THE EFFECT OF PREDICT OBSERVE EXPLAIN LEARNING MODEL AGAINST SCIENCE PROCESS SKILLS OF HIGH SCHOOL STUDENTS

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*Abst*ract

This study was aimed to determine the effect of POE learning model on science process skills of high school students in the material of Newton's Law motion. The study might benefit to a provide different learning experience that makes students become more active in learning and to improve students' science process skills towards the material being taught. The populations in this study were all students of class IPA X of SMA 5 Bandar Lampung in the even semester of the Academic Year 2018/2019, consisting of 6 classes with a total of 203 students, with samples of class X IPA 1 as the experimental class and X IPA 2 as the control class. Research method of the study was quasi-experimental. The research used a pretest-posttest control group design. The result of the study revealed that the control class using the conventional learning model had an average N-gain of 0.42, while the experimental class using the POE learning model had an average N-gain of 0.72. The effect size in this study, which was 0.71, indicated that the POE learning model has a high effect in this study. Based on the hypothesis test, it can be concluded that there was an effect of applying the POE learning model to students' science process skills in the material of Newton's Law. The magnitude of the influence of the POE learning model was classified into the high category with the *Cohen's d* value of 3.40 and the effect size r of 0.71.

Keywords: predict observe explain, science process skills

Education is one of the morality activities and efforts to create a potential quality of human resources. Education aims to develop the potential of students in exploring various sciences. The intended potential is in the form of skills that will become a provision for students while in the community (Hidayah, 2018).

The 21st-Century Learning requires a variety of skills. These skills are termed with 4C, which stands for Critical Thinking, Collaboration or the ability to work well together, Communication, and Creativity (Scott, 2015). Students are to be accustomed to solving problems in the learning process, while it is the teacher's task that helps students to achieve this by making the teaching and learning process more active and fun, including stimulating students' thinking abilities and skills. Therefore, teachers must use a variety of strategies, methods, and learning models that are more creative, so that the goal of forming those desired students can be achieved.

Based on the Regulation of the Minister of National Education of the Republic of Indonesia Number 22 year 2006, concerning Standards for Elementary and Secondary Education Units, stated that: "Physics is considered important to be taught as a separate subject with several considerations, one of which is the provision of knowledge, understanding, and a number of prerequisite abilities for a higher level". Physics is a branch of science that is not only a collection of facts, concepts, principles or processes of discovery but also further development in applying them in everyday life. Physics learning must be directed to search for information and act accordingly so that it can help students to gain deeper concepts, therefore, physics learning must highlight the provision of direct student-centred experiences (Suwandari, et al., 2018). The Natural Science learning process emphasizes providing direct experience to develop competencies in order to explore and understand environment scientifically.

This learning process demands that students no longer play a passive role in teaching and learning activities, of listening to a teacher's explanation and taking note of only important things (Susilawati & Sridana, 2015).

In fact, based on the results of observations and preliminary studies conducted by researchers on Monday, December 10th, 2018, by giving questionnaires to students and interviewing teachers, physics learning at SMAN 5 Bandar Lampung still showed that only a few students were active during the learning process. The teachers only accentuated the mastery of concepts and the achievement of completeness of the materials where the teacher only gives a series of learning tasks in groups and exercise of questions. Frequently, learning physics as it were only an information transfer activity from teachers to students. If this happens, students then tend to memorize what knowledge they get from the teachers (Rahmat, et al., 2014). Physics learning should not only be limited to achieving goals in terms of transferring facts, concepts, principles, or laws alone, but students are expected to master it entirely through the process of discovery (Anggraini, et al., 2017). Besides being boring, if learning only uses the lecture method, the delivered topic will be more quickly forgotten (Miswadi, et al., 2010).

In addition, practicum activities or activities that support student process skills are rarely carried out. This can result in student's science process skills not developing. The education process certainly has indicators that can improve the quality of education. One of the indicators improving the quality of education is learning outcomes (Muna, 2017). Good quality of learning

outcomes is only possibly achieved through the fine quality of student process skills (Komikesari, 2016). Science process skills are very important skills to develop students' science attitudes and problem-solving skills, so they can form creative, critical, open, innovative and competitive learners in the global world competition in society (Budiyono & Hartini, 2016). The understanding of process skills was also expressed by Simamora & Pardede (2016), which is a learning process that aims to develop a number of physical and mental abilities as a foundation for developing higher abilities in students. Hence, this is the purpose of applying for the approach of science process skills.

