THE EFFECT OF STUDENT WORKSHEET BASED ON PREDICT OBSERVE EXPLAIN STRATEGY AGAINST THE LEARNING OUTCOMES

Oci Pitriyanti[1], I Dewa Putu Nyeneng [2], Nengah Maharta [3]
[1,2,3]Program Studi Pendidikan Fisika, FKIP Universitas Lampung
E-mail: ochifitriyanti10@gmail.com

Abstract

The study was aimed to determine the influence of the use of student worksheet (LKPD) based on Predict Observe Explain (POE) strategy on student learning outcomes in the light material. This research was an experimental study with the design of experimental quasi using the form of a one-group pretest-posttest. The population of this study was the eighth-grade students of junior high school (SMP). Data analysis techniques were tested with the learning result grouping techniques, N-Gain analysis, hypothesis testing, linear regression tests, t-test paired test and effect size tests. The result of the N-Gain was a value of 0.60 with a moderate N-Gain interpretation. Linear regression test result was obtained a coefficient value of 0.7, with the sig regression value of 0,0. The result of the paired t-test achieved a significance value of 0.0, which indicated that there was a raise prior and following treatment. The result of the effect size test was 0.31 with a medium interpretation. The learning outcomes for psychomotor learners had an average value of 3.52 with excellent interpretation. Based on these findings, it can be concluded that the POE strategy-based LKPD was considerably effective to be applied in schools resulting in an increasing effect of the students learning outcomes before and after the treatment of POE-based LKPD.

The implementation of the learning process in Natural Sciences (IPA) in schools should be accustomed according to its characteristics. Tias (2017) stated that Natural Sciences is a subject that allows you to explore nature in a systematic approach, so that not only will it convey about concepts or principles, but also does a process to discover and explain about what you have learnt. The scientific learning process needs an accurate learning media that can exert pupils to be more active and more attractive to the delivering subjects.

The well-prepared learning media will assist students in comprehending the learning materials appropriately so that will be able to achieve the learning objectives (Muhson, 2010). This is agreed by Yusuf & Subaer (2013), stating that learning media could be a device in the physical or non-physical form that is used as a mediator between teachers and students in understanding the learning materials effectively and efficiently. Handikha, et al. (2013) demonstrated that the important role of learning media is to support to fostering motivation to learn, and to increase comprehension, in which an interesting material presentation will ease pupils in gaining information. Related to this, Marti, et al. (2014) exhibited that using visual media, it can help students to understand certain concepts that are difficult to explain in language. One of the learning media that can be used and applied for in schools to achieve learning objectives is student worksheet (LKPD). Beladina, et al. (2013) explained that LKDP is one of the learning tools which can help teachers and students to pursue their learning purposes.

The implementation of learning models with Predict Observe Explain (OPE) strategy, which is transferred into a form of POE-based LKPD, may motivate students to improve their learning outcomes; the steps available in the strategy will make them more active in learning activities.

As explained by Tyas, et al. (2013), the POE model will place students actively in a situation or problem, which they need to provide assumptions on a physical event so that the initial concept can be revealed, then they also need to investigate upon their hypothesis; if there are differences between the prediction results and observations, they will experience an adjustment of concepts from incorrect to correct ones. This is supported with the statement of Indrawati & Setiawan (2009), showing that the advantages of the POE model are to promote a good interaction between teachers and pupils and a good interaction between students and students, then to explore student's ideas, and to create curiosity amongst the students.

The application of the POE model implemented in worksheets makes LKPD becoming more variative and enables to improve the learning qualities in classrooms (Kibirige, et al., 2014). According to Hsu, et al. (2011), students will gain knowledge from explorative activities with their common senses. In this case, a teacher will just play a role as a facilitator in constructing their own insights.

The stages of POE-based LKPD, stated by Zulaeha, et al. (2014), as follows:
(1) Prediction, wherein this stage pupils are required to provide apperception related to the discussed material.
(2) Observation, where teachers act as facilitators and mediators to assist students who experience difficulties in conducting observation or finding answers from prediction activities.
(3) Explanation, wherein this stage teachers facilitate the course of discussion activities carried out by students based on their experience during the observation stage.

