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The Effect of POE Learning Models (Prediction, Observation, and Explanation) with Probing-Prompting Techniques on The Student's Cognitive Learning Outcomes of SMA Muhammadiyah 3 Jember

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ABSTRACT

Student learning outcomes are competencies that students have after gaining their learning experience, so indicators of learning success can be seen from student learning outcomes after experiencing the learning process. Student learning outcomes can be improved through the use of learning models, one of which is by applying the POE learning model (Prediction, Observation and Explanation) with probing-prompting techniques. The purpose of this study was to determine the effect of POE learning models (Prediction, Observation and Explanation) with probing-prompting techniques on the cognitive learning outcomes of the tenth grade students at SMA Muhammadiyah 3 Jember on the environmental pollution subject. Type of research is a quasy experimental study using a pretest and posttest design. In the experimental class, learning activity was carried out by applying the POE learning model (Prediction, Observation and Explanation) with probing-prompting techniques and the control class, learning activities are carried out by applying conventional learning models. The data of the students' cognitive learning outcomes were obtained through the pretest and posttest scores then analyzed using ANAKOVA test. The application of POE learning model (Prediction, Observation and Explanation) with probing-prompting techniques had a significant effect with a probability as much as 0,000. The affective learning outcomes influenced significantly with a significance value of 0.001 or $p<0.05$.

INTRODUCTION

Biology is one part of natural sciences. Biology is a discipline that learns about living things and their lives. Biology as part of science lessons becomes a vehicle for improving knowledge of skills, attitudes and values as well as a forum for introducing the environment [1]. Biological learning always connects learning activities with life so that interactions between students and students occur, students with teachers and students with their environment.

The problems in biology learning are largely centered on the low quality of learning. Constraints that are often faced in learning include: (1) selection of inappropriate learning models, (2) lack of use of instructional media and (3) teacher-centered class conditions[2]. This causes the learning process to be not conducive. The learning process emphasizes the aspects of scientific products rather than scientific processes, the delivery of biological material is done with limited media and the learning process is more directed at students to memorize information without being required to understand and develop information in everyday life[3].

The low quality of learning causes low student's biology learning outcomes. Therefore it is necessary to select a learning model that is relevant, effective and efficient to implement, so that it is expected to be able to improve student biology learning outcomes. One learning model that can be applied is the POE (Prediction, Observation, and Explanation) learning model.

The POE learning model (Prediction, Observation, and Explanation) is a learning model that begins by confronting students on a problem, then students make predictions, then carry out observations to prove predictions and explain the compatibility between predictions and observations and provide an explanation of why this happened (explain)[4]. POE (Prediction, Observation, and Explanation) learning models provide opportunities for students to learn concretely by making observations or observations, so that students' science process skills can develop and students have a correct and strong understanding of the material being studied. The advantages of the POE (Prediction, Observation, and Explanation) learning model, which stimulates students to be more creative especially in submitting predictions, reducing verbalism and the learning process is more interesting because students not only listen but also observe events that occur through observation activities. By observing directly students can have the opportunity to compare between theory and reality, so students will be more confident in the truth of learning material [5].

One of the obstacles in implementing the POE (Prediction, Observation, and Explanation) learning model is that students who are not familiar with the (Prediction, Observation, and Explanation) POE learning model will have difficulty in making and proposing predictions of the problems faced. This causes students to tend predictions without rational reasons. These obstacles can be followed up by giving an innovation in the POE (Prediction, Observation, and Explanation) learning model through the insertion of a learning technique that can stimulate student creativity, especially in proposing predictions and helping in discovering new knowledge. The learning technique combined with the POE (Prediction, Observation, and Explanation) learning model in this study is a probing-prompting technique.

Probing-prompting technique is a learning technique by presenting a series of questions that are characteristic of guiding and exploring students 'ideas so that they can facilitate students to associate students' knowledge and experience with new knowledge being studied [6]. Probing question is a digging question to get further answers in developing the quality of answers, so that the next answer is clearer, more accurate and rational[7]. A prompting question is a question that guides students so they can find a more

correct answer. The probing-prompting technique is done by appointing students randomly in the question and answer process so that each student must participate actively when learning takes place. Probing-prompting techniques provide opportunities for students to be active in building and understanding information through individual thought processes and working together in discussions[8]. Probing-prompting techniques are expected to be able to stimulate student creativity, especially in proposing predictions and helping in discovering new knowledge.

Based on this background, the combination of POE (Prediction, Observation, and Explanation) learning models and probing-prompting techniques is expected to improve student's biology learning outcomes. The purpose of this study was to determine the effect of POE (Prediction, Observation, and Explanation) learning models with probing-prompting techniques on the biology's cognitive learning outcomes of SMA Muhammadiyah 3 Jember students.

METHODOLOGY

This study was a quasi-experimental design with pretest and posttest design. This study uses two sample classes, with details of one treatment class that was learned using the POE (Prediction, Observation, and Explanation) learning model with probing-prompting techniques and one control class that uses conventional learning with lecture methods, discussion, question and answer and practice.

