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Online Problem-based learning to Enhance Student Creativity in Physics Learning

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Abstract

This study aims to determine the increase in students' mastery of concepts and creative thinking skills after implementing the problem-based learning model. The sample in this study were students of class VIII MTs Ad-Diinul Qayyim West Lombok using a qualitative approach and the type of classroom action research. The material used in this research is Substance Pressure. This research was conducted in the second (even) semester of the 2018/2019 academic year. The instruments used in this study include 1) observation sheets on the implementation of learning by the teacher; 2) student activity observation sheets; 3) the concept mastery test instrument, and the creative thinking skill test instrument in the form of essay questions. The results showed that using a problem-based learning model could improve conceptual mastery and creative thinking skills, with the following scores: For knowledge of concepts in the first cycle, a score of 65.52% was obtained, and the second cycle was 89.65%. Meanwhile, for creative thinking skills using a test in the form of an essay, 37.93% was obtained, and the second cycle was 93%.

Keywords: concept mastery; creative thinking skills; problem based learning

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INTRODUCTION

Education is a conscious effort to develop the potential that exists in humans through teaching activities. Education is a process to acquire knowledge. Learning is a two-way communication process, teaching by teachers and learning by students. (Panjaitan & Rajagukguk, 2018) Because in the face of increasingly rapid technological developments, reliable human resources are required, who have high abilities and creativity (Suyidno et al., 2019). When someone determines a problem, solves a problem, or understands something, then that person carries out thinking activities.

Good education requires learning that trains various skills, one of which is creative thinking skills. Through a challenging activity, students are expected to think scientifically, one of which is creative thinking (Amrullalah et al., 2017; Usmeldi, 2019). The success of a learning goal is determined by several factors, including the

teacher's factor in carrying out teaching and learning activities because it can directly influence, foster, and improve the intelligence and skills of students

MTs Ad-Diinul Qayyim is one of the madrasas in Dusun Kapek, Gunungsari Village, West Lombok Regency that has implemented the 2013 curriculum (K-13) since 2013. Based on the results of initial observations conducted on March 24, 2020, on class students VIII E in MTs, it is clear that students are still lacking in the mastery of concepts and are still less creative in solving the problems given. Moreover, when an interview was conducted with one of the science subject teachers, especially in physics subjects at MTs Ad-Diinul Qayyim, it turned out that there were still many of the 29 students there were some (11 students) who were less involved in learning activities, causing the ability to mastery. Students' concepts and creative thinking are less than optimal. Students' concepts and creative thinking are less than optimal, and students are more optimizing the ability to memorize concepts that are available only for preparation in working on questions at the time of the exam (Eragamreddy, 2013; Setiawan et al., 2018).

The problems described above indicate that students still have difficulty solving the problems given. In solving these problems, students have not been able to understand and be skilled in carrying out the stages that must be corrected during the learning process. Learning so far has not been optimal. This is because there are dominant and active students, and there are passive students, so learning is not optimal. As for the observations obtained during interviews for the 2020/2021 school year, data showed that students were not maximal in mastering concepts and creative thinking skills, namely: For mastery of classical ideas, it is only 65%, while creative thinking skills are 62.75%.

The method used to measure the level of mastery of students' concepts is done by applying Bloom's taxonomy in Anderson & Karthwohl (2010) to measure students' cognitive processes (Leslie, 2016). The dimensions of students' cognitive processes are; (1) Remembering retrieving knowledge from long-term memory. This aspect refers to the ability to recognize and remember the material that has been studied, from simple to complicated things. (2) Understanding constructing the meaning of the learning material, including what is said, written, and drawn by the teacher. (3) Apply, apply or use a procedure in certain circumstances. (4) Analyzing, breaking down material into its constituent parts and determining the relationships between those parts and the relationship between them and the overall structure and purpose. (5) Evaluating making decisions based on criteria and standards. (6) Creating, combining parts to form something new from coherence or create an original product (Amrullalah et al., 2017). To determine the mastery of students' concepts, in this study, only five cognitive domains were reviewed, namely remembering, understanding, applying, analyzing, and evaluating because they were adjusted to competency standards.

