Implementation of Learning with the Problem Posing Method to Increase Activeness and Learning Outcomes of Physics in the Material of Temperature and Heat

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ABSTRACT

Purpose of the study: This research aims to find out how physics learning using the Problem posing Method is implemented in high school and to find out whether learning physics using the Problem posing Method can increase the activeness and learning outcomes of high school students in physics.

Methodology: This type of research is classroom action research carried out in 2 cycles. This research was conducted in high school. The subjects of this research were 31 students of class X high school. The research data is in the form of student activity and learning outcomes. Students' learning activity is known from the results of observation sheets, while students' learning outcomes are known from the results of evaluations carried out at the end of each cycle.

Main Findings: The results showed that the active learning of students in cycle II showed an increase when compared to cycle I. The results showed learning with the Problem Posing model was preferred by students so that it was hoped that the teacher could apply the Problem Posing model as a variation in learning Physics. The limitation of the research which only applies the Problem Posing model to the material Temperature and Heat with a relatively short research time, it is hoped that further research can be carried out on other materials.

Novelty/Originality of this study: The novelty of this research is that classroom action research was carried out to determine students' activeness in the learning process using a problem posing model specifically for learning physics on temperature and heat.

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1. INTRODUCTION

Education is a very important factor in human life, because with education it is hoped that humans can develop their knowledge, skills and creativity [1]–[3]. Success in the field of education is largely determined in the learning process [4]–[6]. In learning, so that learning objectives can be achieved effectively and efficiently, learning methods are needed that make it easier for students to learn [7]–[9]. Learning should be done using a few lectures and teacher-centered methods. Learning is done more emphasis on interaction with students [10]–[12]. The use of various methods will greatly assist students in achieving learning objectives. In addition to the use of methods, approaches in the learning process are important things to use to achieve learning objectives [13]–[15].

The delivery system for physics material must consider the readiness/maturity, ability, and level of intellectual development of students [16]–[18]. In delivering material, especially temperature and heat, the teacher should use the right method and approach [19]–[21]. But in reality, in delivering physics material at Muhammadiyah Gubug High School, teachers still tend to use conventional methods, namely explaining with lecture methods and whiteboard media as a medium for drawing illustrations, so that students have difficulty understanding the concepts of Temperature and Heat optimally.

This learning also causes students to become bored because learning is less interesting and less fun so that students are less active in participating in physics learning. This makes the learning outcomes of students mostly still below the predetermined average. To increase the activity and learning outcomes of students, a learning strategy is needed that can help students to clearly understand the course of a learning concept. One of them, teachers can use the problem posing learning model group discussion method, Problem posing has been described in different ways by different researchers [22]–[24].

The group discussion method is a method or guidance technique that involves a group of people in face-to-face interactions, where each group member will get the opportunity to subvert their individual thoughts and share experiences or information for problem solving or decision making [25]. While the approach is all the ways or strategies used by teachers to support the effectiveness and efficiency of the learning process of certain materials [26], [27]. Using a creative learning approach will enable the audience (students) to learn better and be able to improve their performance according to the goals to be achieved. In principle, the problem posing learning model is a learning model that requires students to submit their own questions through studying questions (practicing questions) independently [28], [29].