The population of this study was the tenth grade students of SMA Muhammadiyah 3 Jember on 2017/2018 academic year. The sample was determined through random sampling method with the requirement that normality test and homogeneity test were tested based on the results of final test of the students on grade X at SMA Muhammadiyah 3 Jember to find out whether or not the data were normally distributed and homogeneous. The results obtained from the results of the normality test, the five classes were normally distributed. Then the results gained from the homogeneity test were all homogeneous classes with significant values (p = 0,504), p> 0.05 indicated that the data were in the same variant. The next step after homogeneous data were confirmed, X IPA 2 was selected as the control class and X IPA 4 as the experimental class. Data collection research was conducted by giving tests related to environmental change material to students. The types of tests used in this study were pretest and posttest with multiple choice questions and essays. To make it clear, the research design is provided as follows:

E	Q_1	X_1	Q_2
K	Q_3	X_2	Q_4

Notes :

E : experimental class (a classs that used POE (Prediction, Observation, and Explanation) learning models with probing-prompting technique)

K : control class (a class that implemented conventional learning models)

Q_1 : pretest result of experimental class

Q_2 : posttest result of experimental class

Q_3 : *pre-test result* control class

Q_4 : *post-test* result of control class

X_1 : the use of POE (Prediction, Observation, and Explanation) learning models with probing-prompting technique

X_2 : the use of conventional learning models

Data were analyzed using ANAKOVA Test to determine the effect of POE (Prediction, Observation, and Explanation) learning models with probing-prompting techniques between exsperiment classes and control classes, with a significance level of 5%. Analysis of differences in student's cognitive learning outcomes assisted with SPSS 22 for Windows.

RESULT AND DISCUSSION

Assessment of student learning outcomes aims to determine the level of success of students in learning a material or after gaining learning experience. The cognitive learning outcome was an aspect that determined the achievement of student learning outcomes. The assessment of cognitive learning outcomes in this research used pretest and posttest. The results of the average pretest and posttest calculation of the experimental class and the control class can be seen in Table 1 below.

Table 1 . Average Pretest and Posttest

Class	Total	The Mean of *Pre-test*±SD	The Mean of *Post-test*	Difference
Experimental	34	48.67 ± 10.90	73.55 ± 9.53	24.88
Control	34	50.00 ± 9.24	68.05 ± 9.77	18.05

Based on the table, it is known that the mean difference between the pretest and posttest experimental class was higher than the control class which was 24.88 while in the control class was equal to 18.05. Furthermore, the results of the normality test using One-Sample Kolmogorov-Smirnov showed that cognitive learning outcomes consisting of pretest and posttest scores of students in the experimental class and the control class were normally distributed so that it was feasible for further analysis, namely ANACOVA test. ANACOVA test results can be seen in the following table:

Table 2. ANACOVA Test Results

Source	Type III Sum of Squares	df	Mean Square	F	Sig
Corrected Model	3181.164[a]	2	1590.582	29.664	0.000
Intercept	4210.232	1	4210.232	78.519	0.000
Pretest	2666.914	1	2666.914	49.737	0.000
Group	678.702	1	678.702	12.657	0.001
Error	3485.350	65	53.621		
Total	347611.000	68			
Corrected Total	6666.515	67			

Based on the ANACOVA test results presented in Table 2, with a significance value of 0.001 or $p < 0.05$, this indicates that there is a significant effect of the POE learning model with probing-prompting techniques on students' cognitive learning outcomes. Therefore, it can be said that the POE learning model with probing-prompting techniques gives a better influence in improving students' cognitive learning outcomes. The results of this study are relevant to the results of the study stating that learning using the POE learning model significantly influences students' cognitive learning outcomes[9].

In this study, the use of the POE (Prediction, Observation, and Explanation) learning model with probing-prompting techniques has a better influence on student's cognitive learning outcomes. This is because students get learning experience after doing the observation stage. At this stage students make observations and records to test predictions that have been made previously, then in the end the students make an explanation of the compatibility between the predictions and the results of the experiment. If the prediction is in accordance with the results of the experiment, students will be more confident in the concept. But if the prediction is not appropriate, students will be helped to find an explanation why the predictions are not appropriate so students will experience a change in concept from the wrong to the right. By making observations directly students have the opportunity to compare between theory and reality so students will be more confident in the truth of learning material [10].

Each stage in the POE (Prediction, Observation, and Explanation) learning model encourages students to explore their own knowledge, at the stage of predicting students make predictions of answers to a problem, at the observe stage students prove their predictions by using their intellectual abilities, and at the explaining stage students provide explanations for observations through discussion or written so that students' verbal abilities can also be trained [11]. Achievement of cognitive learning outcomes of students in this study can not be separated from the role of science process skills developed. This is because science process skills can help students gain an understanding of material that is more long term memory [12]. During the learning process, students do more of a series of science process skills independently to find facts, concepts or principles. Thus understanding students becomes better.

CONCLUSION

Based on the results of research from the discussion that has been described, it can be concluded that, the POE (Prediction, Observation, and Explanation) learning model with probing-prompting techniques significantly influences the student's cognitive learning outcomes with a significance value of 0.001 or $p < 0.05$. Based on the results of the research that has been done, the reseacher would like give some suggestions, as follows, 1) for the teacher, in using the POE (Prediction, Observation, and Explanation) learning model with probing-prompting techniques it is necessary to set the right time, such as the implementation of the predicton stage through probing-prompting techniques and preparation of tools and materials at the observation stage so the learning process runs optimally and 2) for other researchers, the results of this study are expected to be used as a basis for further research on different learning topics or even on different subjects with regard to the constraints experienced.

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