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The Application of Problem Based Learning Models to Improve Motivation and Learning Outcomes Materials Analyzing the Size of Single Data Concentration and Student Group Data

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Abstract. The problem raised in this classroom action research is whether there is an effect of applying the Problem Based Learning method on increasing motivation and learning outcomes. Analyzing the size of single data concentration and group data for Class XII TKJ 2 SMKN 2 Majene students in the even semester of the 2021/2022 academic year. The choice of the problem was based on the low level of student learning outcomes in mathematics about analyzing the size of the concentration of single data and grouped data. In the research process, the researcher used 2 cycles, each cycle consisting of the stages of planning, implementing, observing and reflecting. The increase in student motivation shows that in the initial condition only 8 students or 30.77%, increased to 17 students or 65.38% in the first cycle, and 26 students or 100% in the second cycle. The increase in student learning outcomes from the average in the initial study of 55.00 rose to 66.54 in the first cycle, and 76.54 in the second cycle, with a learning completeness level of 4 students (15.38%) in the initial conditions, 13 or 50% of students in the first cycle, and in the last cycle it becomes 100% or all students are declared to have completed their studies. Based on these results, the researchers concluded that the Problem Based Learning learning model can increase motivation and learning outcomes for analyzing the size of single data concentration and group data for Class XII TKJ 2 SMKN 2 Majene students in the even semester of the 2021/2022 academic year.

Keywords: Motivation; learning outcomes: problem based learning

1. Introduction

The learning process is never separated from assessment. Assessment serves to see the results of learning that has been done. Permendikbud Number 66 of 2013 [1] describes the assessment of the learning process in the 2013 curriculum using an authentic assessment approach that assesses student readiness, processes, and learning outcomes as a whole. Authentic assessment results can be used by teachers to plan remedial, enrichment, or counseling services. In addition, authentic assessment results can be used as material to improve the learning process in accordance with educational assessment standards.

Teachers as educational professionals have an important role in the teaching and learning process [2], [3]. Teachers must be able to explain their knowledge to their students through learning management by applying approaches and teaching models that are in accordance with the subject matter and cognitive level of students [4], [5]. In addition, teachers must also pay attention that students are students who must be actively involved in the teaching and learning process so that the material taught is more meaningful for students and the desired learning objectives can be achieved [6]. The selection of learning approaches or strategies that will be used by teachers in the teaching and learning process can affect students' interest and motivation to learn [7], [8]. In addition, it can also affect students' understanding of the material or basic concepts which ultimately have an influence on students' motivation and learning outcomes.

Motivation and learning are two things that influence each other. Every child born has the motivation to learn. Motivation comes from the word motive which means the power contained within the individual, which causes the individual to act and act [9]. In this case, he emphasized that motives cannot be observed directly, but can be

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interpreted from their behavior, in the form of encouragement, stimulation, or power generation to do something. Santrock)[10] argues that motivation involves processes that energize, direct, and sustain behavior. Based on some of the expert opinions above, motivation can be concluded as an impulse that exists within the individual, giving rise to behavior to maintain it, providing energy and a certain direction to achieve the desired goal, including the behavior of learning mathematics.

As stated by Sudjana (2010: 22) [11] Learning outcomes are abilities that students have after receiving their learning experience. As for Suprijono [12], explained that learning outcomes are patterns of actions, values, understandings, attitudes, appreciation and skills.

Based on the results of initial observations made by researchers, especially in class XII TKJ 2 which is the research subject of researchers. The results showed that 84.62% of students or 22 students scored below the standard of completeness, namely 70.00, with a classical average score of 55.00 with the highest score of 70 and the lowest score of 40. This condition indicates that an effort is needed. improvements in the mathematics teaching model that can stimulate students to learn actively in the teaching and learning process.

The process of learning mathematics must involve students' thinking processes and motivation actively by developing the cognitive abilities of each student, because cognitive development is a determinant of children's intellectual intelligence, cognitive abilities continue to develop along with the educational process and are also influenced by physical development factors, especially the biological brain. The next development related to cognitive is how to manage or regulate these cognitive abilities in responding to situations or problems. Of course, the cognitive aspects cannot run alone separately but need to be controlled or regulated so that if someone is going to use their cognitive abilities, they need the ability to determine and regulate what cognitive motivation will be used.