Nurhidayati, et al. (2017) stated that the use of POE-based LKPD also may increase the activity of learning in students, motivate them in independent learnings, and direct them in the development of concepts so that it will trigger them to study more effectively

and efficiently. Associated with the use, Rifzal, et al. (2015) exhibited that POE-based LKPD influence pupils to get more involved in various aspects, not only is in the knowledge but also in attitude and skills, so that expectedly there will be an increasing competence in students. Therefore, the use of POE-based LKPD is one of the strategic alternatives that can be used by teachers to implement the active learning system; this is due to using this model, students will be guided and directed accordingly to the POE stages mentioned above.

Fundamentally, learning is a process of transformations occurring inside us after the end of learning activities. While, the learning outcome is a competency achievement that includes some skills and attitude as a result of the learning process (Angraeni & Puspitasari, 2019). Furthermore, according to Wulandari & Surjono (2013), the outcome of learning is the levels of accomplishment achieved by a student that is obtained after conducting learning evaluations that consist of a test which can result in changes, in which involve remember, understand, apply, analyse, evaluate and create.

Learning outcome consists of three realms. Firstly, the cognitive realm contains six types of behaviour, which are knowledge, understanding, implementation, analysis, synthesis and evaluation. Secondly, the affective realm holds five types of behaviour, which are acceptance, participation, assessment, attitude determination, organisation, and lifestyle formation. Lastly, psychomotor realm comprises seven types of behaviour, with readiness perception, guided movement, normal movement, complex movement, customisation of movement, and creativity (Septiani, et al., 2013). During the learning process,

we will directly actualise these three learning realms from the beginning to ending of learning activities.

The student learning outcomes are influenced by internal and external factors. Internal factors are the factors derived from inner self such as independency, learning motivation, emotional intelligence, confidence, logical mathematics intelligence, attitude, etc. While, the external factors are the factors coming from the outsides such as school environments, facilities and infrastructure, teachers, students, same-age friends, curriculum, and teaching methods. These both factors are consistently engaged, but the most dominant one is the internal factor that is much more supporting the success of learning in students. The internal factors that contribute to this success are logical-mathematics and emotional intelligence of students. If those both elements can arise, the learning outcomes of students will be good in the objectives of activities. This is confirmedly revealed by Suhendri (2012), that internal factors are the most dominant factors in the achievements of students, with logical-mathematics and emotional intelligence. If these both elements are available, material learnings delivered by teachers will be much easier to be absorbed by students so that the results of learning will be better in the purposes of learning activities that are achieved.

Meanwhile, Sanjaya (2009) demonstrated that the domains influencing in learning are (a) cognitive domain, which can be measured with a cognitive test like the test of multiple choices and oral tests; (b) affective domain, which can be assessed through observation sheets like the assessment of attitude and interest in learning of students using the sheets with grade

system; (c) psychomotor domain, which can be also evaluated with observation sheets about predictable aspects such as reflex motion, physical skills, skilled movement from students. According to (2016: 281), the criteria of learning outcomes of students can be seen in Table 1.

Table 1. Criteria of Learning Outcomes

Student Mark	Grade Qualification
80-100	Very Good
66-79	Good
56-65	Adequate
40-55	Less
30-39	Fail

Data that will be generated in this study are interval and primer data, in which by using interval data we can sort out and group the learning outcomes of students into the qualification system. The assessment of learning outcomes in students, commonly in the competency-based curriculum, is carried out using the lowest criteria to declare that students achieve the mastery or not; this guidance is normally known as the Minimum Completeness Criteria (KKM). The large numbers of students who exceed the KKM will not change the decision of teachers in declaring them pass or not. Thus, by using KKM, teachers and schools can identify how big the level of completion from the learning outcomes of students in tested courses.

Based on the interview with the Natural Science teachers in SMPN 31, Bandar Lampung, they disclosed that the eighth-grade students have low marks from their daily Natural Science assignments with KKM value at 70, accounting for 40% of students passed over the KKM and 60% of students were below the KKM. This was entirely reinforced by the observation of learning activities that had been performed in the school. The findings obtained from the observations in the school were (1) mostly students talked to others, (2) only few students actively asked and listened to teacher explanations, (3) only students who were knowledgeable completed the given assignments on LKPD and textbooks, (4) students were less initiative to convey the answers of their assignments so that teachers needed to explain again in advance. Moreover, the material that had low marks of the block-test was the light material. In this chapter, students who passed over the KKM standard were eight people from each eighth-grade class. The low results of the block-test were influenced by the lack of proficiency in students in predicting a phenomenon and problem concerning the light material presented by teachers. Also, as seen that students mostly got confused and did not understand in explaining something related to phenomena and problems delivered by teachers since the light material were abstractive and students were unaware.

