JPPS (Jurnal Penelitian Pendidikan Sains)
p-ISSN: 2089-1776
e-ISSN: 2549-1597
Volume 8, No.7, November 2018
https://journal.unesa.ac.id/index.php/jpps/index

POE LEARNING MODEL: THE EFFECT ON STUDENT SCIENCE PROCESS SKILLS ON THE COORDINATION SYSTEM CONCEPT

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Abstract: This study aims to determine the effect of POE (Predict-Observe-Explain) learning models on students' science process skills on the coordination system concept. This research was carried out in SMA Negeri 9 Tangerang Selatan in the 2017/2018 school year. This research method is quasi-experimental with nonequivalent control group design. Sampling using purposive sampling technique. The study sample consisted of 73 students: 37 experimental group and 36 control group. The research instrument used is a test of science process skills in the form of a description test and observation sheet. The results of data analysis of students' science process skills using ANACOVA, showed that there were significant differences between the experimental and the control group. This shows that there was an effect of the application of the POE (Predict-Observe-Explain) learning model on students' science process skills on the concept of coordination system.

***Keywords**: POE Learning Model, Science Process Skills, Coordination System*

INTRODUCTION

Education is a fundamental need for nation building. The development of a nation depends on the quality of education in the nation. If education is of good quality, it is very likely that the country will progress. Vice versa, if education is of poor quality, the country will be less competitive with other countries. To advance the nation, it is necessary for the nation's future generations to be able to compete in this globalization era, of course this can be achieved with the support of good quality education. So it is appropriate for education to be the basic capital for the development of the Indonesian nation. Good education must be supported by a good learning process.

The learning process is the interaction between educators, namely teachers and students (Rustaman, 2001). Learning can be interpreted as assistance provided by educators to students to gain knowledge and the formation of attitudes and self-confidence of students. The process of transforming knowledge between educators and students, generally still takes place in one direction or Teacher Centered.

The Centered Teacher Approach emphasizes the learning process that is only teacher-centered. The learning process must provide experience to students so that they are able to construct the knowledge acquired and help students have the skills to do various things that are needed. Knowledge that is constructed by children as subjects will become meaningful knowledge. Whereas knowledge that is only obtained through the notification process will not be meaningful knowledge (Sanjaya, 2010). The application of the constructivism approach must be applicable to the learning process of biology.

Biology as one of the branches of Natural Sciences (IPA) provides a learning experience to understand the concepts and processes of science through observation, proposing hypotheses, observing, classifying, asking questions and communicating findings both orally and in writing. In biology learning activities the teacher often conveys knowledge with the Teacher centered approach, although in some parts of the learning students are given the opportunity to discuss. This can be known based on the results of observations at SMA Negeri 9 Tangerang Selatan City that the role of teachers is still dominant in the learning process. This makes students less actively involved in the learning process and less can involve scientific attitudes and process skills.

Process skills are a teaching approach that gives students the opportunity to live the process of finding a concept as a science process skill. Excess process skills make students become active in thinking and skilled in gaining knowledge (Sagala, 2010). Science process skills are skills commonly practiced by scientists to gain experience (Zulfiani et al. 2009). Process skills involve cognitive, intellectual, manual, and social skills. Intellectual skills trigger students to use their minds. Manual skills involve students to use tools and materials, measure, compile or assemble tools. Social skills involve students to interact with each other in carrying out learning activities (Rustaman, 2001).

Biology learning on the coordination system concept that has basic competencies, namely analyzing the relationship between the organizing structure of the organ in the coordination system (nerves, hormones, and sensory devices) in relation to the mechanism of coordination and regulation as well as malfunctions that can occur in human coordination systems and evaluate the dangers of use psychotropic compounds and their impact on personal health, the environment and society (Permendikbud, 2016). Students should be directed to activities that encourage active learning. The teacher does not only convey concepts to students. students must also be able to understand the process of a phenomenon through practical activities. Through practicum activities it is expected that students can construct knowledge based on their own experience so as to improve students' science process skills. Teachers must use strategies, models and learning methods that are more creative and use the constructivism approach. One learning model that can be used is Predict-Observe-Explain (POE).

Through practicum activities it is expected that students can construct knowledge based on their own experience so as to improve students' science process skills. Teachers must use strategies, models and learning methods that are more creative and use the constructivism

approach. One learning model that can be used is Predict-Observe-Explain (POE).