According to Nadirah (2016), this approach is addressed to achieve learning objectives optimally, effectively and efficiently. This view is based on the process skill approach that will provide an alternative learning process that is more effective, especially since it gives more possibility for students to be actively involved in the learning process to achieve the expected goals. Hikmawati, et al. (2017) stated that some of the science process skills that must have on students are the ability to observe, classify, interpret, predict, apply, plan research and communicate.

Responding to those tribulations, there is a critical need for learning that can improve cognitive abilities while developing student KPS. Yulianto, et al. (2014) stated, in the POE model, students were invited to critically find their own understanding of the material taught through discussion activities. Whilst, this POE learning model is to minimize the role of a teacher and give a lot of flexibility to students to make discoveries. Thus, the advantage of the POE model is the ability to know that the learning process skills become livelier because students are directly involved in finding concepts or learning process skills (Nurmalasari, et al., 2016). According to Fathonah (2016), POE learning model is one of the learning strategies that refers to a constructivist learning theory, where the essence of this learning model is that students ought to build their own initial knowledge and, with the help of teachers in learning process, they will try to find new things and are finally able to construct knowledge according to the learning outcomes obtained.

Sudiadnyani, *et al.,* (2013) stated that this POE model can train students to be more active prior in search of knowledge according to their way of thinking by using sources that can facilitate in problem-solving skills. According to Permatasari (2018), it can be assumed that the implementation of the POE learning model, that provides a learning experience in the form of both knowledge and information presented in simple real events, provides positive benefits in strengthening the process of students' science process skills. Gustina, *et al.,* (2012) revealed numerous entities that need to be considered in the POE learning model. The proposed entities should be alarms that allow cognitive conflict and trigger curiosity, while predictions must be accompanied by rational reasons. Prediction is not just guessing, demonstrations or experiments, but it must be clearly observed and can provide answers to problems, then students are involved in the explanation process.

One of the most important chapters in learning physics is force. Newton's law is part of the concepts of force and

motion which are the fundamental concepts of various phenomena in daily life. Newton's Law Material is taught in class X of the second semester. In this material, it requires the ability to solve complex problems so it takes skills that can help students understand science concepts in full. Newton's law learnings that have been done in schools so far are only through teacher's explanations without doing practicums, this can cause students' science process skills not developing.

Some findings have proven scientifically the effectiveness of the application of POE learning models in the learning process. Zulaeha, et al. (2014) demonstrated that the POE learning model may potentially improve students' science process skills. Furthermore, POE learning models Budiarti & Sarwanto (2014) using controlled and simple experimental methods can influence student KPS. Moreover, learning activities with POE strategy Rahayu (2015) can improve a better understanding of concepts as well as student KPS.

Therefore, based on the amplification above, this study was conducted to discover the effect of the Predict, Observe, and Explain (POE) learning model on the science process skills of high school students.

METHOD

This study was performed with a quasi-experimental research method. The study design was based on the non-equivalent control group design, as this study was engaged in two classes. Before the learning process, students were given a pretest to determine the initial abilities, then were provided with both the POE learning models in the experimental class and conventional learning models in the control class. Sample selection was done by using purposive sampling technique with the relatively same abilities. After that, an experimental class and a control class were chosen, which were class X IPA 1 and X IPA 2, with 33 students and 36 students respectively. Data collection was completed by providing KPS-based test questions.

This research was conducted at SMAN 5 Bandar Lampung, in even semester of academic year 2018/2019, for one month. Based on observations made by researchers and guided by Newton's Law syllabus, this study took place in January, with details of 9 hours of study in 3 meetings. The instrument test of learning outcomes used in this study was a number of questions related to science process skills adapted to Newton's Law material. The instruments were multiple-choice tests with 10 questions. Data collection was carried out before and after the learning activities. The technique test of data analysis was performed by calculating the N-gain obtained by the difference between the maximum score and the initial test score. The Gain value obtained was used to observe the improvement in science process skills of students before and after the learning process using the POE learning model.