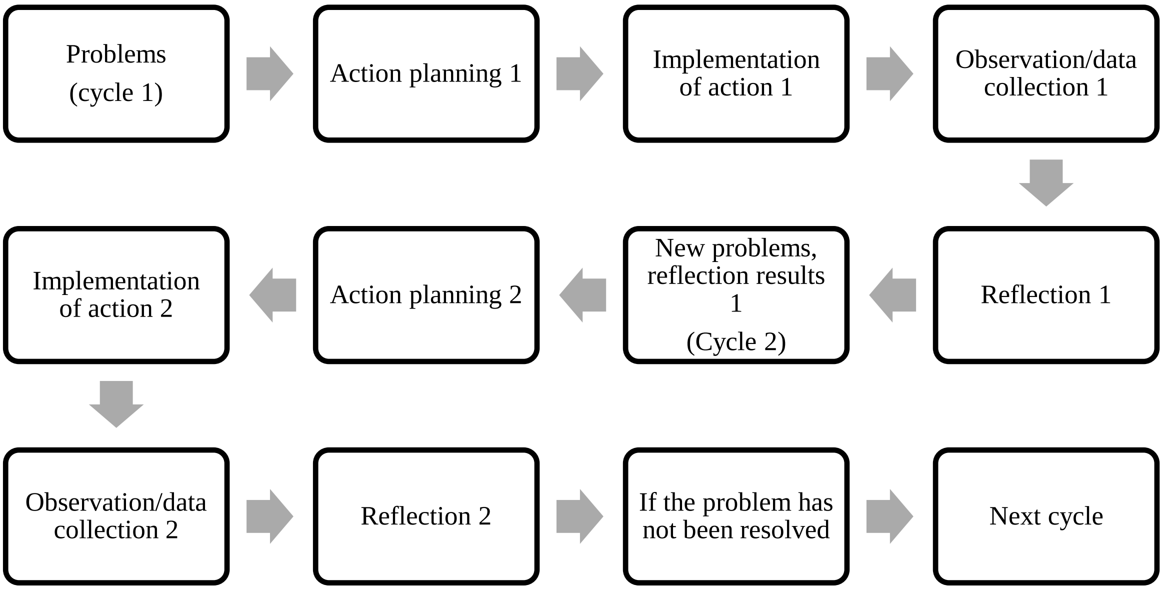
Based on the results of previous studies, it was also found that the problem posing learning model for physics learning outcomes for students who were given an activity-based problem posing approach was higher than the physics learning outcomes for students who used conventional learning approaches [30]. According to Rizal, therefore, an activity-based problem posing approach needs to be implemented in schools to support better learning outcomes [30]. The urgency of this research is that based on the background explanation above, it is important to carry out research related to how to implement physics learning using the Problem posing Method in high schools and to find out whether learning physics using the Problem posing Method can increase the activeness and learning outcomes of physics in high schools. The aim is for students to be able to carry out a meaningful and enjoyable learning process. Then improve student learning outcomes in the main material Temperature and Heat.

With this learning method and approach, it is hoped that the difficulty of temperature and heat material can be reduced so that the concepts of Temperature and Heat are conveyed more clearly and learning can be interesting and fun, so that students are more active in learning and in the end student learning outcomes can increase. This study aims to find out how the implementation of physics learning using the problem posing method at Senior High School and to find out whether physics learning using the problem posing method can increase the activeness and learning outcomes of physics at Senior High School.

2. RESEARCH METHOD

The research method that the authors use in this study is Classroom Action Research (CAR). Classroom action research is a study conducted by teachers in their own class through self-reflection with the aim of improving their performance so that student learning outcomes increase [31]. This action research was carried out for two cycles, namely cycle I and cycle II. The action research model used in this research is the spiral model from Kemmis and Taggart which consists of several action cycles [32]. Where each cycle consists of 4 stages which include planning, implementation of action, observation and reflection.

Subjek peneltian ini siswa sekolah menengah atas dengan total sampel 31 siswa. Teknik pengambilan sampel menggunakan purposive sampling. With a composition of 8 male students and 23 female students. Collaborators in Classroom Action Research (CAR) are people who work together and help collect research data carried out by researchers. Siklus penelitian ini terdiri dari 2 siklus berikut gambar siklus penelitian ini:



The research data collection techniques consisted of documentation, interview, observation, and test methods. Data analysis of student activity seen from student activity through observation and questionnaire methods based on the activeness indicators listed, namely increasing attention, the level of relevance of learning to the needs of students, the level of confidence of students in their ability to carry out learning tasks, and the level of student satisfaction students to the learning process that has been implemented.

Observation data can be calculated by calculating the number of observation scores with certain criteria. To find out about the activities of students in participating in the teaching and learning process, the authors make 5 aspects of observation which include: activeness in asking questions, cooperation, skills in making questions, skills in solving questions both made by themselves and friends and participation in study groups. Then an analysis was carried out on the observation sheet instrument using descriptive techniques through percentages. Calculation of the percentage of student activity.

The criteria for interpreting this research variable are as follows:
75%-100% : very good (A)
50%-74% : good (B)
25%-49% : enough (C)
0%-24% : less (D)

Data regarding the results of evaluation tests taken from students' cognitive abilities in solving problems were analyzed by calculating the average value of learning completeness [33]. As an indicator of the success of this classroom action research is if 85% of students have obtained a minimum score of 70 (according to the KKM provisions from the school). score ≥ 70 (according to the provisions of the school), and activeness achievement of $> 60\%$.