The reality in the field is that students only memorize concepts and are less able to use the concept if they encounter problems in real life related to the concepts they have [13]. Furthermore, even students are less able to determine the problem and formulate it. The low motivation for learning or teaching, especially if it is related to students' understanding of the understanding of the material being taught. This understanding is the students' understanding of the qualitative basis in which facts are interrelated with their ability to use that knowledge in new situations. Most students are less able to make connections between what they learn and how that knowledge will be used/applied to new situations.

Problem-based learning (Problem Based Learning) or abbreviated PBL is one of the innovative learning models that can provide active learning conditions for students [14]. PBL is a learning model that involves students to solve a problem through the stages of the scientific method so that students can learn knowledge related to the problem and at the same time have the skills to solve problems [15].

The mathematics learning method that is suitable for this problem is the Problem Based Learning (PBL) learning model. Problem Based Learning (PBL) is a form of learning that emphasizes the involvement of students in problem solving, which means that they can construct their own knowledge from the results of the solutions they find [16]. In this learning process can help students develop ways of thinking and problem-solving skills that will be used as concepts and can learn more mature so that students are more independent. In addition, this learning really involves students directly in learning so that the knowledge gained is more easily absorbed and lasts longer because they find it for themselves as a result, it can improve their achievement. The difference between conventional learning methods and Problem Based Learning (PBL) models is that in the conventional model students are required to remember all available

information, which is given by the teacher to students, while in the PBL model students are only given sufficient information as the basic capital to solve other problems. In addition, the Problem Based Learning (PBL) model accustoms students to think actively in the teaching and learning process because the application of the Problem Based Learning (PBL) learning model requires students to identify a problem, collect information, and use the information. Students are expected to be able to formulate the questions asked in the problem using the material that has been given previously.

From the description above, researchers are interested in conducting research with the title "Implementation of Problem Based Learning Models to Improve Motivation and Learning Outcomes ".

2. Method

According to Kardiawarman (Paizaluddin & Ermalinda, 2013: 6) This research is a class action research (classroom action research) which means research conducted in a class to find out the consequences of actions applied to a research subject in that class.In this study, researchers used Classroom Action Research (CAR). CAR is a translation of Classroom Action Research, which is an Action Research conducted in the classroom. CAR is research conducted by teachers in their own class through self-reflection with the aim of improving their performance so that student learning outcomes increase.

