FPMIPA UPI-INDONESIA IPGKTB-MALAYSIA UKM-MALAYSIA PPI-INDONESIA

ICMSCE

April 30, 2016

Proceedings

international Conference on Mathematics and Science Education

Collaborative Work to Improve Science Teacher Education Quality

ISBN : 978-602-95549-3-9

Proceeding
International Conference on Mathematics and Science Education 2016

Editor :

Dr. Heli Siti Halimatul Munawaroh, M.Si.
Ika Mustika Sari, M.PFis
Duden Saepuzaman, M.Pd., M.Si.
Lilit Rusyati, M.Pd.

Layout and Design by :

Umar Komarudin, M.Pd

Published by :
Faculty of Mathematics and Science Education
Universitas Pendidikan Indonesia
Jl. Dr. Setiabudhi No. 226 Bandung, 40154, West Java, Indonesia
Official website: http://fpmipa.upi.edu

Bandung, October 17th, 2015

PREFACE

We are pleased to welcome all of the participants to **International Conference on Mathematics and Science Education 2016 (ICMScE 2016).** ICMSE 2016 is organized by Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam Universitas Pendidikan Indonesia (FPMIPA UPI), in collaboration with:

- Program Studi IPA Sekolah Pascasarjana UPI (Science Education Graduates Program)
- Institut Pendidikan Guru Kampus Tuanku Bainun
- Universitas Kebangsaan Malaysia

ICMSE 2016 is the first in FPMIPA UPI as an International Conference on Mathematics and Science Education. This seminar is motivated by improving the quality of mathematics, science and computer science education. The aims of the seminar are: (1) To bring together the education experts and practitioners, students, and civil society organization representatives in the scientific forum; (2) To share and to discuss theoretical and practical knowledge about innovation in Mathematics and Science Education .

ICMSE will be held every year to provide forum for researchers in Mathematics and Science Education to share new ideas or research result in their field. The theme for this seminar is "Collaborative work to improve science teacher education quality ". This seminar is sponsored by FPMIPA UPI. The scope of research results to be presented and discussed in this seminar covers Mathematics and Science Education.

The ICMSE 2016 Program features 4 invited speakers and 116 contributed oral presentations, which come from different countries: Singapore, Malaysia, Thailand and Indonesia. All papers reviewed before and after they are presented in this event. Selected papers will be published in the Atlantis Press (AP Publisher) . To all participants, we hope that you will learn new subjects, make new contacts, and have fruitful discussions with others. To overseas participants, we wish you a pleasant stay in Bandung.

Finally, we wish to express our sincere appreciation to all of the presenters for their valuable contributions and also to the members of the program committee for their excellent works in selecting abstracts and organizing the program.

September , 2016

ICMSE 2016 Committee

TABLE OF CONTENT

PREFACE
TABLE OF CONTENT
List of Article

PHY-93

Student Worksheet Based On Prediction, Observation, Explanation in Physics Subject for 10th Grade

Nurul Ulil Amri, Chandra Ertikanto

Physics Education Lampung University, Lampung, Indonesia

Article info

Keywords:

Student Worksheet,
POE,
Scientific Approach

Corresponding Author:

Anandaulilamri@gmail.com
Chandra_unila@ymail.com

Abstract

This is a preliminary research of teachers and students' needs in SMAN 1 Abung Semuli. Preliminary research consisted of literature and field research.The purpose of this researchare; (1) identifyteachers' needs in physics facilitations to help students understanding the concepts of physics; (2) identifystudents' needs in using the media of physics subjectin order to use the prediction, observation, explanation (POE) model; (3) identify whether a student worksheet that contains the syntax POE on the fluid material needs to be created or developed.This research uses descriptive method. Sampling technique used is purposive sampling. The object of this research is the students of 10th grade which consists of 40 students and 5 physics teachers. Data was collected using questionnaires, qualitative data analysis, the appropriate interpretation of the results of analysis of problems and research questions and the conclusions. The result of the preliminary study are (1) There are several physics teacherswho have known some acknowledgment about the prediction, observation, explanation model. (2) Teachers and students need instructional materials in the form of student worksheet (LKS) based on POE with a scientific approach that can help students in understanding the concepts of physics. The conclusion of this research is to develop student worksheet (LKS) based on POE with a scientific approach.

INTRODUCTION

Implementation of research and development of teaching materials in the form of student worksheet (LKS) with the prediction, observation, explanation model based on scientific approach, requires a preliminary research that includes a literature and field researchwhich are used to determine an object in the field by collecting some information, such as the analysis of teachers and students' needsin term of media or instructional materials used in teaching and learning activities as well as the appropriate methods and approaches used in learning activities in class so that the goal can be achieved.Education participatesin creating a new smarter generation.