Teachers during the learning process have used learning media such as textbooks and LKPD created by teachers that have a structure consisting of contents, assignments and steps of practice. This LKPD is normally used to guide students in performing simple experiments at laboratories of Natural Science in schools. In the learning process in schools, teachers noticed that students were not thoroughly active in taking part of experiment activities conducted in laboratories, beginning from predicting, observing and explaining results of experiments that had been previously done, then while performing the block test of the

delivered materials, many students achieved low marks.

These low marks from students are influenced by various factors, including students who have different abilities in comprehending studied materials, which generates in varied student's responses; there are some who give a good response, some need more explanation in detail, and others need to be guided. Besides that, students are not interested in learning activities, teachers give less attention to students who are less active and less understand on presented materials, and learning media used are less attractive, etc.

According to the student's perspective, they frequently experience difficulties in studying the materials of Natural Sciences, mainly in the material of light. The difficulties appear due to the material of light is abstractive, difficult to understand, and students are still in difficulties of describing and explaining the process of shadow formation on mirrors nor lenses so that students tend to memorise the materials given by teachers rather than comprehending the materials. The same issues followed on the studies of Suniati, et al. (2013), that students in learning the materials of light concepts and optical instruments frequently experience misconceptions, such as on the chapter of the laws of light reflection, diffuse and fuse reflection, shadow sketch on flat, convex, and concave mirrors, and light deviation.

Considering the low grades of students in SMPN 31, Bandar Lampung, it was confirmedly required an alternative to improve the learning outcomes of students. One of the actions that could be taken was by using the learning media of POE-based LKPD. This LKPD was a useful alternative of this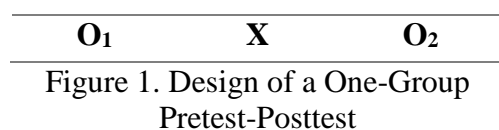 issue, which basically LKPD was a teaching material compiled based on the stages of POE-modelled learnings. Based on this background, it was, therefore, encouragingly performed a study with the title "The Effect of Use of POE-based LKPD against the Learning Outcomes of Students in SMP on the Material of Light".

METHODS

The population of this study was the entire students of the eighth grade in SMP on even semester in academic year 2018/2019, which consisted of 9 classes with the total of 30 students in each class, and some students of the ninth grade with the total of 279 students. The sample collection in this study was performed using the random sampling technique.

Based on the number of 279 eighth-grade students, the establishment of the sample size was not using the statistical calculation. Gay, et al. (2006) showed that the establishment of sample size does not have the absolute determination, which means no provision of percentage is taken. Therefore, the sample was only collected for 11% of the total population, which resulted in 30 students in each class. After that, the sample was used as the experimental class.

The design of this study was the design of experimental quasi as the authors were unable to control all variables that might influence the tested variables. The used experimental design was a one-group pretest-posttest, which students would be tested prior with pretest, as an initial competency, before carrying out treatments. Then, after the treatments, students would receive posttest. Generally, the used research design can be seen in Figure 1.

Oci Pitriyanti, I Dewa Putu Nyeneng, Nengah Maharta
The Effect Of Student Worksheet Based On Predict Observe Explain Strategy Against The Learning Outcomes

O₁	X	O₂

Figure 1. Design of a One-Group
Pretest-Posttest

Information:
X : Treatment
O₁: Pretest grade before treatment
O₂: Posttest grade after treatment

The pretest-prior treatment aimed as a basic establishment in determining increasingly changes in learning outcomes. While the posttest treatment, at the end of learning activities, would reveal the intensity of achievement on the treatments given. By using the design of a one-group pretest-posttest, the results obtained would expectedly be more accurate; hence, we enabled to compare the circumstances before and after treatments. Before the instruments used in this study, it was conducted the validation test and the questionnaires of instrumental reliability prior using the total of 32 respondents from students.