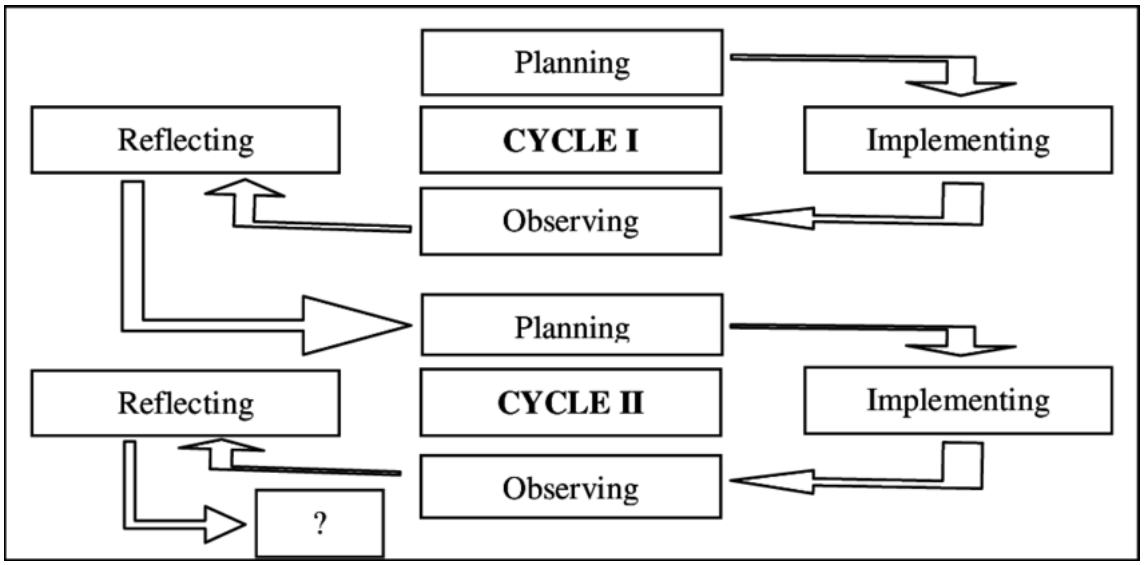

Figure 1. Classroom Action Research Flow

Each cycle in action research consists of four stages, namely 1) Planning, 2) Implementation, 3) Observation, 4) Reflection. The first action taken is planning, at this stage the researcher explains about what, why, when, where, by whom, and how the action is carried out. The second stage is implementation, this stage is the implementation or application of the design content, namely wearing actions in class. The thing to remember is that in this second stage the implementer (teacher) must try to comply with what has been formulated in the design, but must also act fairly, not artificially. In reflection, the relationship between implementation and planning needs to be considered carefully so that it is in sync with the original intent. The third stage is observations made by observers. The third stage is carried out simultaneously with the second stage. When the implementation takes place, the teacher who is also an observer looks back at the implementation of learning. While making observations, the

implementing teacher recorded little by little what happened in order to obtain accurate data for the improvement of the next cycle. The fourth stage is reflection, at this stage is an activity to restate what has been done. This reflection activity is very appropriate to do when the implementing teacher has finished taking the action, then dealing with the researcher to discuss the implementation of the action plan. If the action research is carried out through several cycles, then in the last reflection, the researcher conveys the suggested plan to other researchers if he stops his activities, or to yourself if you will continue on another occasion. Important notes that are made should be detailed so that anyone who will carry out other times will not encounter difficulties. Data collection techniques used in carrying out classroom action research are non-test techniques (observation, documentation), and test techniques. In this study, the validity of the data was carried out by triangulation (triangulation of sources and triangulation of methods).

3. Results and Discussion

Classroom action research through the application of the Problem Based Learning (PBL) learning model in class XII TKJ 2 SMKN 2 Majene was carried out in 2 cycles. Each cycle consists of four stages, namely initial reflection; Planning; Implementation and ; Observation. Each stage will be described as follows.

3.1 Initial Conditions

An explanation of the results of the activities in the initial conditions of classroom action research is as described below.

Table 1: Recapitulation of Initial Condition Formative Test Results

No	Completeness Criteria	Initial Condition	
		Amount	%
1	Complete	4	15.38
2	Not Completed	22	84.62
	Amount	26	100.00
	Lowest value	**40.00**	
	The highest score	**70.00**	
	Average	**55.00**	
	Completeness	**15.38**	

From the explanation of the table above, it can be concluded that student learning outcomes are still low, it is proven that there are only 4 students or 15.38% who are declared complete, while the remaining 22 students or 84.62% are declared incomplete because they have not met the criteria for completeness individually. a minimum score equal to or above the KKM of 70 and classically 18.38% declared complete learning.

An explanation of the assessment of student motivation using an observation sheet with 7 indicators, namely the desire and desire to succeed, being tenacious in facing difficulties, showing interest in various problems, preferring to work alone, getting bored quickly on routine tasks, being able to defend his opinion, happy to seek and solve problems, enjoy following lessons, persevere in learning and deal with math assignments showing the results as described below.

Table 2: Recapitulation of Observation Results of Student Motivation in Learning Activities Initial Condition

No	Description	Amount	Note:
1	Completed Student	8	
2	Percentage Complete	30.77	
3	Student Unfinished	18	
4	Percentage Unfinished	69.23	
5	Classical Completeness	30.77	

From the explanation of the table above, it can be concluded that students' learning motivation is still low, it is proven that there are only 8 students or 30.77% who are declared complete while the remaining 18 students or 69.23% are declared incomplete.

