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THE EFFECTIVENESS OF USING POE (*PREDICT-OBSERVE-EXPLAIN*) STRATEGY ON STUDENTS' LEARNING RESULT OF REACTION RATE CHAPTER IN SMA

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Abstract. The purpose of this research is to describe the effectiveness of using POE strategy on students' learning result on the topic of the factors affecting reaction rate. The subjects of this research are 33 students of XI grade MIA 1 SMAN 1 Leces Probolinggo in 2016/2017 academic year. The data collecting techniques in this research were observation, test, and questionnaire. The results showed that the students' activities were student-centered learning and all students achieved the completeness of learning result in knowledge aspect. Based on those results, we could conclude that the implementation of POE strategy were effective to improve student's learning result on the topic of factors affecting reaction rate.

Keywords: *POE strategy, learning result, factors that affect rate.*

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INTRODUCTION

The purpose of the 2013 Curriculum is to prepare Indonesian having the ability to live as individuals and citizens who are faithful, productive, creative, innovative, affective, and able to contribute for society, nation, state, and civilization. Those purpose should be implemented by the schools, one of them is SMAN 1 Leces Probolinggo.

The results of interviews conducted by researcher to chemistry teachers in SMAN 1 Leces is found that there was incompleteness of student learning result, especially in chemistry subject. Researcher observed the students' chemistry learning result and found that the average of chemistry learning result of grade XI SMAN 1 Leces in gasal semester is 65. It was below the KKM which is 80. The other facts revealed based on the interview result is the teachers seldom involved students in scientific process in learnings. This wasn't without a reason.

Inadequate facilities own by the school cause teachers can't invite students to do scientific process, such as practice, so the learning tends to be teacher oriented. The teacher only explains the material of learning as a product. Students only memorized low factual information and was not accustomed to develop their thinking skills potential.

The chapter of the reaction rate is one of the chapters in chemistry subject taught in the gasal semester of grade XI. There are some basic competencies that are considered difficult by students on the reaction rate chapter, because this chapter contains many abstract concepts but close to the students' real life.

This is supported by the examination results of reaction rate chapter in the 2015/2016 academic year which the number of students who achieved the completeness of examination was 46%, and the number of students who didn't achieve the completeness of examination was 54% (list of chemistry subjects is obtained from interview with the teacher). From that result, some students had to follow remidi in order to achieve the completeness. The low score of students' learning result is caused by the students' passivity which could impact the low ability and interest for students in chemistry learning. It affected the inhibition of students' understanding in chemistry subject, causing the students still not reach minimum learning result completeness.

The POE strategy was firstly introduced by White and Gunstone in 1995 (Dalziel, 2010). POE is a learning strategy using an experiment that begins with the presentation of a problem which the student is invited to predict what possibly happen

(*predict*) then followed by observation by observe directly on that problem (*observed*) then proved by experimenting to find the truth of the beginning prediction in the form of explanation (*explain*). Through these three activities, students are expected to understand and be able to apply their knowledge in real life (Kearney, 2001).

The POE strategy is appropriate for students in this school as it involves students actively from the start of learning, primarily in experimental activities, asking questions, and communicating learning in reaction rate chapter. Learning with this strategy makes students continually think and have positive activity so they are not easy to be drowsy. SMAN 1 Leces uses the 2013 Curriculum which in its learning uses a scientific approach. The POE strategy applied to this study supports the scientific approach used in learning.

The predict stage can be done through observing images or phenomena that are close to real-life students and they have known before, then students are asked to make questions. The *observe* stage can be done through discussion and cooperation when conducting experiments or practicum to collect data that support learning. The *explain* stage can be done through associating and communicating the results of the experiment as well as working on the questions given by the teacher. This POE strategy is appropriately used in reaction rate chapter because this chapter involves many phenomena and substances that are close to the student's real life.

The effectiveness of learning using POE strategy in this study will affect the learning result obtained by students, therefore it needs to conduct observations on the teachers' ability in applying learning using the POE strategy. Students in this research are invited to apply and conduct experiments related to the reaction rate chapter, thus the learning process becomes more interesting because students gain direct experience and be able to construct the knowledge and creative ideas obtained from the observation and discussion, so that at the end of the learning the learning will get a positive response from students.