In this study, there were two types of variables, independent and dependent variables. The independent variables were POE-modelled LKPD, whereas the dependent variables were the learning outcomes of students. The instruments used were the test sheets with 15 long essays, which were divided into 3 sections of light materials; first: the materials of light properties, second: the direction of light propagation, and third: the nature of light, based on the characteristics of objects. The other instruments used were a syllabus, Learning Implementation Plan (RPP), and observation sheets of psychomotor assessment.

In this study, the learning outcomes of students were determined by pretest-posttest evaluation. This evaluation would generate a marking

system that was then analysed using N-gain normality method with the following formulation:

$$N - Gain = \frac{Posttest\ Score - Pretest\ Score}{Maximum\ Score - Pretest\ Score}$$

The results obtained from the calculation were then interpreted into criteria system in the N-Gain table (Hake, 1999).

Table 2. N-Gain grouping criteria

N-Gain	Criteria
$G \geq 0,7$	High
$0,3 \leq G \geq 0,7$	Moderate
$G < 0,3$	Low

The calculation of N-gain was beneficial to determine a difference in learning outcomes before and after the intervention, and data obtained was expectedly be equal interval where later it could be seen and grouped into a categorical system: low, medium or high.

Hypothesis test was conducted using the four analysis methods in IBM SPSS 22; (a) normality test is a test used to investigate data of learning outcomes whether it comes from normal distribution or not; (b) simple linear regression is a test used to determine values of dependent variables if values of independent variables (X) experience raise or decrease, and to assess the direction of correlation between independent and dependent variables (Y) to positive or negative values; (c) paired t-test, a test used the same samples, yet with different interventions, this test was aimed to examine an average difference of learning outcomes in students before and after receiving treatments; (d) effect size test was performed to observe how

big effectivity of models or methods in learning methods used.

RESULTS AND DISCUSSION

In the previous elaboration, it has been explained that this study was aimed to investigate the impact of the use of POE-modelled LKPD against the learning outcomes of students in the material of light so as to obtain the average N-Gain data of the cognitive learning outcomes in students. The results were shown in Table 3.

Table 3. N-Gain data of cognitive learning outcomes of students

Experiment Class			
Pretest	**Posttest**	*N-Gain*	**Criteria**
38,87	74,83	0,60	Moderate

Table 3 displayed the average N-Gain values. It was obtained, in the experiment class, a value of 0,60 with the moderate N-Gain Criteria. Interestingly, there was an escalation on the learning outcomes of students in the cognitive domain of the experiment classes before and after using POE-based LKPD.

After gaining the average N-Gain of the student learning outcomes, linear regression was then performed. This test was used to examine the independent and dependent variables of experiencing either raise or decrease and to investigate the correlation between two variables towards positive or negative correlation. The results of this test were presented in Table 4.

The ANOVA linearity test generated from the results of regression output was used to determine the significant levels or linearity outcomes from the data analysis obtained. Displayed on Table 4, it was found the

normal sig value of $0,000 < 0,005$, with a coefficient value of 0,710, for the impact of POE-modelled LKPD, by the sig regression at 0,000, as to exert the constanta nor linear regression admitted at a confidence level of 95%. This meant that the relationship between the learning outcomes of students and the dependent variables of POE-based LKPD was linear.

Table 4. The Results of linear regression

	B	Std. Eror	Sig
(Constant)	47,245	4,973	,000
Impact POE-modelled LKPD	,710	,123	

The statistical results of the paired sample t-test revealed a significant value of 0,000, which meant the learning using POE-modelled LKPD could potentially promote the learning outcomes of students. This was statistically found from the elevation occurred before and after the treatments in the experiment classes shown in Figure 2.
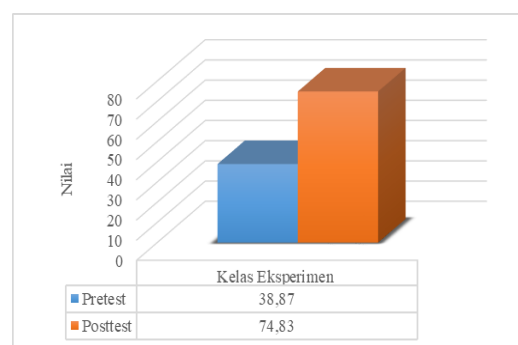

Figure 2. Statistical Graphic of the average of learning outcomes in the cognitive domain

In figure 2, it was obviously shown the difference between the two tests addressing to the increase in the learning

outcomes of students using POE-modelled LKPD. In addition, the use of this learning model encouraged students to be more active since students actively involved in every step of the learning process through simple experimental activities. Hence, it was suggested that this POE-modelled LKPD was significantly effective applied for in schools, and effectively to escalate the learning outcomes of students. This was validated by the findings of N-Gain and effect size tests at 0,31 which was classified into the moderate category.