3.2 Cycle I

The first cycle of action planning was designed based on the results of initial reflection when researchers carried out initial observations of the implementation of learning in class XII TKJ 2 on the material to analyze the size of single data concentration and group data. In the first cycle, the focus is on achieving the indicator "Calculating the average value, median and single data mode."

An explanation of the results of the implementation of learning activities in the first cycle of classroom action research as described below:

Table 3: Recapitulation of First Cycle Formative Test Results

No	Completeness	Cycle I	
		Amount	%
1	Complete	13	50.00
2	Not Completed	13	50.00
	Amount	**26**	**100.00**
	Lowest value	**60.00**	
	The highest score	**80.00**	
	Average	**66.54**	
	Completeness	**50.00**	

From the table above, it can be explained as follows that the average value of learning outcomes in the implementation of the first cycle of learning improvements is 66.54, the number of students who have completed their studies is 13 students or 50% and the number of students who have not completed their studies is 13 students or 50 %

From the explanation as mentioned above, it can be concluded that the results of the formative test scores have increased from the initial conditions, because before the improvement, 4 students (15.38%) increased to 13 students (50%) or increased by 9 students (34.62). %). The data above shows that the results of the research in the first cycle are not in accordance with the indicators, namely at least 85% of the total number of students are declared complete or get a minimum score equal to the KKM 70.

Table 4: Recapitulation of Observation Results of Student Motivation in Learning Activities First Cycle

No	Description	Amount	Description
1	Completed Student	17	
2	Percentage Complete	65.38	
3	Students have not finished	9	
4	Percentage Unfinished	34.62	
5	Classical Completeness	65.38	

From the table above, it can be concluded that from 26 students there are 17 students who have completed their studies (65.38%) in terms of their learning motivation, while 9 students (34.62%) have not completed their studies based on their learning motivation. Seeing the results above, the researchers together with the observers agreed to carry out learning improvements in cycle II with the hope that in cycle II students' learning motivation could achieve gains above 85% in accordance with the predetermined success criteria.

The obstacle in the first cycle is that there are still many questions that are not systematic, so that there are steps that are skipped or sometimes there are steps that should not be necessary and result in inaccurate results, so that the conclusions from the results obtained are also inaccurate. The action plan that will be carried out in the second cycle based on the results of the reflection from the first cycle is to improve every aspect of problem-solving sabilities. This is carried out by further optimizing each step of Problem Based Learning. Students are given problem-solving questions and discussed in groups. The teacher directs each group to be more optimal in participating in learning and more coherently in solving each problem given in accordance with the four aspects of solving problems.

3.3 Cycle II

Classroom action research on the implementation of the Problem Based Learning (PBL) model was carried out in 2 meetings. At the stage of implementing the action, the researcher who acts as a teacher carries out actions in accordance with the learning steps with a Problem Based Learning model as in the lesson plans that have been prepared as in the implementation of the actions in cycle I, but the indicators are different where in cycle II the indicator is "Calculating the value of mean, median, and mode of grouped data." During the implementation of the action, the researcher was assisted by research colleagues in conducting observations. Observations were made based on the observation guidelines that had been compiled, and the results were recorded in observation sheets and field notes.

An explanation of the results of the activities in the second cycle of classroom action research is as described at Table 5:

Table 5. Recapitulation of Second Cycle Formative Test Results

No	Completeness Criteria	Cycle II	
		Amount	%
1	Complete	26	100.00
2	Not Completed	0	0.00
	Amount	**26**	**100.00**
	Lowest value	**70.00**	
	The highest score	**90.00**	
	Average	**76.54**	
	Completeness	**100.00**	

From the table above, it can be explained as follows that the average value of learning outcomes in the implementation of the second cycle of learning improvements is 76.54, the number of students who have completed their studies is 26 students or 100%, and there are no students who have not completed their studies or 0%.

From the explanation as mentioned above, it can be concluded that the results of the formative test scores have increased from the first cycle, because in the first cycle, 13 students (50%) completed an increase to 26 students (100%) or an increase of 13 students (50%). Seeing the results above, the researchers together with the observers concluded that the mastery of learning had reached a figure above 85%, so that the learning improvement process was declared successful and complete in cycle II.