The education process can happen anywhere, and the most influential is the education at school level. Education in schools is created through the learning process between teachers and students. The learning process in class greatly influence the level of achievement of the objectives learning which has been designed by the teacher (Suwati, 2008: 166). Student Activity Sheet according Ozmen & Yildirim (2005) is an important component that must be done by all the students in the learning process so that the learning objectives can be achieved. The results showed that the use of student worksheet (LKS) effectively to improve student learning outcomes. Celicler (2010) concluded that student worksheet (LKS) can increase participation and learning achievement.The results of the study (Yildirim et al.2011) shows that using worksheets is more effective because it causes students actively participate in learning activities.

The learning model Predict-Observe-Explain (POE) according to Suparno (2007) is a learning model that uses three steps of the scientific method: (1) prediction isa process of creating anexperiment presumption, (2) observation is observing an experiment. In other words, the students were invited to do an experiment, to test the students' prediction, and (3) Explanation isexplaining the correspondence between the observation phase to the alleged experimental

results.If the predicted results correspond with the results of observations, the students prediction of the concept is assured. If it isinappropriate, students should find another explanation of the prediction results. Students will experience a switching concepts from incorrect to be a correct one.

Therefore, students can learn from mistakes, and learning from mistakes usually will not be easily forgotten. Indrawati and Setiawan (2009) said that the model of learning by using the syntax POE is a learning model that emphasizes the concepts of evidence directly obtained so that the concept will not be easily lost. POE models can be effective in teaching strategies to facilitate students' understanding of a concept (Kearney 2004). In addition POE can also be used to explore students' conceptions of knowledge and motivate students to conduct investigations (costumers 2010). POE learning model effective in-use to improve students' understanding of science (Liew 2004). Additionally POE is a great learning model to engage students in developing high-level thinking skills in interacting directly with the environment (Chew 2005).

Based on the above research, it can be concluded that the POE learning model can be used to improve student ability,either in mastering the concepts or enhancing the students' learning activities. The subject of research in some high schools at Abung Semuli, North Lampung are 40 students and 5 physics teachers. Fannie (2014) in his research stating that in order to evaluate the ability of the students who had been listening to the material and examples presented in the worksheets, students can solve the problems by evaluating any learning activities that have been assisted by POE (Predict, Observe, Explain) steps.

Then at the end LKS has also prepared problemswith all the material covered. Based on the above exposure, in accordance with the purpose of physics contained in the Standards and basic competencies unit level of high school education in 2006, which are; (1) forming a positive attitude towards physics to realize an orderliness and beauty of nature and to praise the Greatness of God Almighty; (2) nourish an honest scientific, objective, open, resilient, critical and can cooperate with others; (3) develop the experience to be able to define problems, propose and test hypotheses through experiments, designing and assembling the instrument trial, collect, process, and interpret data, and communicate the results of the experiment orally and in writing: (4) develop the ability to reason in thinking analysis inductive and deductive using the concepts and principles of physics to explain natural events and resolve problems both qualitatively and quantitatively; (5) master the concepts and principles of physics and have the skills to develop the knowledge and attitude of confidence in preparation for continuing education at higher level and develop science and technology. So the goal of this research are; (1) identify teachers' needs in physics facilities to help students understand the concepts of physics; (2) identifystudents' needs in using the media of physics subjectin order to use the prediction, observation, explanation (POE) model; (3) identify whether a student worksheet that contains the syntax POE on the fluid material needs to be created or developed.

RESEARCH METHODOLOGY

Sampling technique used is purposive sampling. Purposive sampling is a determining technique with a certain considerations. Implementation of a field research was conducted in February 18th, 2016. Data was collected by analyzing some questionnaires about teachers' needs and needs of students. The processing and analysis data is done through four stages. The first stage is coding the data as the results from the questionnaire; Second Stage is dividing data into some faction, feature, type and frequency so it would be easy to be read, categorized, and analysed; Stage Three is analysing qualitative data, which is analyzed by breaking and link data and information related to the research subject. The fourth stage is makingan appropriate interpretation of the problem analysis and statement of research and concluding them.

Researchers developes the POE-based student worksheets using 4-D models proposed by Thiagarajan, et al (...). Stages 4-D consists of four stages, namely Define (Phase Defining), Design (The Plan), Develop (Development Phase) and Desseminate (Phase Deployment). This research carries out up to three phases, namely the Development (Development Phase), Desseminate (Phase Deployment) is not done. The object of this research is LKS based on Predict, Observe, explaint (POE).