The POE modelling in LKPD for the material of light helped students in understanding the materials deeper as we knew that the material was completely abstractive and tough for them. Also, this learning model suggested several phases of learning process: predict (P), where students were highly enthusiastic and passionate to discuss with other members of groups to write down some predictions occurred from phenomena presented in LKPD; observe (O), where students were attracted to conduct experimental activities about light materials to discover answers from the prediction activities that had been done in the previous phase; explain (E), where students explained the results obtained from both previous phases. These phases caused students to remember and understand more over the studied materials.

Moreover, this learning type using POE-modelled LKPD urged students to actively accomplish assignments using scientific methodologist and to elevate curiosity of students to keep learning, so that this might impact student positively for their learning outcomes, mainly in the cognitive realm. As revealed by Syawaludin, et al. (2017), using POE-designated LKPD as a learning media

would involve students actively more in experimental activities and would construct their own knowledge through the learning activities of predict, observe and explain (POE) model. Students expectedly would achieve their maximum competency scientifically. Performed by Nurhidayati, et al. (2017), her research exhibited that with this modelling design of LKPD, students became more trained in completing their assignments with scientific methodologist, and their curiosity increased alongside, so that it was positively impacted in their learning outcomes.

POE-designated LKPD compiled based on the stages of POE learning model has advantages and benefits, as revealed by Ozedemir, et al. (2011), such as promotable the mastery of concepts that impacts on the cognitive learning outcomes, and to explore student's initial knowledge. This initial knowledge is usable as the data of thinking capabilities of students that can be used by teachers to place students in various discussing activities. These activities aimed to explore the capabilities and knowledge of students so that their passions were expectedly impacted on their increasingly learning outcomes.

In the learning process using POE-modelled LKPD, students more involved in predicting a phenomenon, observing through experiments and explaining results of experiments from their previous predictions. According to Rifzal, et al. (2015), this POE-modelled LKPD is efficient and effective for students, including teachers also receive benefits of it, mainly in delivering difficult materials with guidance and the steps of learning within LKPD. Thus, LKPD in learnings is completely needed. Besides that, in discussion sessions,

students were freely allowed to discover their own concepts as to make them more understood over the concepts. Supported by the research of Syawaludin, et al. (2017), by using POE-designated LKPD the learning activities of students also could develop, where students would independently work in developing a concept and finding answers of the completed activities, so that this would become more effective and efficient, also, students would be knowledgeable with a concept which was being studied.

Assessment of the learning outcomes of students in the psychomotor domain during the learning process entirely used the observation sheets, which teachers provided marking on each student discussing in every group. The results of student learnings in the psychomotor realm was shown in Figure 3.
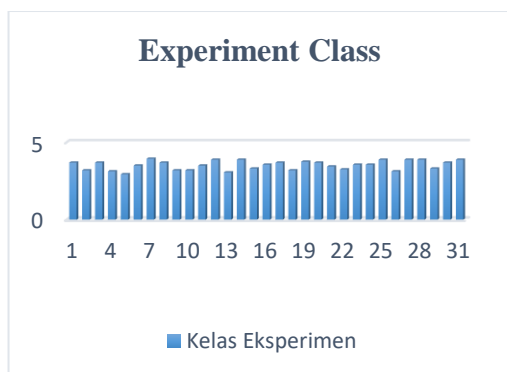
Experiment Class

Figure 3. The Results of student learnings in psychomotor domain

As seen in Figure 3, the psychomotor assessment of the eighth-grade students (Class VIIIA) with 30 pupils relatively had a value of >2,85, classified into the good category. Remarkably, the students were passionate and enthusiastic in the learning activities, beginning from seeing the presented simple phenomena, interacting with group members, and

discussing together with other groups regarding the experimental results obtained.

