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THE PRACTICALLITY OF PO2E2W LEARNING MATERIAL MODEL ASSISTED PHET MEDIA TO IMPROVE THE STUDENTS PHYSICS PROBLEM SOLVING SKILLS

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Abstract. PO2E2W learning model (problem orientation, observation, explanation, elaboration, and write in science) assisted by PhET media is a learning model that is oriented towards self regulated learning which in the process of physics learning activities is carried out with the help of PhET media. The purpose of this study was to analyze the practicality of the PO2E2W model assisted by PhET media in improving the physics problem solving skills of high school students. This research was carried out at Kemala Bhayangkari 1 High School (Surabaya, Indonesia) for students of class XI IPA 1, XI IPA 2 and XI IPA 3. Criteria for practicality of learning devices in this study were based on (1) the implementation of the learning implementation plan (RPP) during one meeting in class XI IPA 1 and the implementation of the learning plan (RPP) for five meetings in class XI IPA 2 and XI IPA 3, (2) obstacles during learning activities. The number of observers in this study is two observers. The aspects observed consisted of introduction, core and closing activities. Based on the results of the practicality study of the PO2E2W model assisted by PhET media, the results obtained (1) the average assessment of two observers in class XI IPA 1 was 3.30 with good category with a percentage of agreement 96.75%, XI IPA 2 was 3.71 in very both with a percentage of agreement 95.84% and in class XI IPA 3 was 3.76 in very good category with a percentage of agreement 96.85% (2) obstacles during learning activities that can be overcome properly. Conclusion based on the results of the study of the freeness of the PO2E2W model assisted by PhET media is practically applied in learning to improve the physics problem solving skills of senior high school students.

Keywords: PhET media, practicality of PO2EW model, problem solving skills

INTRODUCTION

Education is an absolute requirement of every individual, because educated human resources are a source of excellence from a country. Education is not enough just to build a source of excellence, but also requires quality education. Quality education requires a standardized learning process to be carried out continuously and systematically. The standardized learning process will bring students to actively develop themselves to have the power of religion, self-control, personality, intelligence, noble character and skills and life skills to increase added value for themselves and their communities. The purpose of this education is what humans need as a provision for life in the 21st century. One that is needed in the 21st century is problem solving skills.

Problem solving is a process or means of an individual to use his knowledge, skills and understanding to meet the demands of an unusual situation. A person is considered to have or experience problems when facing four conditions, namely (1) difficulties in clearly dealing with conditions or situations that are happening, (2) difficulties in clearly understanding the expected goals, having various objectives to solve problems, but not being able to direct one goal of completion, (3) difficulties in understanding a set of resources that can be used to overcome situations that occur in accordance with the objectives of this includes time, knowledge, skills, technology or certain goods, (4) lacking the ability to use various resources to achieving goals.

In fact, based on the results of TIMMS which showed that Indonesian students were ranked very low in the ability to (1) understand complex information, (2) theory, analysis, and problem solving, (3) use of tools, procedures, and problem solving, (4) carry out investigations. In addition, based on preliminary research through the results of a questionnaire of students totaling 15 people in class XI IPA 3 SMA kemala bhayangkari 1 (Surabaya, Indonesia) obtained results including (1) 26.67% of students answered that at the beginning of the learning teacher always gave problems related to physics phenomena and 73.33% of students answered that at the beginning of the learning the teacher did not always provide problems related to physical phenomena, (2) 93.33% of students answered that difficulties in solving physical problems and 6.67% of students answered that they had no problems in solving problems. physics, (3) 80% of students answered that the teacher often gave lecture methods in physics learning and 20% of students answered that the teacher did not often give lecture methods in physics learning. Therefore, one of them requires a practical learning model. Practical criteria can be seen from the implementation of RPP in learning and the constraints faced during learning activities.

Based on the results of the research by applying the PO2E2W model, namely problem oriented, observation, explanation, orientation, and write in science, it was found that the PO2E2W model was categorized as practical in improving problem solving skills with suggestions for the need for further research to improve learning from the PO2E2W model, for example more varied learning media such as interactive multimedia. Therefore in this study applying the PO2E2W model with the help of PhET media so that it is expected that the PO2E2W model is assisted by practical PhET media in improving the physics problem solving skills of senior high school students.

METHOD

This research was carried out at SMA Kemala Bhayangkari 1 (Surabaya, Indonesia). The research scope is high school students of class XI IPA 1, XI IPA 2 and XI IPA 3 who take physics subjects 2017/2018 school year. The purpose of this study was to analyze the practicality of the PO2E2W model assisted by PhET media in improving the physics problem solving skills of high school students. The practicality of the PhET media assisted PO2E2W learning model was determined based on (1) the implementation of the lesson plan for five meetings from the average assessment of two observers, (2) the obstacles encountered during the learning activities. The material applied in this study is the kinetic theory of gas.

Data collection technique

Research uses observation techniques. Observations are made during learning and carried out by two observers. Both observers sit where they can easily observe. Every observer holds the observation instrument.