Defining phase

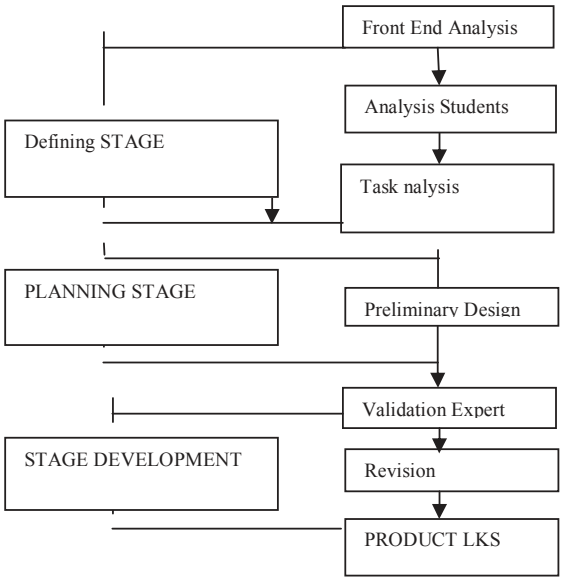

Figure 1. Development Flow Of Student Worksheet

Defining stage is the stage of determining and defining the terms of the preparation of POE-based worksheets based on Figure 1. There are three main steps of this stage:

a. Analysis of the front end : Developing the student worksheet is aim to determine the fundamental problems.
b. Analysis of student : This analysis has been done by paying attention into the characteristics, abilities, background knowledge and level of cognitive development of students as an idea to develop creative thinking skills.
c. Analysis of Task : This analysis has been done by detailing the content taught in outline form.

Stage Design

Planning learning devices has been done at this stage. Things to do at this stage are 1. Preparation of the test which links the definition phase into the design, 2. Election of the media), 3. Format selection, this stage conduct an assessment of the formats have been developed.

Stage of Development

This phase was conducted to determine the validity of LKS with certain criteria.

RESULTS AND DISCUSSION

Based on field reports with the results of observations during the field research, they are:

The analysis of the teachers' needs

Recapitulation of the teachers' needs questionnaire showed that teachers need more training in making worksheets with the syntax of POE model in order to get the learning process in class actively, will not be lazy and bored when understanding and solving the problemsin the worksheets, the statement in no.16-17 and 18 are about the syntax of LKS making based on POE. In factthat the teacher has been known well yet about LKS based on POE so the teacher is difficult in developing this POE-based LKS which in this worksheet, students are asked to give opinion about the experiments conducted in the classroom and then it will be observed by teachers.In the use of LKS students should be involved during the learning process so that students' knowledges can be constructedthrough LKS's practices(Toman, et al, 2013). According to Limbach & Waaugh (2003): an active learning experience is meaningful and stimulating students's cognitive development. The learning model Predict Observe-Explain (POE) was first introduced by White and Gunston in 1992 in the book Probing Understanding (Mabout, 2006). Khantavy (2009)a

learning model that asked students to predict whatwill take place against a phenomenon to be studied, then the teacherdemonstrations and students observe what the teacher whilematch with allegations that students have made the last student is askedto explain why it could happen. This model provides an opportunity tostudent to put knowledgetheir initial regarding the material given,the cooperation between students during discussionstakes place, the exchange of opinions between studentsone with the other students, the changeconceptual knowledge held bystudents (Kolari & Ranne, 2004). Gupta & Chandiwala (2009) addlearning POE models is less suitable to be applied to the materials that are difficult if it is intended to get the results in short time (on hand). Samosir research (2010) POE using demonstration can make students active and creative to melaeksplorasi and search for information to complete the task group).

The analysisof students' needs

Recapitulation of the questionnaire disclosure students' needs can be seen to the students of SMAN 1 Abung Semuli who are really need this kind og learning. it is indicated by the identification of problems that exist on the results in the field where almost of all the students newhen learning physics, so that students can predict or give presumption of experimental results.after giving their presumption, then the students need to do an observation according the previous result to get the exact conclusion.This is a model of learning the syntax of the POE. Identification of the problem is also the majority of students want LKS used in physics learning to be more interesting, using clear language that is easy to understand.So the researchers concluded that it is necessary to develop POE-based learning physics student worksheet with a scientific approach that would be useful for teachers and students in learning activities so that learning is more effective and efficient to achieve the goal of learning physics.According to Wu (2005) he adds that POE learning can increase students' activity for finding the initial idea, generalizing discussion,generalizing the investigation, motivating to investigate the concepts and teaching science process skills that is a small part of the various factors to construct liveliness.

