviation is 10.95. Means the spread of data is at 10.95 from

the average. Then after applied conventional learning conducted the final Test (posttest) with the lowest value is 72.0 and the highest value is 95.0. The average value obtained is 85.33 with a standard deviation of 6.71 means that the data spread is at 6.71 from the average. Based on the results of Pretests and posttest in grade XI students IMIA2 (control class) obtained the average value of mathematics increased, i.e. the average value of pretests is 61.16 and the average value of posttest 85.33. In this section are conducted inferential statistical analysis to find out if there is a significant difference to the problem-based learning of learning outcomes of students of the grade XI IMIA3 SMA Negeri 2 Namlea. Test Normality Testing normality aims to determine whether students ' value data is in a normal distribution. Testing of normality in this study was to be the statistics of SPSS version 23 through the Kolmogorov-Smirnov test. Based on test normality using Kolmogorov-Smirnov test obtained a significant value of 0410 for Pretests and 0080 for Posttest. So the result obtained is greater than 0.05 then it can be concluded that the value data pretest and posttest distribution is normal. Hypothesis Test The hypothesis test using the test Paired Sample T Test aims to determine the presence or absence of the average difference of one of the A-block sample group that gets two treatments, namely before and after getting problem-based learning. The statistical hypothesis is formulated as follows: H0 = if T counts < T table and the value of sig. > 0.05, then there is no average difference between the mathematics learning of the class XI IMIA3 SMA Negeri 2 Namlea before and after problem-based learning. H1 = If T count values > T table and the value of Sig. < 0.05 Then there is the average difference between the mathematics learning of class XI IMIA3 SMA Negeri 2 Namlea before and after problem-based learning.

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest	58.800	30	11.4723	2.0945
	Posttest	89.300	30	5.2729	.9627
Paired Samples Correlations					
		N	Correlation	Sig.	
Pair 1	Pretest & Posttest	30	.651	.000	

Table 3.
Test Paired Sample T Test Pretest value and post test Class XI IMIA3

Based on test Paired Sample T Test with the equivalent significance of 0.05 obtained value significance. 000 so it can be concluded that H0 rejected and H1 accepted because of the significant value of < 0.000 < 0.05. So there is a significant average difference between the mathematical IMIA3 of the students of the School Negeri 2 Namlea before and a problem-based learning. Independent Sample Test T test Independent sample T test to determine the presence or absence of the average difference between two unrelated sample groups, i.e. XI-class students IMIA3 who got problem-based learning with XI class students IMIA2 who learned Conventional. The statistical hypothesis is formulated as follows: H0 = if T counts < T table and the value of sig. > 0.05, then there is no average difference between the grades of the student XI class IMIA3 with the average value of grade XI students IMIA2. H1 = If T count values > T table and the value of Sig. < 0.05 Then there is an average difference between grades of XI students IMIA3 with the average value of grade XI students IMIA2

Table 4.
Independent Sample Test T Test grades XI students IMIA3 and grades students grade XI IMIA2

Group Statistics					
	Class	N	Mean	Std. Deviation	Std. Error Mean
Result	1	30	89.300	5.2729	.9627
	2	30	85.333	6.7125	1.2255

Based on the results of the research obtained, it can be concluded that problem-based learning can increase the learning outcomes of the class XI Chemical SMA Negeri 2 Namlea. This can be seen at the average value of students before the use of problem-based learning (pretest) is 58.80 and the value after problem-based learning (posttest) is 89.30.

5. Discussion

The enhancement of student mathematics learning outcomes is influenced by several factors. One of them is the process of learning activities in a classroom centered on teachers. Problem-based learning is an effective learning model used in the teaching and learning process. Problem-based learning helps students to get information already in their mind and devise their own knowledge of basic and complex knowledge. Problem-based learning has a student-centered characteristic, designed based on real problems that encourage students to build a rich knowledge of contextual mathematical concepts through a series of constructive questions. Problem-based learning is a student-centered learning, while before the use of learning problem-based learning in class is only centered on teachers. Learning that involves students in learning to solve real-life problems can increase motivation and curiosity to increase.

6. Conclusion

Based on the results of the research obtained, it can be concluded that problem-based learning can increase the learning outcomes of the class XI Chemical SMA Negeri 2 Namlea. This can be seen at the average value of students before the use of problem-based learning (pretest) is 58.80 and the value after problem-based learning (posttest) is 89.30.

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