Based on the background above, the researcher considers it is necessary to conduct a research entitled "The Effectiveness of Using Predict-Observe-Explain (POE) Strategy on Student Learning Result of Factors Influencing Reaction Rate in SMA"

METHOD

This research is a pre-experimental research, aimed to describe the effectiveness of learning by using POE strategy on students' learning result in

knowledge aspect. Learning devices are developed with 4D design that has been reduced to 3D design that includes the *definition*, *design*, and *development* stage. The effectiveness of learning devices using POE strategy can be seen from learning result after the implementation of POE strategy and students' activities during learning using POE strategy.

This research was conducted at SMAN 1 Leces Probolinggo in 1st semester of 2016/2017 academic year. This research is intended to obtain information about the effectiveness of this learning devices in the form of the learning implementation, students' activities, and learning result. The instrument used for this research is students' activities observation sheet and concept comprehension test sheet.

The data were analyzed descriptively quantitative and qualitative. The data of learning implementation and student responses were analyzed using quantitative descriptive analysis, then the result of the data analysis is described using qualitative descriptive analysis to obtain a statement describing the quality of the score. While the data of students' activities are analyzed using quantitative descriptive analysis in diagram form. Data of student learning result was analyzed using quantitative descriptive analysis, then the result of data analysis is described using qualitative descriptive analysis to obtain statement which describes the quality of the score.

Sugiyono (2011) stated that to know the effect of learning on learning result we should analysis *N-gain score* with the following formula:

$$(g) = \frac{Sp_{post} - Sp_{pre}}{S_{max} - Sp_{pre}}$$

with (g) = gain value, Sp_{post} = post-test value, Sp_{pre} = pre-test value and S_{max} = max value.

RESULTS AND DISCUSSION

1. Students' Learning Result in Aspects of Knowledge

Referring to the Appraisal Guide for SMA from Kemendikbud, the value of learning achievement includes knowledge, attitude, and skill aspect. Minimum Completeness Criteria (KKM) for the knowledge aspect set by SMAN 1 Leces Probolinggo District is 80 with the C predicate (Enough). At the time of the pretest, it was found that no students who achieved 80 but after the learning with the POE strategy the students' learning result in knowledge aspect increase. The percentage of students' completeness is 100%, meaning that all students have value ≥ 80 .

Learning using POE strategy is effective to improve the students' concepts understanding because the learning stages experienced by students in accordance with the students' cognitive development. It's formal operational stage, a stage where students can think abstractly/symbolically and solve problems through experiments (Nur, 2008). Learning with POE strategy has three stages, namely: predict, observe and explain.

Predict stage is an early stage where students are prepared physically and mentally in order to follow the learning process well. In this stage, students are made curios about the topic which will be learned. It could be done by linking the topic with the existing cognitive structure which students have had. This action is in order to make students feel they are necessary to learn new topic or commonly called by David Ausubel as meaningful learning. Ausubel stated that meaningful learning is a process which new information is linked to the knowledge structures that a learning person already have. In practice, in this preparation stage students are given apperception of the material to be studied. Therefore this stage is the stage to create understanding or the stage when neurons communicate with each other. Neurons in the brain will communicate well when they get new information if the new information is interconnected with the old information so it will create a new cognitive structure that will ultimately be meaningful in students' mind.

The next stage is the Observe stage. Students build and discover the concepts that they learn through practice and reading books as well as other learning resources. The practice and reading books contain information that is still within the reach of students in the class, is in accordance with Vygotsky's theory that learning processes will occur if children work or handle uncharted tasks, but these tasks are within their reach, called the zone of proximal development, ie the area of development level slightly above the current development area of a person (Nur, 2008).

Studying in small group allows the students to reach a development potential level greater than their actual development. Students conduct learning activities in groups to understand learning materials that can still be reached by their cognitive structure or called zone of proximal development, because by learning from experience in solving problems students will gain confidence and motivation to solve more complex problems again (Suyono and Hariyanto, 2011). Vygotsky also introduced the term of scaffolding. Scaffolding means providing help to

students during the early developmental phase then subtracted little by little and gives students full opportunity to take full responsibility. This is the basis for researcher to divide students into heterogeneous learning groups, which means within that learning group every student has a variety of abilities. It is intended for student who has more ability capable to help their friends in his group who find difficulties in understanding the concept.

Students who are learning will experience cognitive development. This development is divided into two levels. They are the level of actual development and the level of potential development. According to John (2010) the level of actual development is seen from a person's ability to complete tasks or solve various problems independently. Meanwhile, the level of potential development is seen from one's ability to complete tasks and solve problems under adult guidance or more competent peer.

