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# Implementation of Modified Base Learning Problems in Improving Vocational Physics Learning Outcomes on Optical Materials

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**Abstract:** The purpose of research on the implementation of Problem Based Learning (PBL) can improve students' physics learning outcomes in terms of knowledge and skills. Classroom Action Research was conducted in two cycles, the subject of the research was class X APHP 03 with 35 students. The data collection method used was a test for knowledge and skill aspects through observation. Qualitative descriptive data analysis method for the knowledge aspect by percentage of students' mastery level classically and the skill aspect through the observation sheet scoring. Learning outcomes from cycle I and cycle II have increased in the knowledge aspect by 17.14%. Aspects of student skills increase in the indicators of systematic presentation, mastery of the material and pronunciation at the time of presentation, so that the implementation of Problem Based Learning can improve student learning outcomes.

**Keywords:** Aspects of knowledge; Aspects of skills; Learning outcomes; Problem Based Learning.

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## Introduction

Learning is a process of interaction between students and educators in a learning environment (Permendikbud RI number 719/P/2020). Aspects of knowledge, skills and attitudes are expected to go hand in hand in learning physics. Solving problems using scientific methods and understanding concepts requires high creativity from students. Learning objectives will be achieved if the learning model used is appropriate and appropriate for students. The learning model is one of the strategies in learning in organizing the concepts given by the teacher. According to (Darmadi, 2017) problem-based learning is a learning approach that presents contextual problems so as to stimulate students to learn. The right learning strategy will have an effect on the learning outcomes themselves. The characteristics of the Problem Based Learning model are: (1) the existence of a question or problem submission; (2) focuses on inter-discipline linkages; (3) authentic inquiry; (4) produce a product or work and present it; and (5) cooperation (Ibn Badar Al-Tabany, 2017). According to Sudjana (Kasih & Purnomo, 2016) learning outcomes are abilities that students have after receiving their learning experiences.

The results of initial observations on students regarding learning outcomes still do not meet the criteria for school completeness, this is with an assessment in terms of knowledge and skills. The percentage of student learning outcomes in terms of knowledge is 54.14% while in terms of skills 60.00%.

The low learning outcomes of students encourage teachers to make efforts to improve the learning process, one of which is using the Problem Based Learning model. The application of the Problem Based Learning model as a solution to improve learning outcomes was

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also carried out by several researchers who were able to overcome various problems ranging from learning outcomes, critical thinking, problem-solving, the ability to ask questions (Rahmadani, 2019), (Anggiana, 2019), (Masrinah, et al. al., 2019), (Shofiyah & Wulandari, 2018), (Widyaningrum, 2016), (Maulidia, et al., 2020), (Yusuf & Pujiastutik, 2017), (Yoesoef, 2015), (Masek & Yamin, 2012), (Celik, et al., 2011), (Bahri, et al., 2012). The teacher provides appropriate teaching materials on Edmodo, then students are given the freedom to solve problems with the material. In addition to observations through observations and discussions with fellow teachers, the concepts in physics will be easier for students to understand if students are directly confronted with examples of existing physics problems. Then seen from the results of previous studies, there are still many students who have not met the mastery of learning and lack of activity in completing assignments and physics learning activities on Edmodo.

The steps of the learning model in the Problem Based Learning model in this study were modified in several syntaxes using different delivery media. The differences in the steps are shown in Table 1.

**Table 1.** Steps of the Problem Based Learning Model

| Stages | Teacher's Behavior (Rahmadani, 2019) | Teacher behavior | |
|---|---|---|---|
| | | Cycle I | Cycle II |
| Stage 1 Student Orientation on Problem | The teacher explains the learning objectives, explains the logistics needed, proposes phenomena or stories to bring up problems, motivates students to be involved in solving the problems they choose. | The teacher proposes examples of geometrical optics problems and asks students to observe and understand the problems individually (poured in students' edmodo) | The teacher proposes an example of an optical problem and asks students to observe and understand the problem individually (poured in the students' edmodo) |
| Stage 2 Organizing students to learn | The teacher helps students define and organize learning tasks related to the problem. | The teacher divides students into groups and Student Worksheets that are already available on Edmodo, and monitors students in discussions (discussion only through Whatsapp Group and Edmodo) | The teacher divides students into groups and Student Worksheets are available on Edmodo, and monitors students in discussions (discussions only through Whatsapp Group and Edmodo and one meeting with zoom for discussion before group presentations) |
| Stage 3 Guiding individual and group investigations | The teacher encourages students to collect appropriate information, carry out experiments, to get problem solving explanations. | The teacher asks students to connect the material with the phenomena that occur (Discussion only via WhatsApp Group and edmodo) | The teacher asks students to connect the material with the phenomena that occur (Discussion only via WhatsApp group and edmodo and via zoom) |
| Stage 4 Develop and present the work | The teacher helps students in planning and preparing appropriate works such as reports, videos, models and helps them with various tasks with their friends. | The teacher asks students to prepare reports on the results of group discussions neatly by referring to the Student Worksheets that have been given to students. | The teacher asks students to prepare reports on the results of group discussions neatly by referring to the Student Worksheets that have been given to students. |
| Stage 5 Analyze and evaluate the Problem-Solving Process | Teachers help students evaluate their investigations in the processes they use. | The teacher asks students to send records of the results of each group's presentation | The teacher asks the group representative to present the report via the zoom application |

With the results of discussions with teacher friends and reviewing the literature, the right learning model will be able to make solutions to improve student learning outcomes. The learning model used to overcome these problems is the Problem Based Learning model.