So, it can be concluded that from the results of observations and interviews conducted on March 24, 2020, it was clear that what emerged in class VIII E MTs Ad-Diinul Qayyim students was still emphasizing aspects of knowledge and understanding of the material. So far, the teacher has given more practice and worked on the questions contained in the student textbooks. This causes a lack of training in students' ability to master concepts and creative thinking skills. Therefore, to stimulate mastery of concepts and creative thinking skills, it

is necessary to have a learning model that supports and directs students to overcome the problems they face (Satriawan et al., 2020). This ability is the ability to solve problems, where this ability can be developed through learning where problems are presented in the classroom and students are asked to solve them with all the knowledge and skills they have.

Based on the problems above, it is necessary to strive for learning model innovations, including applying innovative learning strategies, methods and approaches. The process of learning physics is not enough to carry out the delivery of information about concepts and principles. Still, students must also understand the process of physical phenomena by sensing as much as possible, observing events that occur through experiments, conducting experiments, recording data and patterns that arise from these events (Maryati, 2018). Thus the learning process becomes more interesting and meaningful because students gain direct experience from experiments carried out. Problem-based learning is an approach that uses real-world problems as a context for students to learn about critical thinking and problem-solving skills and acquire essential knowledge and concepts (Iyam & Udonwa, 2018). Thus the learning process becomes more exciting and meaningful because students gain direct experience from the experiments. Moreover, in this study, the author tries to apply one of the learning models, namely the problem-based learning model, to find out whether using this model can improve conceptual mastery and creative thinking skills in science learning (physics) or not.

One of the learning models that can train students to improve mastery of concepts and creative thinking is the Problem Based Learning (PBL) learning model. PBL is centred through relevant problems, and students are directed to look for problem situations. The search process is expected to be able to examine the gap between their knowledge and skills to find which information needs to be obtained to resolve and manage the existing problem situation (Rerung et al., 2017; Schettino, 2016; Yulianti et al., 2019)

PBL can develop students' creative thinking by training their process skills to solve problems and find solutions (Fitriani et al., 2019; Insyasiska et al., 2015). In addition to increasing students' mastery of the material, it will also foster a great sense of responsibility for what is done and confidence in themselves (Batlolona et al., 2018; A. Wulandari & Suparno, 2020; B. Wulandari & Surjono, 2013). Therefore, research was conducted with the aim of determining the increase in students' mastery of concepts and creative thinking skills after implementing the problem-based learning model.

METHOD

This classroom action research was conducted on 29 students of class VIII E MTs Ad-Diinul Qayyim. This study collaborated with one observer, namely a science teacher, especially in physics subjects at the school. This research will be carried out in class VIII E MTs Ad-Diinul Qayyim, located at Kapek Hamlet, Gunungsari Village, West Lombok Regency.

The targets of action in this study were students of class VIII E at MTs Ad-Diinul Qayyim. There are many students with different personalities and characteristics in a class, and these students also come from different social environments. Students' ability, disposition, and social environment shape it into a different character with a certain behaviour pattern.

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The differences exist in certain things, and none of the students has anything in common. If one aspect is the same, then the other aspects must be different. The difference of each individual is one of the supporting factors to realize the quality of each individual (Septiani & Kejora, 2021).

So, at MTs Ad-Diinul Qayyim, especially in class VIII E, students have characteristics. among others, it is found that there are students who are smart, students who are not smart, and are not smart based interview with Mr. Sahrul Hadi (Physics course teacher's). Smart students will more easily accept learning materials than those who are less intelligent and not smart. Not to mention the differences in talent, emotional, and social. These differences in characteristics require teachers to be wise in responding to them.

Classroom Action Research Design

This classroom action research is carried out in a certain class to observe learning activities in the form of an action Broadly speaking, and four steps are done in class action research. Kurt Lewin's model of planning, action, observation, and reflection (Annisa et al., 2018).