Based on the learning outcomes of students in psychomotor and cognitive realms, the learnings using POE-modelled LKPD was presented in Figure 4.
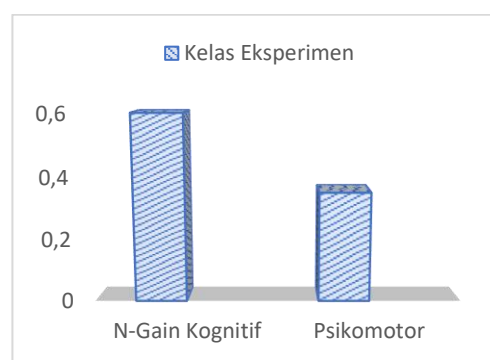

Figure 4. Average results of cognitive and psychomotor learnings

In Figure 4 was the increase of learning outcomes both in the psychomotor and cognitive domains shown using POE-modelled LKPD. The relevant studies performed by Nurhidayati, et al. (2017) also revealed that there was an estimated 100% of students, using POE-based LKPD in classrooms setting, who passed the standard of KKM. Hence, the use of this model learning design was significantly impactful, not only did the learning outcomes in the cognitive realm increase but also did the psychomotor realm become even better.

The success in changes of learning outcomes in students, prior and following treatments, was due to the use of a precise media in learning process, which was POE-modelled LKPD, motivating students to become more active and passionate in learning activities as result in better learning outcomes.

CONCLUSION

Based on the results obtained, there was an increased learning outcome of students using POE-modelled LKPD in the cognitive realm with the materials of light on the pretest and posttest values at 38,87 and 74,84, respectively. While in the psychomotor realm, the learning outcomes of students using POE-modelled LKPD in the material of light in experiment classes showed a value of 3,52 with average marks at >2,85, classified into a very good category.

The effect of the use of POE-modelled LKPD, with N-Gain value of students in experiment classes at 0,6010, resulted intensification with a moderate category. This model applied in schools was effectively proven to be used. This was reportedly presented in the calculation of effect size test at 0,31 with a moderate category. Considering these findings, therefore, it was suggested that the use of POE-modelled LKPD was effectively beneficial and impactful on the learning outcomes of students.

REFERENCES

Angraeni, L., & Puspitasari, H. (2019). Pengaruh Media Simulasi Komputer Terhadap Hasil Belajar Mahasiswa Pada Materi Kinematika Gerak. *Jurnal Pendidikan Matematika dan IPA*, *Vol. 10, No. 1,* 2-10.

Beladina, N., Suyitno, A., & Khusni. (2013). Keefektifan Model Pembelajaran Core Berbantuan LKPD Terhadap Kreativitas Matematis Siswa. *Unnes Journal of Mathematis Education (UJME), Vol. 2, No. 3,* 1-6.

Gay, L. R., Mills, G. E., & Airasian, P. (2006). *Education Research: Competencies for Analysis and Aplications.* USA: Pearson.

Hake, R. R. (1999). *Annalzing Change/Gain Scores.* AREA-D American Education Reserch Association's Devision. D, Measurment and Reasearch Methodology.

Handikha, I. M. D., Agung, A. A. G., & Sudhata, I. G. W. (2013). Pengembangan Multimedia Pembelajaran Interaktif Model Luther Pada Mata Pelajaran IPA Kelas VIII Semester Ganjil Tahun Pelajaran 2012/2013 Di SMP Negeri 1 Marga Kabupaten Tabanan. *Jurnal Teknologi Pendidikan*, *Vol.* 1, *No.* 2, 34-39.

Hsu, C. Y., Tsai, C. C., & Liang, J. C. (2011). Facilitating Preschoolers' Scientific Knowledge Construction Via Computer Games Regarding Light And Shadow: The Effect Of The Prediction-Observation-Explanation (POE) Strategy. *Journal of Science Education and Technology, Vol. 20, No. 5, 482-493.*

Indrawati & Setiawan, W. (2009). *Pembelajaran Aktif, Kreatif, Efektif, dan Menyenangkan untuk Guru SD.* Bandung: PPPPTK IP.

Kibirige, I. Osodo, J. & Tlala, K. M. (2014). The Effect of Predict-Observe-Explain Strategy on Learners' Misconceptions about Dissolved Salts. *Mediterranean Journal of Soscial Science, Vol. 5, No. 4, 300-310.*

Marti., Syamswisna & Panjaitan, R. G. P. (2014). Efektivitas Pembelajaran Kooperatif Tipe NHT (Number Head Together) dengan Media Visual Terhadap Hasil Belajar Siswa Pada Materi Organisasi Kehidupan di Kelas VII SMP REHOBOTH. Jurnal Pendidikan Matematika dan IPA. *Jurnal Pendidikan Matematika dan IPA*, Vol. 5, No. 2, 21–28.