RESULTS AND DISCUSSION

Normality test is used to determine data generated from conducted research whether they are from a normal distribution or not. Data normality test uses Kolmogorov Smirnov Ratumanan & Theresia, (2003) by comparing the significance value with a significance level of 5% or 0.05. Based on the data

obtained, it was shown that the N-gain data of the experimental class and the control class were normally distributed, with the Asymp Sig. (2-tailed) above 0.050, at 0.590 for the experimental class by POE learning model and 0.721 for the control class by the common learning models in schools. According to this finding, again it can be asserted that the N-gain data of science process skills from both classes were normally distributed. Homogeneity tests were performed using the Homogeneity of Variances in One Way ANOVA (Ratumanan & Theresia, 2003). The homogeneity test results exhibited that the sig. value of 0.819> 0.05, which

means that the two classes have the same variant.

The average critical thinking ability of students, before applying the POE learning model in the experimental class, was 18.6, then raised up to 77.1 for the average KPS of students after applying the same learning model, which resulted in an increase by 58.5. Similarly, in the control class, before the learning process, the average critical thinking ability of students was 18.1, then increased up to 52.6 for the student KPS, after applying the common learning model, which meant to a growth of 34.5.

Tabel 1. Data of Average N-Gain of Student KPS

Gain Category	Experimental	Control
Highest Gain	75	50
Lowest Gain	30	12,5
Average Gain	58,6	34,6
Average Increase Score	46%	41%
Average *N-gain*	0,72	0,42
Average *N-gain* Category	High	Medium

Based on this table, it was displayed that the average increase score in KPS in the experimental class was higher than the control class.

Research hypothesis testing is used to examine the feasibility of provided hypothesis to be accepted or rejected. The followings were research hypotheses proposed in this study:

H0: there is no effect of the application of the POE model to the science process skills of high school students

H1: there is an effect of the application of the POE model to the science process skills of high school students.

The results of the research hypothesis testing were generated by independent sample t-test, with Asymp Sig (2-tailed) value on the hypothesis test of 0,000, which was less than 0.05. Thus, this finding allowed us to conclude that H0 was rejected and H1 was accepted, which meant that there was an impact on the application of POE

learning model to the science process skills of high school students.

According to the results of observing the learning process, applying the POE learning model might create a more varied form of teaching, so that students were expected to involve in a variety of experiences. The gained experience can develop student basic abilities to be creative, active, skilled in thinking and gaining their knowledge. Besides, this POE learning model can also sharpen the patterns of thinking and improve student learning outcomes. Observations were carried out during the ongoing learning process. The experimental class was better in improving science process skills compared to the control class, because in the learning processes and activities, by applying the POE learning model, there was a learning syntax that stimulate students to be more active in learning, such as students being given the opportunity to develop their knowledge and the opportunity to thinking, searching, finding and explaining examples of the concept applications that have been studied independently, including discussions with other peers. Teachers act as facilitator and direct students when things are wrong or misconceptions. Learning by using the POE learning model is not always easy to apply, the difficulty of classroom management during exploration activities causes students to frequently underestimate and depend on their peers. The implementation of the POE learning model is usually prone to conduct experiments in groups that make teachers having difficulty in monitoring student activity entirely.

Likewise, conducted by Zulaeha, et al. (2014), the studies showed there was an increase in students' KPS abilities even though the results were not significantly different between the experimental class and the control class. Similarly, the findings of Budiarti & Sarwanto (2014) demonstrated that the POE learning model using controlled and simple experimental methods were able to influence student KPS. The POE learning model using a controlled experimental method had a higher KPS average score compared to a simple experimental model. It was confirmedly agreed by (Rahayu, 2015). Hence, the results of this current study revealed that the POE strategy was able to develop a highly better understanding of concepts in the experimental class in comparison with the control class as well as student KPS.

CONCLUSION AND SUGGESTION

Based on the results of these findings, it was concluded that there was an effect of the application of the POE learning model to the science process skills of high school students in Newton's law material, which was indicated by the differences in the average pretest and posttest of students and the differences in N-gain between experimental and control classes that were of high standard. The magnitude of the influence of the POE learning model was classified into a high category with a *Cohen's d* value of 3.40 and an *effect size r* of 0.71.

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