This POE model was developed by White and Gustone in 1992, in this learning model students are asked to make predictions, then make observations and explain and compare observations with predictions (Ozdemir et al., 2011).

This POE learning model directs students to play a more active role in the learning process. Students are required to convey their opinions and knowledge, so that they will construct between prior knowledge and new knowledge gained from the learning process.

The POE learning model emphasizes constructivism approaches such as predicting, that is, students are asked to make predictions about a phenomenon. Furthermore, proving his assumption through observation is by conducting discussions and working together in conducting experiments or practicum to obtain data and provide an explanation of the suitability between predictions and observations (Syamsiana, et al, 2018). In these activities students are required to be responsible for the results of observations carried out

The results of the prediction are in accordance with the results of the observation, then students are increasingly convinced of the concepts learned. If the predictions are not correct then the teacher will be assisted by the teacher in changing his predictions. The teacher can justify false assumptions, so students will experience a change of concept from the wrong concept to the correct concept. Students can also prove the prediction of a phenomenon by making direct observations (Ayvaci, 2013).

Based on these problems, the research question in this study is What is the Influence of POE (Predict-Observe-Explain) Learning Models on Students' Science Process Skills on the Coordination System Concept? My hypothesis: There is positive influence of POE Learning Model to Students' Science Process Skills.

METHOD

The research method used in this study is quasi-experimental with nonequivalent control group design (Sugiyono, 2013). This research was carried out in SMA Negeri 9 Tangerang Selatan in the 2017/2018 school year.

The population in this study is class XI IPA. Sampling using purposive sampling technique. The research sample was taken from two classes totaling 73 students, consisting of 37 experimental and 36 control group.

This study used two types of instruments. The research instrument used is a test of science process skills in the form of an essay test and observation sheet. Essay test of the science process skills is used to measure students' scientific process skills. Observation sheets are used to see the achievement of the learning process using the POE model.

In this study the data obtained from the test of science process skills were analyzed using ANACOVA in SPSS 23. The data obtained from the observation sheet were analyzed and explained by percentages.

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RESULT AND DISCUSSION

Data were analyzed, the result showed in Table 1 for experimental and control group.

a. Posttest Results of Science Process Skills Experimental and Control Classes

The results of posttest data in the experimental and control group before being given treatment can be seen in Table 1.

Table 1 shows the average posttest results of science process skills in the experimental group in the High category of 79.54%, while in the control group in the medium category of 69.04%. Its shown the highest science process skills in both the experimental and control classes are classification with percentages of 98.48% and 91.22%. The lowest science process skills in both the experimental and control group are hypotheses with a percentage of 50% and 33.78%. Posttest results in the experimental and control group, on the aspects of communication, hypotheses and predictions have very significant differences. This is because in the experimental group the POE learning model is applied which has the stages of prediction, observation and explanation. Therefore, students in the experimental group are better able to develop science process skills in aspects of communication, hypotheses and predictions compared to the control group.

Table 1. Achievement of Posttest Aspects of Science Process Skills Experiment and Control group

SPS Aspect	*Posttest*			
	Experi-ment (%)	**Cate-gory**	**Con-trol (%)**	**Cate-gory**
Observe	79,73	High	78,38	High
Classifica-tion	98,48	High	91,22	High
Interpreta-tion	72,97	Medium	60,81	Medium
Communi-cation	87,84	High	71,62	Medium
Hypothesis	50	Medium	33,78	Low
Plan an experiment	90,31	High	81,98	High
Predict	81,53	High	60,36	Medium
Asking question	97,30	High	86,49	High
Apply the concept	57,70	Medium	56,76	Medium
Average	**79,54**	**High**	**69,04**	**Medium**

b. Data analysis

Table 2 showed the results of the data homogeneity test. It was seen that the value of F = 0.009 and not significant (p> 0.05). This means that post scores are homogeneous.

Table 2. Levene's Test of Equality of Error Variances[a]

Dependent Variable:post-test

F	df1	df2	Sig.
.009	1	71	.925

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + group + pre-test

Table 3. Tests of Between-Subjects Effects

Dependent Variables: Post-test

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	3735.931[a]	2	1867.965	20.748	.000	.372
Intercept	40269.130	1	40269.130	447.286	.000	.865
grup	1035.237	1	1035.237	11.499	.001	.141
pretes	2779.822	1	2779.822	30.877	.000	.306
Error	6302.097	70	90.030			
Total	475320.000	73				
Corrected Total	10038.027	72				

a. R Squared = ,372 (Adjusted R Squared = ,354)

Table 3 showed that there were significant differences in post-test scores between the experimental and control groups, by controlling the pre-test (F = 11,499; p <0.01). Thus the treatment we provide is proven to be able to improve science process skills in the experimental group. The contribution of this treatment in improving science process skills is 14.1 percent.

