Implementation of problem based learning models in history of physics courses to promoting student learning result

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Abstract. This research type is a classroom action research conducted in three cycles. Each stage of action research consists of four stages: 1) Planning, 2) Acting, 3) Observation, and 4) Reflection. The subject of this research is the sixth semester physics student of FKIP University of Bengkulu. The data used consist of qualitative data and quantitative data. Qualitative data obtained through observation, while the quantitative data obtained from tests are given to students. Data collection in this research using observation sheet instrument and test sheet. The tests in this study were processed and analyzed using the equations of average values, absorption, and percentage of complete learning and final grades of students. The success indicator of this research is the absorption, it is said to increase if the students’ absorption in cycle II is better than cycle I and cycle III (DS1 <DSII <DSIII). PBIP for DDP MIPA to improve critical thinking skill to physics education program student of FKIP University of Bengkulu. The conclusion of this research is that by applying PBL can increase student learning activity in Physics Program of FKIP University of Bengkulu, that is understanding concept with average value of cycle I is 64, cycle II equal to 74 and cycle III equal to 83. Absorption ability of student of cycle I equal to 64%, second cycle is 74%, and cycle III is 83%, and the completeness of learning cycle I is 65%, cycle II is 86% and cycle III is 100%.

1. Introduction
History of Physics is one of the compulsory courses in Physics Education program, Faculty of Teacher Training and Education (FKIP), University of Bengkulu (UNIB). It is important studied for dealing with the concept of physics. If the prospective teacher is weak in mastering the concept of physics, then there will be errors in conveying materials and physics concepts in physics learning in school. As a result, prospective teachers who have weak physics concept will cause errors in the learning.

Based on observations made by researchers during teaching the history of physics, researchers can m e value and observe the character of the student. From the results of the assessment of researchers to students who are in the sixth semester who took the course of physics history has a low participation rate in following the learning process. From 78 students, there are 7 students who actively answer the apersepsi question given by the researcher in the learning process. It tert e but indicates that the class students tersebu no motivation to answer the questions posed lecturers. Judging from is a physics student learning outcomes are achieved still needs to be improved.
The distribution of the students' scores on the physics history course of FY 2015/2016 is 7 people get the score 50-59, 12 people get the score 60-69, 47 people get the score 70-79, 8 people get the value 80-89, and 4 people get the value 90-99.

Based on the results obtained, students who get an A score of less than 50%. Another problem that arises is the ability of students in the achievement of thinking. Students should have critical thinking skills. The ability to think is one of them serves as a selective thinking activity in receiving information.

One alternative that can be used to determine the quality of a possible educational process is to apply a problem-solving. In addition to supporting in learning, problem solving will support the ability in thinking. Physics lessons are very closely related to PBL, this is because problem solving is a center of physics learning and PBL model is a learning model that emphasizes more on problem solving or problem as a starting point. [1] reveal that PBL has a feature which can be achieved with indicators of skills that can be used as a measure, namely (1) the recipient (receiving), (2) response has been (responding), (3) planting value (valuing), (4) organizing the values (organization), and (5) character (characterization). If such skills can be achieved, then it becomes possible that the student has the ability to think critically.

Based on the above described, it is necessary to find a solution of the problem. One solution that can solve Problem m is to undertake action research (PTK). The purpose of this study is to improve student learning outcomes in Physics Program FKIP University of Bengkulu.

2. Research Methods

2.1 Types of research
This research is classroom action research (CAR) carried out in three cycles. [2] Each cycle consists of four stages, namely 1) Planning, 2) Implementation, 3) Observation and 4) Reflection. Description in classroom action research can be seen in figure 1.

![Figure 1. Groove in Classroom Action Research](image)

The implementation of the research will be carried out three cycles. Each cycle will be taught about the material history of physics.

2.2 Place and time of research
This research was conducted in Physics Department of FKIP University of Bengkulu in semester anjil academic year 2016/2017. The study time will be conducted from June to September 2016.
2.3 Data collection technique
In this study the data used are data that is both qualitative and quantitative. Qualitative data obtained through observation while the quantitative data obtained from tests given to students. Data collection in this research using observation sheet instrument and test sheet.

2.4 Preparation of Observation Sheets
Observation sheet consists of two general categories: 1) observation sheet activities of lecturers, is used to determine the deficiencies of the teachers at the time to teach and to observe the activity of the preliminary stage, the core and the cover, and 2) the observation sheet activity is most students are used to determine the extent to where activeness and participation in following the teaching and learning process from preliminary, core and closing.

2.5 Preparation of the Test Sheets
The test is a way / technique to measure students’ ability in achieving a certain competence, through the quantitative processing of the results in the form of numbers. This study uses an essay written test.