## Method

This research is a Classroom Action Research with the design used adapting from the Ministry of National

Education with a combined model of Sanford and Kemmis. This research was conducted in two cycles.

The research will be carried out in May 2021 at SMK Negeri 1 Trenggalek for class X students in the even semester of the 2020/2021 academic year. The research subjects were class X APHP 03 with the method of selecting a purpose sampling area with a total of 35 students.

The dependent variable in this study is the use of a modified Problem Based Learning model and the independent variable on student learning outcomes in aspects of knowledge and aspects of skills. The research instrument used was a test and a guide for filling out the presentation observation sheet. The data collection method used was a test for the knowledge aspect and observation for the skill aspect, with qualitative descriptive data analysis methods including reducing data, presenting data, drawing conclusions, and verifying. The data to be analyzed is in the form of mastery learning results with the formulation.

$$P_1 = \frac{n}{N} x \; 100\% \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots.. \quad (1)$$

Description:

$P_1$ = The percentage of students' learning completeness.

n = The number of students who achieve completeness test scores > 60 and a maximum score of 100.

N = The total number of students (Eryanti, 2015).

The criteria for learning completeness are as follows: Individual completeness, if students reach a score of 60 out of a maximum score of 100. Classical completeness, if there are at least 75% of the number of students in the class who have achieved individual mastery.

## Result and Discussion

The data obtained by the researchers on the students' learning completeness in the alternating current electricity chapter in the knowledge domain is 57.14% and the skill domain is 60.00%. Based on this percentage, it still does not meet the minimum completeness criteria of 75%. This percentage by using scoring in the assessment of the knowledge, skills can be described in the real conditions of students during the learning process. It appears that more than 10 students who are not actively collecting assignments on Edmodo and also do not provide feedback when in class. Classically the class has not been able to be active in learning, tends to be silent and less active in communication both face-to-face and online. The recapitulation of research results in the realm of student knowledge is in Table 2.

**Table 2.** Recapitulation of Student Learning Outcomes in the Knowledge Domain in the pre-cycle, Cycle I and Cycle II.

| Aspect | Cycle | | |
|---|---|---|---|
| | Pre-cycle | Cycle I | Cycle II |
| Lowest score | 20.00 | 30.00 | 40.00 |
| The highest score | 86.00 | 90.00 | 100.00 |
| Completed Students | 20.00 | 24.00 | 30.00 |
| Students Not Complete | 15.00 | 11.00 | 5.00 |
| Average | 62.52 | 65.71 | 76.86 |
| Percentage of Completeness (%) | 57.14 | 68.57 | 85.71 |

The stages were carried out in cycle I so that there was an increase from the pre-cycle although it was not significant by providing detailed material exposure on Edmodo, then the researcher gave instructions on how to work and collect assignments. Discussion activities were carried out through messages on Edmodo, WhatsApp groups and the researchers gave a brief explanation regarding the completion of the Student Worksheet on optical material in the Geometric Optics sub-chapter. The researcher gave detailed directions regarding the assignment and asked students to do a literature study apart from the teaching materials provided. Students work in groups to complete the Student Worksheet and record the Student Worksheet presentation. Researchers provide input or coordination related to work through WhatsApp groups or independent coordination from students. Reflecting by providing input or comments on the work of students that have been collected in the Edmodo assignment bag. At the end of the learning process, a formative test is given to find out how to increase the success of students during the teaching process.

The results in the first cycle did not meet the classical learning completeness of 68.57% because group activities carried out by students needed to be briefed directly via video conference. The use of the learning model is still held in the process of guidance in the middle of the syntax. In Cycle II, the students carried out the work by recording the process of compiling and completing the Student Worksheet with the direction of the researcher. The researcher provided some of these questions during a video conference. Things that must be discussed include optical concepts and solving problems related to these materials. Students make live presentations during video conferences, while others provide input. In cycle II there is an increase in classical learning completeness and has met the 75% completeness standard. The increase in mastery learning from cycle I and cycle II can be seen in Figure 1.

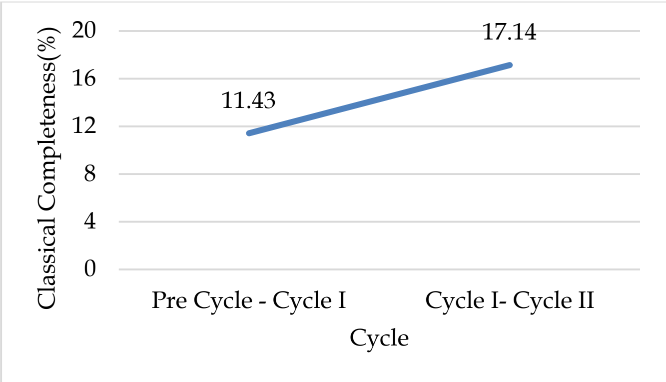


**Figure 1.** Graph of Increasing Mastery Learning Outcomes Aspects of Knowledge.

Based on Figure 1. there is an increase from pre-cycle, cycle I, and cycle II, because in its implementation there is an evaluation of treatment carried out by researchers starting from initial observations in the pre-cycle, cycle I, and cycle II.