Based on observations of the implementation of the POE learning model at the first class meeting all stages were fully implemented. However, in the second class meeting, not all stages were fully implemented. Stages that have not been fully implemented are observing. The percentage average of the two class meetings is 75%. This is because the time used for the observation and observation stages is insufficient. Furthermore, for the average value of the students worksheet the experimental class has an average of 84.83 and the second meeting has decreased with an average of 84.33. This is because there are groups that are less able to explain the experimental results correctly.

c. Discussion

The results of this study indicate that the POE model has a positive influence on students' science process skills. To see the improvement of students' science process skills from both experimental and control classes, it can be shown from the N-gain value that the experimental group gets a value of 0.61 and the control group is 0.49. The increase in the experimental group occurs because the learning model makes students to learn more actively and improve students' science process skills.

The POE learning model requires the students to be active in getting their own learning concepts. The POE learning model also provides more meaningful learning because it corresponds to the constructivism view, namely students build knowledge through experience. So that the task of the teacher no longer provides knowledge, but rather prepares a situation that leads students to observe, ask questions, and find facts and concepts themselves. As has been done in this study, by applying the POE learning model through practical activities, students are expected to construct their own knowledge and develop scientific process skills.

Science process skills are needed by students, especially in science learning because

science process skills have a role, namely, (1) helping students learn to develop their minds, (2) providing opportunities for students to discover, (3) improving memory, (4) providing intrinsic satisfaction if the child has succeeded in doing something, and (5) helping students learn scientific concepts (Trianto, 2010). These roles encourage an educator to apply a learning that allows students to be active in the learning process, one example is the POE learning model.

POE learning model is a learning model consisting of three process skills, each of which has indicators that can be applied from each process skill. The three skills are making predictions, making observations and explaining.

Make predictions to allow teachers with students to understand what is being made. With the hope that there is a match between what teachers and students think. Students' understanding of the situation at hand can stretch very broadly and will appear in discussions. Make observations, which carry out the activities by the teacher or the students themselves, after which they record their observations. Making an explanation is the final stage in the POE learning method. At this stage students are required to conduct discussions related to predictions and observations that have been made (Juniati, 2009).

Learning with this POE model has advantages, one of which requires students to be active. In the experimental group, students actively are involved in learning, it can be seen from the learning process by conducting practical activities consisting of prediction, observation and explaining activities. Students are required to predict before starting activities such as how the reflex mechanism works and showing the area of the taste map on the tongue. After making predictions, students make observations. The students then conduct discussions to explain the relationship between predictions and observations.

At the explanation stage students can explain the knowledge of concepts that have been studied and compare the results of predictions with their observations which have been made. Process skills can be seen in experimental activities. This process skills will help students to have meaningful learning experiences.

In the control group the learning processes use a scientific approach. In the control group also another practicum activities were conducted but students are less actively involved, due to the lack of student activity in the learning process. Students in the control group do not make predictions so they lack sharpening the students' initial abilities. The control group is only given an explanation of the practicum activities and the teacher instructs them to make observations. In the control group, student activities tend to be passive. In the communicating stage, students only explain the results of observations carried out without linking them to initial knowledge so that the learning process becomes less meaningful.

From the data of research findings that have been described, this is in line with the results of research conducted by Fithriyah (2016). The POE model through the experimental method as a whole gained better science process skills compared to students who received learning with conventional learning models. In the results of the study by Zulaeha, et al (2014), there was also an influence of students' science process skills between classes that received POE learning models with classes that received learning using conventional methods.

CONCLUSION

Based on the results of the research and data analysis, it can be concluded that the application of the Predict-Observe-Explain POE learning model has a positive significant influence on students' science process skills in the concept of coordination system. There were significant differences in post-test scores between the experimental and control groups, by controlling the pre-test ($F = 11{,}499$; $p < 0.01$). Thus the treatment we provide is proven to be able to improve science process skills in the experimental group. The contribution of this treatment in improving science process skills is 14.1 percent.

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