1. Draw up a plan. At this stage, the activities should be carried out as follows:
   a. Create a plan for the implementation of learning
   b. Prepare facilities from the necessary support facilities
   c. Preparing instruments to record and analyze data
   d. About the process and the outcome of the action.
2. Carry out actions At this stage, carry out actions formulated on the plan of implementation of learning in actual situations, including initial activities, core activities, and final activities.
3. Carry out observations. At this stage, what needs to be done is:
   a. Observe the behaviour of learners in participating in learning activities,
   b. Monitor the activities of learners,
   c. Observe each learner's understanding of the material that has been designed for classroom action research.
4. Doing reflection. At this stage, the things to do are:
   a. Record the results of observations,
   b. Evaluate the results of observations,
   c. Analyze learning outcomes,
   d. Note the weaknesses to be used as material for the preparation of the next cycle plan until the research objectives of the class action are achieved.

The class-action research model used in this study was the Kurt Lewin model. Kurt Lewin explains that four things must be done in action research, namely planning, action, observation, and reflection. The implementation of action research is a process that occurs in a continuous circle.

In this study, if the first cycle is not successful, namely the teaching and learning process using the application of problem-based learning (problem-based learning) has not been able to increase the mastery of concepts and creative thinking skills that can be seen from the teaching and learning process of physics, then a follow-up cycle will be held until an increase in mastery concepts or creative thinking skills of students are achieved. Classroom action research includes qualitative research. Although the data obtained can be descriptive in words, the researcher is

the main instrument in data collection. The researcher's attention is directed to understanding how an event or the effect of the action takes place (Panjaitan & Rajagukguk, 2018).

The following stages of classroom action research carried out are shown in Figure 1.

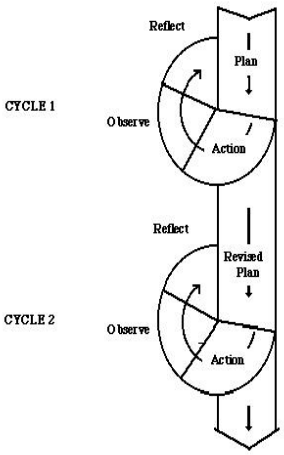

Figure 1 Classroom action research

Action Plan

This research activity plan begins with a preliminary study (preliminary research/preliminary observation) about the pattern of the teacher's learning process in the classroom. The action planning procedure can be explained as follows:

Precycle

At this stage, the activities carried out by the researchers were identifying problems and collecting data before the research was carried out, namely by conducting interviews with one of the science subject teachers of class VIII E MTs Ad-Diinul Qayyim, namely Mr Sahrul Hadi, S. Pd.

Cycle I

The actions taken in a classroom action research are rarely successful in reaching the limit of learning mastery in just one cycle. Therefore, class actions are carried out cyclically, i.e. more than one cycle. In this study, the researcher used two cycles. Each cycle consists of several main activities: planning, action, observation, and reflection. The first cycle steps are as follows (see Table 1).

Table 1 Stages of PBL learning model

Stage	Activities
Planning	• Designing a learning implementation program according to the method or model that will be carried out in the form of RPP on Substance Pressure material with the subject of Pascal's Law • Prepare student activity observation sheets (attached) • Prepare an observation sheet for the implementation of learning by the teacher (attached)
Action	• Orientation of students to the problem. The teacher explains the learning objectives, explains the logistics needed, motivates students to be involved in solving the chosen problem. • Organizing students to learn. At this stage, teachers help learners define and organize learning tasks associated with the problem that the material on the Law A Archimedes. • Guided investigation of an individual or group. At this stage, the teacher encourages students to collect information that is by Archimedes' Law material, conduct experiments (practicum), to get an explanation and solve the problem.
Observation	• Along with the action, the observer observes how the learning process is carried out using the student activity observation sheet by the observer according to the application of the problem-based learning model as material for revision of actions that will be carried out in the next cycle.

Reflection	• This reflection stage is intended to thoroughly examine the actions that have been carried out in each cycle, based on the data that has been collected and then evaluate to perfect the following action. Activities in the form of analysis and assessment of the observation results and the results are used for basic repairs reflection in many Usun planning in the next cycle.