Table 6: Recapitulation of Observation Results of Student Motivation in Learning Activities Second Cycle

No	Description	Amount
1	Completed Student	26
2	Percentage Complete	100
3	Student Unfinished	0
4	Percentage Unfinished	0
5	Classical Completeness	100

From the table above, it can be concluded that from 26 students there are 26 students who have completed their studies (100%) in terms of their learning motivation. Seeing the results above, the researchers together with the observers concluded that the results of observations on increasing learning motivation had reached above 85%, so that the learning improvement process was declared successful and complete in cycle II.

Based on the results of reflection, it can be said that in general the implementation of mathematics learning using Problem Based Learning in cycle II in class XII TKJ 2 has been going well and has increased from the previous cycle. Every step of Problem Based Learning has been carried out well. The problem-solving ability of students has increased in the second cycle as seen from the results of the problem solving ability test in this cycle. The average percentage for each aspect has increased from the previous cycle. Students are coherent in solving problems, have chosen the right plan of completion and are able to conclude and re-examine the results of problem solving. The obstacle in the first cycle is that there are still many questions that are not systematic, so that there are steps that are skipped or sometimes there are steps that should not be necessary and result in inaccurate results, so that the conclusions obtained are also inaccurate. Based on these reflections and has been corrected in the second cycle, students' mathematical problem-solving ability has increased.

The subjects in this study were students of class XII TKJ 2 SMKN 2 Majene, totaling 26 students. Observational data obtained when observing students, especially on student learning motivation in mathematics. While the learning outcomes data were obtained from the results of the formative tests which were carried out at the end of this CAR cycle. Class teachers admit that they find it difficult to teach mathematics to students when they lack or even no motivation to learn, which leads to low student learning outcomes both individually and classically.

Based on the results of the evaluation test, it appears that there is an increase in students' problem-solving abilities from cycle I to cycle II. This can be seen from the class average value obtained from the first cycle and second cycle tests. The average grade value obtained by students at the end of the first cycle was 66.54 in the second cycle to 76.54 from the initial condition of 55.00. The average percentage of student test scores in the initial conditions, cycle I to cycle II for each indicator of problem-solving ability also increased.

Discussion

Thus, from the discussion above, it can be concluded that the way to increase learning motivation is by using the Problem Based Learning method, namely explaining the learning objectives to be achieved to students, the clearer the learning objectives are conveyed to students, the greater the motivation of students in learning, creating discussion groups toplanning an idea that will be realized to other groups, giving encouragement to students to learn by giving maximum attention to students, besides that the teacher makes students interested in the material presented by using learning methods that are interesting and easy for students to understand, namely the Problem Based Learning method.

In the first cycle, students' motivation and learning outcomes were still low, this was because students had not been able to follow the course of the action process in the first cycle and students did not understand the Problem Based Learning method. While in cycle II, students' motivation and learning outcomes have increased, this is because the teacher is more intensive in encouraging students to encourage students to excel, the teacher directs students' attention to the ongoing learning process such as during discussions and presenting the results of the discussion, and the teacher adds time during the presentation of the results of the discussion, so that students become more active in presenting the results of the discussions of each member of the group and more active in answering questions raised by other groups.

In this study, the grouping of students was done with the closest sitting friend. Referring to the opinion of Arends (2004:407) [17] which states that there are no standard rules regarding how to group students in PBL, the grouping consists of four people per group.

Based on the results of observations of the implementation of learning, in the first cycle there were no students who dared to respond to the results of the presentation voluntarily. Students' courage to analyze and respond began to appear in cycle II. In this stage several times there are questions and answers between students. The discussion took place under the guidance of the researcher. After the discussion is over, the researcher evaluates the results of each group's investigation and provokes students to conclude.

4. Conclusion

Based on the previous description, the actions taken in learning with PBL have been carried out according to the PBL steps so that the actions taken have met the indicators of successful implementation of PBL learning. In accordance with the

description of the implementation of the research that has been described previously, it can be seen how the application of mathematics learning through Problem Based Learning has been able to improve students' mathematical problem-solving abilities in the matter of estimating the circumference and area of a circle. This can be seen based on the data obtained both through tests and observations.

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