2.6 Analysis of observational data
Observation sheet of teacher and student activity is used as a reference of observation in knowing the shortcomings done by lecturer and student during the learning process. The results of this observation sheet are then analyzed, why and what caused the deficiencies that have occurred. For further results of this observation serve as a reference or guidance in improving the implementation of learning in the next cycle.

| Table 1. Score observation aspect of observation sheet |
| --- | --- | --- |
| No | Score | Interpret assessment |
| 1 | 3 | Good |
| 2 | 2 | Enough |
| 3 | 1 | Less |

2.7 Analysis of test data
The tests in this study were processed using the equation of average values, absorption, and percentage of complete learning and final grades of students. [3] The average grade is calculated using the equation.

\[
\bar{X} = \frac{\Sigma X}{N}
\]  

(1)

where \( \bar{X} \) is the average grade value, \( \Sigma X \) is the total value of all students and \( N \) is the number of students. Student absorption (DS) is calculated using the equation.

\[
DS = \frac{N_s}{S \times Ni} \times 100
\]  

(2)

where \( N_s \) is the total value of all students, \( S \) is the total number of students while \( Ni \) is the ideal value (100). The final value of each cycle is calculated using the equation:

\[
NA = 70\% \text{ Value Test} + 30\% \text{ value report (LKS)}
\]  

(3)

The success criteria of action performed on each cycle in this study if the absorption is said to increase if the absorption of students in cycle II is better than cycle I and cycle III better than cycle II (DS_I < DS_II < DS_III).
3. Results and Discussion

3.1 Result
The group report (LK) will be used as the final learning value, with their respective percentages, the test results per cycle (70%) and group report (30%). Test implemented after the learning process HOTS, while the value of the group obtained from the results of filling LK.

![Data Research Results](image)

**Figure 2. Data Research Results**

Reflexion cycle I
After doing the teaching and learning process by applying the PBL to the material the history of physics at the end of cycle I is done reflection on the results that have been obtained both from the observation sheet and from the first cycle test. To improve the aspects that are still lacking in cycle I, it is necessary to improve the steps that will be implemented in cycle II. The improvement must be done: 1) in the orientation phase of the problem, the student must pay attention to the teacher so that they understand the introduction of the issues raised, 2) In the investigation phase, the student must use the best time seriously when doing LK, 3) In the presentation phase of student work should be more courageous and active when asked questions.

Student orientation phase on cycle I problem, when the Teachers provide problems raised from the background of daily life and explore the students’ knowledge of the experiences they have experienced students are not paying attention and less serious so that at the stage of performing observation procedures many students are confused.

Phase Hypothesis cycle I, Inviting and guiding students to observe no problems and already in good criteria, this is because students have noticed the Teachers to convey.

Phase I inquiry phase I, divide the students into 6 groups by way of accent to megatur group composition, Teachers distribute LKS to each student, Provide opportunities for students to carry out group discussions and guide discussion nets, Teachers help groups to define and organize learning tasks related to problems. In this phase there are still many students who ignore so only produce enough criteria.

Phase presents the work of cycle I, in this phase produces the work, but not as expected, the presentation of this work is the result of the investigation so indirectly.

Alternative phase of problem solving cycle I, Guiding students to conclude alternative problem solving, as well as in the previous phase is the phase of presenting the work on average there are still many students who ignore, this is because students are not accustomed to express opinions and considered that all knowledge is only centered on the Teacher.

The phase of evaluating the problem solving cycle I, in this phase students are less active in responding and asking the results of the discussion, this is because students still do not have critical thinking skills so do not understand things that will be in criticism and conveyed.
Cycle Reflection II
After doing the teaching and learning process by applying the results of reflection on the first cycle, then generated an average score of 10 so that pertained good criteria. This is due to the shortcomings that exist in cycle I has been improved, but other than that there are still shortcomings in cycle II. To improve the aspects that are still lacking in cycle II, required improvements that must be done by students in cycle III. The improvement must be done include: 1) The teacher guides students to analyze the data carefully so that the results in accordance with the expected, 2) guide students to be able to issue all knowledge related to the material so that students know the important points that must be taken conclusion, 3 ) The teacher gives a warning to the students not to cooperate with other groups when doing the task. [4] This is in line with stating that PBL has characteristics to stimulate the ability of learners.

The student orientation phase on the problem cycle II, when the Teachers give the problems raised from the daily life background and explore the knowledge of the students from the experiences they have experienced so many students have paid attention and seriously so that at the stage of doing the observation procedure not many students are confused.

Phase hypothesis of sikus II, Allow and guide students to experiment does not occur problem and already in good criterion, this matter because student already pay attention which Teacher convey.

The phase of investigation cycle II, divide the students into 6 groups by way of accent to organize group composition, Teachers distributing LKS to each student, giving the students the opportunity to carry out group discussion and guide the discussion, The teacher helps the group to define and organize learning tasks related to problems.

Phase presents the work of cycle II, in this phase there are more than 50% of students dare to express their opinions so that the observation sheet into the good criteria.