Muhson, A. (2010). Pengembangan Media Pembelajaran Berbasis Teknologi Informasi: Staf Pengajar Jurusan Pendidikan Ekonomi – Universitas Negeri Yogyakarta. *Jurnal Pendidikan Akuntansi Indonesia, Vol. 8, No.* 2, 1–10.

Nurhidayati, D. Sesunan, F., & Wahyudi, I. (2017). Perbandingan Penggunaan LKS (POE) dengan LKS Konvensional Terhadap Hasil Belajar Siswa. *Jurnal FKIP Unila,* 45-56.

Ozedemir, H. Bag, H. & Bilen, K. (2011). Effect of Laboratory Activities Designed Based on Prediction, Observation, Explanation (POE) Strategy on Pre-Service Science Teachers' Understanding of Acid-Base Subject. *Western Anatolia Journal of Educational Science, 169-174.*

Rifzal, Ira L., Akman & Nurhayati. (2015). Pengaruh Penggunaan LKS Berbasis POE Dalam Pembelajaran IPA Terhadap Kompetensi Siswa Kelas VII SMPN 5 Padang. *Jurnal Pillar Of Physics Education, Vol. 6, 33-40.*

Sanjaya, W. (2009). *Perencanaan Desain Sistem Pembelajaran.* Jakarta: Kencana Prenada Media Group.

Septiani, A. Rosidin, U., & Suyatna, A. (2013). Pengaruh Minat dan Cara Belajar Terhadap Hasil Belajar Melalui Model Pembelajaran *Interactive Concepiuan linstruction(ICI). Jurnal FKIP Unila.*

Suhendri, H. (2012). Pengaruh Kecerdasan Matematis–Logis Dan Kemandirian Belajar Terhadap Hasil Belajar Matematika. *Jurnal Formatif, Vol. 1, No.* 1, 29-39.

Suniati, N. M. S., Sadia, W., & Suhandana, A. (2013). Pengaruh Implementasi Pembelajaran Kontekstual Berbantuan Multimedia Interaktif Tehadap Penurunan Miskonsepsi. *e-Journal Program Pascasarjana Universitas Pendidikan Ganesha, Vol. 4,* 1-13.

Syawaludin, A., Poerwanti, J. I. S., & Hadiyah. (2017). Pengembangan Lembar Kerja Siswa (LKS) IPA berbasis Predict, Observe, Explain (POE) di Sekolah Dasar. *Jurnal Didaktika Dwija Indria, Vol. 5, No.* 1, 1-8.

Tias, I. W. U. (2017). Penerapan Model Penemuan Terbimbing Untuk Meningkatkan Hasil Belajar IPA Siswa Sekolah Dasar. *Dwijacendekia. Jurnal Riset Pedagogik. Vol. 1, No. 1*, 50-60.

Tyas, R. N., Sukisno & Mosik. (2013). Penggunaan Strategi POE

(Predict-Obcerve-Explain) untuk memperbaiki miskonsepsi Fisika. *Jurnal Pendidikan Sains Universitas Muhammadiyah Semarang, Vol. 1, No. 1, 34-41.*

Yusuf, I. & Subaer. (2013). Pengembangan Perangkat Pembelajaran Fisika Berbasis Media Laboratorium Virtual Pada Materi Dualisme Gelombang Partikel Di Sma Tut Wuri Handayani Makassar. *Jurnal Pendidikan IPA Indonesia, Vol. 2, No. 2,* 189-194.

Wulandari, B., & Surjono, H. D. (2013). Pengaruh Problem-Based Learning terhadap hasil belajar Ditinjau dari Motivasi Belajar PLC di SMK. *Jurnal Pendidikan Vokasi, Vol. 3, No. 2,* 178-191.

Zulaeha., Darmadi, I. W., & Werdhiana, K. (2014). Pengaruh Model Pembelajaran Predict, Observe, And Explain terhadap Keterampilan Proses Sains Siswa Kelas X SMA N 1 Baleasang. *Jurnal Pendidikan Fisika Tadulako (JPFT), Vol. 2, No. 2,* ISSN 2338 3240, 1-8.