3. RESULTS AND DISCUSSION

The learning outcomes of students taken in the data analysis in this pre-cycle are the results of learning the previous material as shown in the following table:

Table 1. Test scores for previous material (teacher documentation)

Lowest value	30
The highest score	70
Class average	50
Classical mastery	56,8 %

Based on the table above, it can be seen that before getting learning with the Problem Posing model, the completeness of classical learning outcomes is still far below the specified classical learning outcomes of 85%. From the observation of the first cycle, the following observations were obtained:

The results of observations of student activities during the learning process. Data from observations of students' activities in cycle I were taken from the observation sheets of students' activeness based on the guidelines for filling in the observation sheets.

Table 2. Analysis of Student Activity in Cycle I

Observed aspect	Total	Percentage	Information
Asking activity	61	49 %	Not enough
Create individual questions	70	58 %	Enough
Answer individual questions	69	56 %	Enough
Answer questions about friends	56	45,2 %	not enough
Convey ideas	52	41 %	Not enough
Amount	308	49,5 %	Not enough

Data from cognitive observations of students were taken from the results of the cycle I evaluation test.

Table 3. Analysis of Student Evaluation Results Cycle I

Student learning outcomes	Initial Value	Cycle I Value
The highest score	70	80
Lowest Value	30	53
The number of students who complete learning	17	22
The average value of students	56,9	70.1
Completeness percentage	54.8%	70.9%

From the results of the evaluation of cycle I, it can be seen that the classical completeness obtained at 70.9% has not met the specified classical completeness of 85%, so that action is needed to improve cycle II.

Based on the results of the first cycle of observations, reflection was then carried out on the steps that had been implemented. The results of these reflections are as follows:

- Teachers are expected to improve time management in learning activities so that they are more planned.
- Teachers are still tense to start and carry out learning.
- Teachers to be more optimal and even in guiding students to complete group assignments in the learning process.
- Teachers are expected to give homework as a means of practicing questions.
- The learning outcomes of students in learning activities have not reached the predetermined indicators of success, so it is necessary to hold cycle II.

From cycle II observations, the results of observations of students' activities during the learning process were obtained. Data from observations of students' activities in cycle II were taken from the observation sheets of students' activeness based on the guidelines for filling in the observation sheets.

Table 4. Analysis of Cycle II Student Activity

Observed aspect	Total	Percentage	Information
Asking activity	68	54.8%	Enough
Create individual questions	83	66.9%	Good
Answer individual questions	79	63.7%	Good
Answer questions about friends	83	66.9%	Good
Convey ideas	69	55.6%	Enough
Amount	382	61.5%	Good

Furthermore, the cognitive observation data of students taken from the results of the second cycle evaluation test are presented in the following table:

Table 5. Analysis of the evaluation results of cycle II students

Student learning outcomes	Nilai Siklus II
The highest score	86
Lowest Value	53
The number of students who complete learning	29
The average value of students	74,74
Completeness percentage	93.5%

From the data above it can be said that students have achieved classical completeness with a score of 93.5%. Based on the results of observations of the implementation of cycle II actions, the following reflection results were obtained:

- Teachers have been able to improve time management in learning activities so that learning goes according to plan.
- The teacher has been able to adapt to the conditions of the students and the conditions of the classroom where the learning takes place.
- Teachers are able to guide students more evenly to complete group assignments in the learning process.
- The teacher gives homework as a means of practicing the questions.
- Student learning outcomes in learning activities have achieved predetermined indicators of success.

During the pre-cycle, the researcher obtained information from interviews with the physics teacher that during learning, students were less active in asking and answering questions raised by the teacher. Less active in this case, students were still shy or lacked confidence in asking questions or opinions even though they actually have ideas to raise. In addition, the lack of activity of students in learning is shown by the lack of enthusiasm of students when the teacher is explaining the lesson, not paying attention when the teacher explains the lesson, and there are still students who talk to their friends when the lesson is given. This is an indicator that students have low or less activeness and in the end causes learning to be still teacher-centered and not student-centered. Then from the interview results, the subject matter that is still considered complicated and difficult for students to understand is temperature and heat. This material is considered more difficult to understand because this material contains many mathematical equations that require high memorization.