Types of Instruments and How to Use them the instrument in this study used data collection techniques, namely in the form of essay test questions. The researcher gave a test at the end of the first and second cycle meetings through the concept mastery variable. Meanwhile, to measure the ability of creative thinking skills, the researcher gave a test after the learning process activities: (1) Concept Mastery Data (Test), Arikunto (2005) states that a test is a tool or procedure used to find out or measure something in an atmosphere, with predetermined ways and rules (Fajrina et al., 2020). The technique of collecting data through tests conducted by researchers aims to obtain data on the concept mastery of students of class VIII E MTs Ad-Diinul Qayyim; (2) Creative Thinking Skills Data (Test). The technique of collecting data using an essay test was carried out by researchers aiming to determine the ability of students to think creatively on physics science subjects.

Action Implementation the activity carried out in the implementation stage of this action is that a teacher acts as implementing the PBL learning model that was previously planned by researchers (Saputri, 2021). When the teacher acts, the researcher also observes the ongoing learning process. It aims to collect data without disturbing the learning activities of students. A teacher carries out learning activities based on the lesson plans that previous researchers have made. Furthermore, to find out the increase in the mastery of concepts and creative thinking skills of students, the researchers used a test in the form of the essay question.

The observation in question is the observation of the implementation of the learning model aimed at knowing whether the stages of the learning model studied have been implemented by the teacher or not. These observations are made in the form of a checklist. So, in filling it out, the observer gives a checklist on the stages of the learning model being studied by the teacher. The observers involved were science teachers, especially in physics subjects at the school where the research was conducted (Hermawan et al., 2021; Taufik, 2020).

The indicator of success in this research is the improvement in the mastery of concepts and creative thinking skills of class VIII E MTs Ad-Diinul Qayyim in physics subjects with the subject of substance pressure after applying the problem-based learning model. The criteria for mastery of classical concepts are 80%, and the creative thinking skills of 90% of students have mastered the indicators of mastery of these concepts and thinking skills.

RESULT AND DISCUSSION

The reason for choosing class VIII E as the research subject is based on the results of initial observations made on science subjects, especially physics. Students' ability in class VIII E is still low in mastering concepts and creative thinking skills compared to other classes. For this reason, class actions are planned to improve students' mastery of concepts and creative thinking skills in the science of physics subjects through the problem-based learning model.

Implementation of Cycle I

Cycle I was carried out with 5 x meetings. In the first cycle, learning is carried out with Pascal's Law material were. In implementing the first cycle,

students form large groups of 5-6 students.

From the results of the description of the first cycle, it can be seen that the score obtained on teacher activities is 70% and is quite good. This can be seen from the observations of teacher activities in cycle I using a problem-based learning model. In the next cycle, the teacher's implementation of learning needs to be improved again.

From the results of the description of the first cycle, it can be seen that the score obtained on student activities is 60% and is quite good. In the next cycle, student activities need to be improved again. Furthermore, in the first cycle, the teacher gave an evaluation in the form of a test with five essay questions to know the mastery of students' concepts and four essay questions to determine creative thinking skills.

The concept of Substance Pressure with the subject of Pascal's Law in this study is limited to seeing the cognitive level in aspects of C1 and C2. In theory, the test is carried out by carrying out a written evaluation in the form of essay questions consisting of 5 questions that have been validated and given at the end of the cycle. From the results of the description of the first cycle, it can be seen that the score obtained on the results of the student's concept mastery test is 65.52% and is quite good. In the next cycle, students' mastery of concepts must be improved following existing scientific concepts.

The ability to think creatively in this study is the ability of students to understand the material and problems presented, both in theory and in their application in everyday life. In theory, a test is carried out by carrying out a written evaluation in the form of an essay question consisting of 4 items that have been validated. From the results of the description of the first cycle, it can be seen that the score obtained on the test results of students' creative thinking skills is 37.93% and is classified as poor. In the next cycle, students' creative thinking skills need to be improved again according to the indicators of these creative thinking skills.

Cycle II Implementation

Cycle II was carried out with 3 x meetings. In the second cycle, learning is carried out using Archimedes' Law material, which in the second cycle, the students form small groups consisting of 3-4 students.