Data analysis technique

Data analysis in the trial was conducted using quantitative descriptive analysis to describe data in the form of percentages and explain data or events with explanatory explanatory sentences including:

(1) Analysis of RPP implementation

Observation of the implementation of the RPP conducted by two observers by giving a check mark (√) in the implementation column and the assessment column. The description of the implementation of the RPP is determined by comparing the results obtained with the RPP

implementation criteria. Implementation criteria are presented in Table 1.

Table 1. Criteria for Learning Implementation

Interval Score Average	Category
1.00 ≤ score ≤ 1.59	very not good
1.60 ≤ score ≤ 2.59	not good
2.60 ≤ score ≤ 3.59	good
3.60 ≤ score ≤ 4.00	very good

Learning management is said to be practical if the teacher's ability to manage learning has reached a good or very good category. Calculation of instrument compatibility percentage to determine whether or not the instrument was developed with the following formula:

$$R = \left[1 - \left\{\frac{A-B}{A+B}\right\}\right] \times 100\%$$

Information:
R = instrument reliability percentage (Percentage of agreement)
A= frequency of validation observed with high frequency
B = frequency of validation observed with low frequency

(2) Obstacle Analysis
The constraints during the implementation of the learning were analyzed with qualitative descriptive, namely the observer and the researcher gave notes about obstacles or obstacles that occurred during the implementation of the learning model of PO2E2W assisted by PhET media.

RESULTS AND DISCUSSION

(1) Implementation of RPP and constraints in class XI IPA 1

Implementation of Learning Implementation Plans (RPP) by using physics learning tools the PO2E2W model assisted by PhET media to improve students' problem solving skills was observed by two observers. In learning the PO2E2W model assisted by PhET media students perform five phases of activities including (1) problem orientation phase (problem orientation) which is a stage of activities carried out by students to understand problems related to the concept of gas kinetic theory to be discussed. Problems in the form of phenomena in everyday life and these problems can be solved with the help of PhET media. According to [9] states that problems arise when living things have a purpose, but do not know how to achieve this. Every time someone cannot go from a particular situation with the desired situation only by action, then there is another way to think. Therefore, when a person thinks, it has a relationship with the problem.

According to states that the problem has an initial state, the goal (desired result), and the way to achieve that goal (including various operations or activities that lead to the goal); (2) observation phase observation (observation phase) is the stage of scientific observation activities, namely the process of investigation to solve problems of phenomena related to the concept of gas kinetic theory. This observation activity is assisted by PhET media by presenting phenomena related to a problem related to the concept of gas kinetic theory. According to scientific observation is a central role in the formation of scientific knowledge thus having an important role in teaching and learning; (3) phase of explanation, namely the stage of activities providing scientific explanations on the results of observations made in solving problems.

According to science is basically an explanation of phenomena in the world. The explanation emphasized in science is to provide scientific explanations. Scientific explanations play a central role in the document of science education reform, including those achieved for scientific literacy, the National Science Education Standards, and several recent research reports. Building an explanation involving students in problem solving, using evidence, and communicating, can be considered as an important process to support students in building 21st century skills; (4) elaboration phase (elaboration) which is the stage of student activities in elaborating the understanding of the concept of gas kinetic theory and problem solving strategies that have been obtained in concepts and other problems related to the concepts studied. Learning that provides opportunities to elaborate their knowledge and repeat the elaboration activities has an effect on memory.

This is as expressed by which states that providing a stimulus in the environment will increase the tendency of memory to enter the sensory system and enter short-term memory; the phase of writing science (write in science) is the stage of students' activities communicating the results of activities in several previous stages (stages of problem orientation, observation, explanation and elaboration) in writing. The task associated with creating products in the form of writing can be a powerful tool for developing scientific understanding because in writing students must take, synthesize, and organize information Research related to creative writing about science shows an increase in conceptual knowledge, greater understanding and metacognition. The

same thing was expressed by one of the important reasons for writing in science is to encourage conceptual understanding. Some of the objectives of writing include: attracting/remembering prior knowledge, strengthening and reviewing ideas, formulating and expanding new knowledge. Writing in a science class can improve understanding and can involve students in the assessment process.

The following is presented the results of the implementation of learning (RPP) in class XI Science 1 on the material of kinetic theory of gas for one meeting before being tested in class XI IPA 2 and XI IPA 3 is presented in Table 2.

Tabel 2. Implementation of RPP XI IPA 1

Rated aspect	**XI IPA 1** $\bar{P}$
preliminary	3.63
core activities	
Phase 1 Problem orientation	3.29
Phase 2 Observation	3.25
Phase 3 Explanation	3.38
Phase 4 Elaboration	3.00
Phase 5 Write in Science	3.17
Closing Activity	3.00
Time management	3.00
Class situation	4.00
The average observer's overall rating	3.30
Average percentage of agreement	96.75%
Category	good

$\bar{P}$= the average observers assessment for one meeting

Based on Table 2, information was obtained that the results of observations on the implementation of the learning plan (RPP) for one meeting in class XI Science 1 were categorized as good with an average assessment of two observers was 3.30 and the percentage of suitability assessment of two observers was 96.75% . The constraints and solutions to overcome the obstacles faced during the learning process in class XI IPA 1 can be presented in Table 3.