In addition to conducting interviews, the researcher also made preliminary observations, namely by looking at the learning outcomes of students on previous material prior to conducting the research. From the results of the documentation of learning outcomes, the highest score was 70, the lowest score was 30, the average score was 51 and classical completeness was 57.1%. Only 17 students who met the KKM. Seeing the existing problems, the Problem Posing learning model is the right solution to overcome them. In this case researchers and teachers plan to implement it.

In cycle I, the Problem Posing learning model began to be applied. At the first meeting of cycle I, the participants began to explain the learning steps using the Problem Posing model. Submission of learning objectives, forming groups and distributing handouts in the form of materials on temperature and heat which are outlined, as well as apperceptions carried out by the teacher make the learning atmosphere more varied. This makes students more enthusiastic about participating in learning because they find a new, different atmosphere. but in carrying out the learning steps with this model students still look less than optimal and look still confused, because students are still in the adaptation stage.

The lack of maximum students in learning can be seen when they are still always asking about how to make these questions. Here, the teacher applies the Problem Posing learning model of the pre-solution posing type, in which students make questions about statements made by the teacher. This is done considering that at this school the Problem Posing learning model has never been applied. However, this began to be resolved at the second meeting in cycle I. At the first meeting of cycle I, students were asked to make one or two questions for each individual which would be exchanged with their group mates and friends in other groups.

Lack of time is one of the obstacles in implementing this learning model. This happens because students still feel confused about what kind of questions they should make, so that the discussion time that has been determined in the lesson plan is slightly shifted.

From the observation results, it can be seen from each aspect, namely the activeness of asking students in learning by 49%, the ability to make individual questions by 58%, the ability to solve self-made questions by 46%, the ability to solve questions made by friends 45.2%, and convey ideas by 41%. The percentage of observations of students' activities shows that their thinking skills and activeness are still lacking. They are still confused in making questions that have an impact on solving problems they make themselves. The level of conveying ideas is also still low, as seen from the number of students who are willing to refute a friend's answer if the answer is not the same as theirs. I

Then for the learning outcomes of students, there are still many students who have not fulfilled the KKM, out of 31 students only 23 students have fulfilled the KKM determined by the school, namely 70, with classical completeness below the specified standard, namely 70.3%, for that need to be repaired again in cycle II. Cycle II is an improvement on the weaknesses that occur in cycle I based on reflection. In cycle II, students are familiar with the Problem Posing learning model. This can be seen from the increased activity that can be seen on the observation sheet, the ability to ask questions increased to 52.4%, the ability to make individual questions 64.5%, the ability to complete self-made questions 62.9%, the ability to complete tasks made by friends 66 .9%, as well as the ability to convey ideas by 54%. Students are getting used to making questions, solving them, and responding to their friends' questions. As with the increase in student activity, learning outcomes in cycle II also increased, classical completeness increased to 93.5%, with the highest score of 86, the lowest score of 53, and the class average of 74.74. There were 29 students who fulfilled the KKM, in this case an increase of 6 children.

Previous research conducted by Calabrese et al., found that using the problem posing model can improve students' problem solving abilities [34]. However, previous research has not measured how the problem posing model increases student activity and student learning outcomes. In the current research, researchers are conducting research to find out how the problem posing model affects student activity and student learning outcomes. Then in previous studies examined in mathematics. So the current research is devoted to the physics subject of temperature and heat. The implication of this research is as material for consideration in increasing the body of knowledge about models and approaches to learning. Then the hope is to motivate teachers in fostering creativity to carry out meaningful and fun learning and teachers have additional variations of learning models and approaches in learning physics. The limitation of the research which only applies the Problem Posing model to the material Temperature and Heat with a relatively short research time, it is hoped that further research can be carried out on other materials.

4. CONCLUSION

The results showed that the active learning of students in cycle II showed an increase when compared to cycle I. The results showed learning with the Problem Posing model was preferred by students so that it was hoped that the teacher could apply the Problem Posing model as a variation in learning Physics. The results of the study show that learning with the Problem Posing model is preferred by students so that it is hoped that teachers can apply the Problem Posing model as a variation in Physics learning. For further research, the researcher recommends conducting research related to the development of learning tools oriented towards improving children's cognitive, psychomotor and affective skills.

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