From the results of the description of the second cycle, it can be seen that the score obtained on the teacher's activities is 90% and is classified as very good. This shows that there has been a significant increase of 20% in the second cycle.

From the results of the description of the second cycle, it can be seen that the score obtained on the activities of students is 85% and is classified as good. This shows that in cycle II, the activities carried out by students have increased by 25%. In cycle II the teacher gave an evaluation in the form of a test with a total of 5 essay questions to know the mastery of students' concepts and four essay questions to determine creative thinking skills. From the results of the description of the second cycle, it can be seen that the score obtained on the students' concept mastery test results is 89.65% and is classified as very good, so there is no need to continue to the next cycle.

The ability to think creatively in this study is the ability of students to understand the material and problems presented, both in theory and in their application in everyday life. In theory, a test is carried out by carrying out a written evaluation in the form of an essay question consisting of 4 items that have been validated. From the results of the description of the second cycle, it can be seen that the score obtained in the test results on the creative thinking skills

of students is 93% and is classified as very good so that the next cycle does not need to be done again.

The research aims to improve the learning process to increase students' mastery of concepts and creative thinking skills through problem-based learning models (problem-based problem-based learning). The research is intended to see how teachers manage learning activities, activate students in learning, and evaluate student learning outcomes to improve students' mastery of concepts and creative thinking skills. The following are the results of teacher and student activities observation listed in Table 2.

Table 2 Teacher and student activity observations

Observation	Cycle I	Cycle II
Teacher Activities	70%	90%
Student Activities	60%	85%

The teaching and learning activities of teachers and students' activities in the classroom from cycle I to cycle II turned out to have increased. This is evidenced by the results obtained from each cycle using the problem-based learning model that has been applied. The following table compares results between teacher activities and student activities in 2 cycles.

The teaching and learning activities of teachers and students' activities in the classroom from cycle I to cycle II turned out to have increased. This is evidenced by the results obtained from each cycle using the problem-based learning model that has been applied. The following table compares results between teacher activities and student activities in 2 cycles.

The results of data analysis in implementing the first cycle using a problem-based learning model (problem-based learning), the theoretical mastery of students' concepts by using tests in the form of essay questions obtained a score of 65.52%. Meanwhile, for the test of creative thinking skills using essay questions, 37.93% was obtained. This is because there are still shortcomings in the learning process based on the results of research that has been done.

In implementing the second cycle using a problem-based learning model, students' mastery of theoretical concepts using a test in the form of essay questions obtained a score of 89.65%. For the test of creative thinking skills using essay questions, a score of 93% was obtained. For both tests, it is not necessary to continue to the next cycle because it has experienced a significant increase.

The following Table 3 shows a comparison of test results between mastery of concepts and creative thinking skills of students' activities in 2 cycles.

Table 3 Concept mastery test results and creative thinking skills

Aspect	Cycle I	Cycle II
Concept Mastery	6.2 %	8.9%
Creative Thinking Skills	3.7 %	9.3 %

Based on the results of research data analysis, it was found that using a problem-based learning model can improve students' mastery of concepts and creative thinking skills, especially on the subject of substance pressure. A problem-based learning model (problem-based learning) prioritizes students in learning and solving existing problems, both in the material and in doing the tasks given by the teacher regarding the material provided. In addition, this learning model uses real-world problems as a context for students to learn about creative thinking and problem-solving skills and gain knowledge of essential concepts from the material being studied. And in the research that has been done by (Sucirahayu et al., 2015) the problem-based learning model can also train students to solve a problem they face independently. With problem-based

learning, students can think creatively, develop initiatives, and acquire essential knowledge and concepts from the subject matter.

CONCLUSION

Based on the results of research and discussion, it can be concluded that the ability to master concepts and creative thinking skills of students can be improved through the application of problem-based learning models. The improvement of each indicator of the mastery of concepts and creative thinking skills of these students can be seen from the results of the research that has been done. For mastery of concepts in the first cycle, a score of 65.52% was obtained, and in the second cycle, 89.65% was obtained. Meanwhile, for creative thinking skills using a test in the form of essay questions, a score of 37.93% was obtained, and in the second cycle, 93% was obtained.

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