Alternative phase of problem solving cycle II, guiding students to conclude alternative problem solving, as well as in the previous phase is the phase of presenting the work on average many students who have started to care about his colleagues or discuss, this is because students are getting used to express opinions.

The phase of evaluating the problem solving cycle II, in this phase students began to actively respond and ask the results of the discussion, this is because the students already have critical thinking skills so do not understand what will be criticized and delivered.

Cycle Reflection III
Achievement of completeness in cycle III because the teacher has reflected the cycle II, namely: 1) The teacher guides students to analyze the data carefully so that the results in accordance with the expected, 2) guide students to be able to remember the material so that students know the important points that must be taken conclusion, 3) The teacher gives a warning to the students not to cooperate with other groups when doing the task.

The student orientation phase on cycle III issues , when Teachers provide issues raised from everyday life background and explore the knowledge of students from experiences they have experienced students have been paying attention and seriously so that at the stage of doing the experimental procedure not many students are confused.

Phase III cyclical hypothesis, invite and guide students to experiment no problem and already in good criteria, this is because the students have noticed the Teachers to convey.

Phase III of the investigation phase, divide the students into 6 groups by donating to group composition, the teacher distributes LKS to each student, giving the students the opportunity to carry out group discussion and guide the discussion, The teacher helps the group to define and organize the learning task related to problems.

Phase presents the work of cycle III, in this phase the students have dared to express their opinions so that the observation sheet is included in the good criteria and there is no need to be fixed in detail.

Alternative phase of problem solving cycle III, guiding students to conclude alternative problem solving, as well as in the previous phase is the phase of presenting the average work of many students
who have cared attention to his colleagues or discuss, this is because students are accustomed to express opinions and do not assume that all science is merely teacher-centered.

The phase of evaluating the problem solving cycle III, in this phase students begin to actively respond and ask the results of the discussion, this is because the students already have critical thinking skills so as not to understand things that will be in criticism and conveyed.

3.2 Discussion

The student orientation phase on the problem: ability of students in solving the problem of each cycle is increasing, this is caused by the critical thinking ability of learners better. [5] When Teachers provide words that come from everyday backgrounds and reduce the knowledge of the experiences they have experienced students are already accustomed and serious in difficult situations not many students are confused. Students have creativity science skills [6].

Phase hypothesis: students are able to invite and the teacher guides students to experiment does not occur problems and already in the criteria, this is because students have noticed the Teacher convey [7].

Investigation Phase: Teachers distribute LKS to each student, giving students the opportunity to conduct group discussions and guide discussion, Teachers help groups to define and organize learning tasks related to problems. Furthermore, teachers provide guidance so students understand. [8] stated in his research that if learners do not understand it needs guidance.

Phase presents the work: the student has the ability to express his opinion so that on the observation sheet is included in the good criteria and there is no need to be fixed in detail. [9] that students' ability to express their opinions will have a positive impact on students' ability.

Alternative phase problem solving: students are able to find an alternative problem solving, because students are accustomed to express their opinions and do not assume that all knowledge is centered on the Teacher alone. [10] says that the more often the individual faces a problem and is able to solve it then the individual will have the ability to develop his/her ability to solve the problem.

The phase evaluating the problem solving: students are active in responding and asking the results of the discussion, this is because students already have critical thinking skills so they do not understand the things that will be in criticism and conveyed. [11] The ability to evaluate is one of the higher-order thinking skills capable of facilitating individuals in solving problems

The increase in each cycle is caused by several factors, including: 1) the teacher has tried maximally to apply the PBL as well as possible, 2) the teacher has tried to correct the deficiencies that occurred in the first and second cycle and apply better in cycle III, 3) in the third cycle of students pay more attention to the lesson, in the discussion they are also increasingly interested and enthusiastic in studying the material history of physics. This is consistent with the statement [12] that PBL is a learning approach that can be applied by way of solving the problem, the students will explore their own concepts that are required under their control, and participants will be active for the critical and through discussions, investigative skills, and undergo a process skill procedure. Furthermore, [13] mentioned that the characteristics of PBL are: (1) problems of starting point, (2) structured facts, (3) requiring multiple perspectives, (4) identification of learning needs and new fields in learning, (5) learning to direct oneself to be the main thing, (6) utilization of various sources of knowledge, and (7) collaborative, communication, and cooperative.

4. Conclusions

Based on the results of research and discussion then it can be concluded that the study of the history of physics by applying PBL can improve student learning outcomes in Prodi Physics FKIP University of Bengkulu, that is understanding of matter with average value of cycle I is 64, cycle II equal to 74 and cycle III equal to 83. Absorption ability of student of cycle I is 64%, cycle II equal to 74%, and cycle III equal to 83 %, and mastery learning cycle I is 65%, cycle II equal to 86% and cycle III 100%.
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