Changes in treatment in cycle I and cycle II appear in the delivery of opinions from other students, there has been an increase in skill assessment according to observations made by researchers. The results of the assessment of presentation activities in the domain of skills can be seen in Figure 2.

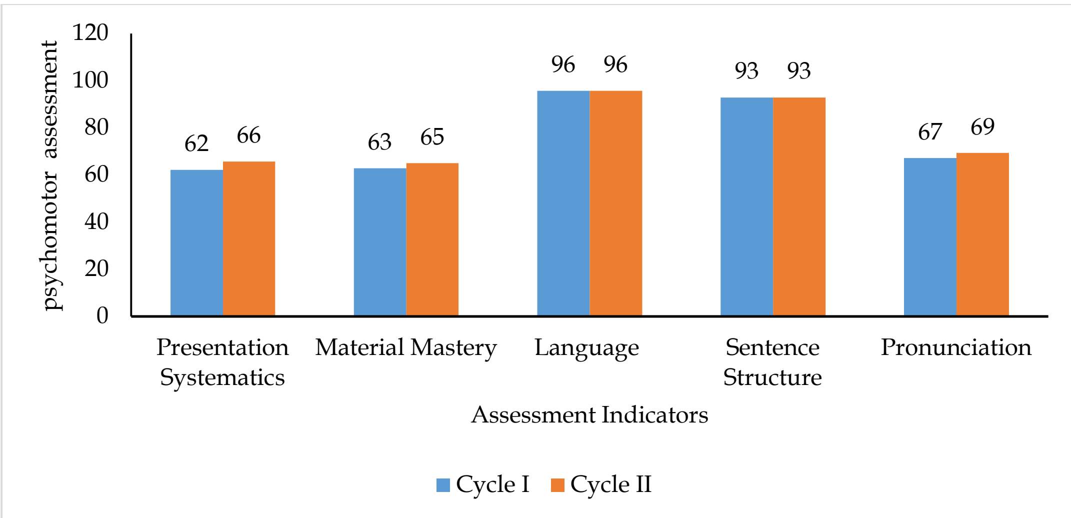


**Figure 2.** Graph of Student Learning Outcomes Aspects of Skills

Students began to experience an increase but not significantly in the presentation systematic, because during the first cycle there were no face-to-face discussions so they only discussed via WhatsApp groups and messages on Edmodo. Meanwhile, in the second cycle, the researchers conducted virtual face-to-face discussions via zoom in addition to discussions on WhatsApp groups and messages on Edmodo. In the implementation of the second cycle, feedback has also been obtained from the implementation of the recording of the first cycle of presentations so that students have increased in mastery of the material and also pronunciation. However, in cycle I and cycle II there were still two indicators of the language used and the sentence structure in the presentation did not change. This can be further developed in further research by providing treatment with a learning model that involves students communicating and arguing.

Similar research was also conducted by (Elizabeth and Sigahitong, 2018) the application of the Problem Based Learning model obtained the final average result of students' creative thinking abilities of 73.80. The final average of the creative thinking ability of students who take part in learning with the expository learning model is 65.97 so it can be concluded that the Problem Based Learning learning model has an effect on the creative thinking ability of students. Rahmadani, (2019) also conducted research related to the application of the Problem Based Learning model. The results showed that students' critical thinking skills showed an increase from cycle I to cycle II, namely 59.75% in cycle I to 75.25% in cycle II. And student learning outcomes also increased from 70% in the first cycle to 85%. in the second cycle.

Based on the results of the study, it can be concluded that the application of the Problem Based Learning learning model can improve the ability of critical thinking skills and student learning outcomes. The research was also conducted by (Rerung, et al., 2017) related to improving learning outcomes by applying the problem-based learning model. Cognitive learning outcomes increased between cycles by 20%. Meanwhile, psychomotor learning outcomes also increased. This shows that the application of the Problem Based

Learning model can improve student learning outcomes.

Based on the results of research and literature studies on physics learning with the Problem Based Learning model, it can improve student learning outcomes in the domain of knowledge and skills in class X students, especially class X APHP 03 the Academic year 2020/2021.

## Conclusion

Implementation of learning with the Problem Based learning model can improve physics learning outcomes for students in class X APHP 03 with classical learning completeness that meets the standards set by the school. Improving the learning outcomes of students in the knowledge aspect of 17.14%. Meanwhile, the improvement of student learning outcomes in the skills aspect using the Problem Based Learning model for class X APHP 03 students has increased. It can be seen that the ability of students to carry out online learning activities has increased in the systematic presentation, mastery of the material, and pronunciation at the time of presentation. So that the classical completeness value has been fulfilled.

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