Table 3. Constraints and solutions XI IPA 1

Type of obstacle	Solution
The implementation of the time needed to carry out the learning activities is not optimal according to the time allocation because in the observation activities there were 5 experiments	Reorganize the time allocation by reducing observation activities by experiment 3 times so that all learning activities are carried out optimally
Students experience difficulties in planning observation activities procedures through PhET media assisted trials	Provide guidance and guidance to students when planning procedures for observation activities through PhET media assisted trials
Students experience difficulties in carrying out observation activities through PhET media assisted experiments in accordance with planned procedures	Provide guidance and guidance to students when carrying out observation activities through PhET media assisted experiments in accordance with the planned procedures

So, based on the results of observations of the Implementation of Learning Implementation Plans (RPP) and constraints and solutions, practical tools for use in class XI IPA 2 and XI IPA 3 for five meetings.

(2) Implementation of RPP and constraints in class XI IPA 2 and XI IPA 3

Implementation in class XI IPA 2 and XI IPA 3 was held for five meetings for each class on the material of the kinetic theory of gas. The results of the analysis of the implementation of RPP are presented in Table 4.

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Tabel 4. Implementation of RPP class XI IPA 2 and XI IPA 3

Rated aspect	**XI IPA 2** $\bar{P}$	**XI IPA 3** $\bar{P}$
preliminary	3.80	3.90
core activities		
Phase 1 Problem orientation	3.81	3.84
Phase 2 Observation	3.75	3.77
Phase 3 Explanation	3.75	3.85
Phase 4 Elaboration	3.77	3.80
Phase 5 Write in Science	3.77	3.77
Closing Activity	3.80	3.90
Time management	3.00	3.00
Class situation	3.90	4.00

Rated aspect	XI IPA 2 $\bar{P}$	XI IPA 3 $\bar{P}$
The average observer's overall rating	3.71	.76
Average percentage of agreement	95.84%	96.85%
Category	very good	Very good

$\bar{P}$= the average observers assessment for five meetings

Based on table 2, it was obtained information that the implementation of learning in class XI Science 2 was generally very good with an average rating of 3.71 overall and the percentage of suitability assessment of two observers was 96.85%. The implementation of learning in class XI IPA 3 is generally very well categorized with the overall observer's average score of 3.76 and the percentage of suitability assessment of two observers is 97.07%. To make it easier to know clearly the comparison of the average overall rating scale of observers in class XI IPA 2 and XI IPA 3 can be presented in Figure 1.

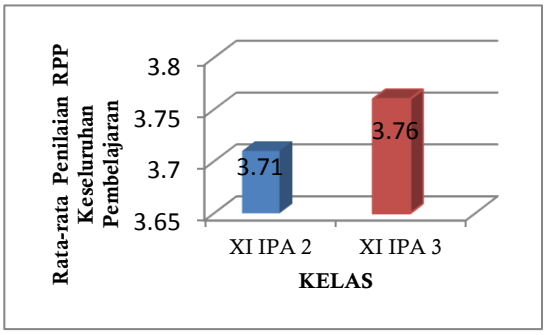

Figure 1. Average RPP observer overall rating

Based on Figure 1 shows clearly that the average overall observer rating scale in class XI IPA 3 is higher than class XI IPA 2, which means that the implementation of the learning plan (RPP) in class XI IPA 3 is better done when compared to class XI IPA 2.

The results of the implementation of the PhET media assisted PO2EW learning model are supported by research which states that the PO2E2W learning model of money applied to junior high school students in heat material has fulfilled the practicality requirements, namely through the implementation of the stages of the PO2E2W learning model by the teacher. The mean percentage of implementation of the PO2E2W learning model stages has increased from the initial meeting to the final meeting. The average percentage of implementation of the PO2E2W learning model stages in the category of very good and good.

Constraints in the implementation of the learning model PO2E2W assisted by PhET media in class XI IPA 2 and XI IPA 3 there are several obstacles encountered. These constraints were discussed by researchers together with two observers so that solutions were found to be encountered. The results of observations of constraints and solutions to these constraints can be presented in Table 5.

Table 5. Constraints and solutions

Type of obstacle	Solution
Students experience difficulties in planning observation activities procedures through PhET media assisted trials	Provide guidance and guidance to students when planning procedures for observation activities through PhET media assisted trials
Students experience difficulties in carrying out observation activities through PhET media assisted experiments in accordance with planned procedures	Provide guidance and guidance to students when carrying out observation activities through PhET media assisted experiments in accordance with the planned procedures

Based on Table 5, it was obtained information that the constraints during the learning activities of the PO2E2W model assisted by PhET media to improve students' problem solving skills in class XI IPA 2 and XI IPA 3 in the observation activities were the same as the problems that occurred in class XI IPA 1 because both in class XI IPA 1, XI IPA 2, and XI IPA 3 in learning with the PO2E2W model assisted by PhET media is new to students, however, these obstacles can be overcome properly.

CONCLUSION

Based on the results of the research, the freeness of the PO2E2W model assisted by PhET media is practically applied in learning to improve the physics problem solving skills of high school students.

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