The Explain stage is the stage that students are given the opportunity to present the results of the analysis that have been done with the members of the group. This stage also provides an opportunity for students to trace the psychomotor aspect by presenting the results of the discussion, asking to their friends, and refuting the argument of friends if it is not in accordance with what they learned. In this stage emphasizes the importance of rest and time to review what students have learned. The inclusion of information learned by students from short-term memory to term memory takes time, so this stage is absolutely necessary for students to have time to organize the information received into their long-term memory.

The exercises given by teacher aim to strengthen students' self-conceptual understanding. By doing the exercises they will often recall the concepts that they have learned so the concepts can be stored in their long-term memory. In long term memory, knowledge is stored permanently and could be called again later, if somebody wants to use (Nur, 2008). Besides giving exercises, this stage also encourages students to conclude what they have learned.

One of indicators that can be used as a reference whether the learning devices is effective or not is by seeing the students' learning result improvement, which in this case is the improvemet of their concepts understanding. Students who learn using POE strategy are given pretest and posttest. This is to find out how effective learning devices, which are developed, to improve students' concepts understanding. Students' learning result increased significantly,

which was stated by *Normalized Gain* score (n-gain). The number of students who get n-gain score <0.70 is 9 students with high category. One student get n-gain score 0,5 with medium category.

The results of the research that stated chemistry learning devices using POE strategy is valid, effective, and practical in in improving students' learning result support some of the previous researches on POE. Liew (2004) concludes that Predict-Observe-Explain strategy is very effective in diagnosing students' understanding of science and students' completeness level so it has implications for curriculum development, teacher development, and students' promotion and understanding. Physics teachers can combine Predict-Observe-Explain strategy with conflict strategy maps to introduce conceptual learning and gain knowledge in the classroom to improve learning result.

Scheid (2009) concludes that students recall and understand by themselves that learning and learning from experiments can be enhanced by appropriate cognitive activation as a Predict-Observe-Explain sequence. Kala et. al., (2012) concluded that by using the POE strategy can reveal that some students have misconceptions about the pH and pOH. The results of this study are supported by the previous studies results (Prahani, et al., 2015; Prahani, et al., 2018; Yasir, et al., 2016) that the teaching materials, devices, and learning models of quality and feasible (meet the valid, practical, and effective aspects) can improve student learning outcomes.

2. Students Activities

Students' activities is measured using activity observation sheets filled by the observers. Based on Figure 1 can be explained that the percentage of students' activity when paying attention to explanations/phenomena explained by the teacher is 7.41%. Average percentage of students' activity when writing ideas/questions, reading textbooks, experimenting, discussing and cooperating, presenting the result of their group work, asking/giving opinions, and concluding learning is 88,19%. The average percentage of students' irrelevant behaviors is 4.44%. Based on the percentage of students' activities, it can be concluded that learning by using POE strategy is student centered learning. Students' activities results are visually presented in Figure 1.

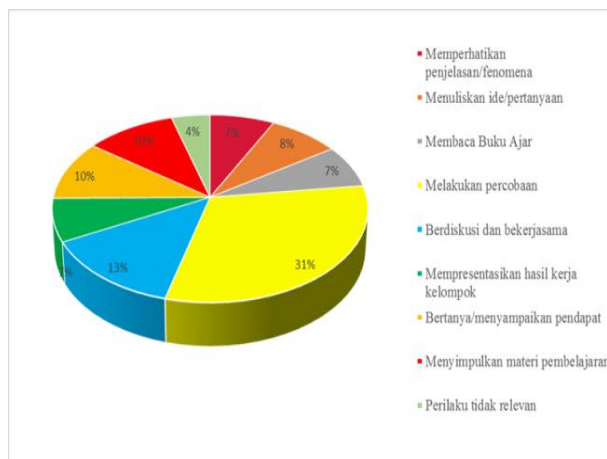


Figure 1. Diagram Students Activities

CONCLUSION

Based on the results and discussion, it can be concluded that the effectiveness of learning by using POE strategy can improve students' learning result on the topic of the factors affecting reaction rate.

SUGGESTION

Teachers should be able to manage the time well because learning by using Predict-Observe-Explain (POE) strategy requires a lot of time. Besides that, teachers should give the skill of using laboratory equipment to students so the practice run effectively and efficiently.

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