Development Procedures

This stage, the activities to be done is to analysis the needs through field surveys. In this case, the researchers conducted a field survey of the problems in learning and teaching materials that are at the high school.The stages of Research and Development by Borg and Gall (1983: 775) developes the 10 stages in developing the model, they are; (1) Researching and collecting information, including a research of the literature relating to the cases studied, the needs assessment, research on a small scale, and preparation to formulate research framework; (2) planning, includes formulating research skills and expertising related to the problem, determining the objectives to be achieved at each stage; (3) developing preliminary firm of product is developing forms of the beginning of the product to be produced; (4) preliminary field testing, which conduct field trials beginning on a limited scale in involving 1-3 schools, with a number of subjects 6-12.In this step the data collection and analysis can be done by interviewing, observating, or giving questionnaires; (5) the main product revision, is to make improvements to the initial product generated by the initial test results; (6) main field testing, the main trial involving a wider audience, which are 5-15 schools, with a number of subjects 30-100 people. LKS is designedto measure the students' competence. The steps of designing LKS based on POE (Product, Observe, explaint) on a fluid material is as follows; (1) determine the title LKS; (2) collect references; (3) design LKS; (4) score a physics student worksheets based on POE (Predict, Observe, Explain). The next step is design validation. It has to be done by asking several experts who have experiencesinscoring the designs so that it can be discovered their strengths and weaknesses.Showingthe design, the experts were asked to evaluate, so that the suggestions and input of the validators can be used as the basis of the product design improvements. Validator is given in the form questionnaire rating scale as a form of validation of an instrument to assess the product. LKS research is validated by a team of education experts, a team of experts selected in accordance with the consideration of the skills, expertise and experience in the learning of physics and in designing LKS. This validation includes the validation of the contents of the material and design of LKS learning physics-based POE (Predic, Observe, Explain) validation. After the productis we validated by the experts then, can know the weakness of the product.Then the

researchers revised the designs based on the input of experts. Fannie (2014) in his research stating that in order to evaluate the ability of the students who had been listening to the material and examples presented in the worksheets, the students can solve the problems of any learning activities that have been assisted by the steps of POE (Predict, Observe, Explain).

CONCLUSION

Based on the research objectives above, it can be concluded that: (1) teachers in various schools, especially at the high school level, requires a teaching materials in the form of worksheets to facilitate the learning process in class, (2) students at various high schools need the learning media in the form of worksheets in order to facilitate them to understand and master concepts of physics taught, (3) it needs to develop LKS based on POE in learning physics so that students can be more active in following activities in the classroom.

REFERENCES

Borg. W.R. dan Gall, M.D. (1983). Educational Research: An Introduction. New York: Longman.

Çelikler D.(2010). The Effect of Worksheets Developed for the Subject of Chemical Compounds on Student Achievement and Permanent Learning: Educational Research Association. The International Journal of Research in Teacher Education 2010, 1(1):42-51

Chew.(2005). Effects of Biology-Infused Demonstration on Achievement and Attitudes in Junior College Physics: Nanyang Technological University.Graduate School of Education

Costu B.(2011). Investigating the Effectiveness of a POE-based Teaching Activity on Students' Understnding of Condensastion. Dokus Eylul University. Journal of Educational 40:47-67

Fannie Rizky Desricha.(2014). Pemngembangan Lembar kerja siswa (LKS)Berbasis POE (Predict, Observe, Explain) pada materi program Linier kelas XII SMA(diakses 20 febuari 2016)

Gupta R & S. Chandiwala.(2009). A Student-Centred POE Approach to Provide Evidence-Based Feedback on the Sustainability Performance of Buildings. Conference on Passive and Low Energy Architecture. Quebec City: Canada

Indrawati & W. Setiawan.(2009). Pembelajaran Aktif, Kreatif, Efektif, dan Menyenangkan untuk Guru SD.Bandung:PPP PTK IPA

Khantavy H. (2009). The Grade Student's Mental Model of Force and Montion Trough POE Stretegy.Thailand: Khon Kaen Unerversity

Kearney M.(2004). Classroom Use of Multimedia-Supported Predict–Observe Explain Tasks in a Social Constructivist Learning Environment. Journal Research in Science Education 34 (3): 427–45

Kolari, S & Ranne, C.S.(2003). Promoting the Conceptual Understanding of Engineering Student Through Visualisation. Global Journal of Engineering Educational, Vol 7, No.2 (hlm189-200). Tersedia pada http://www.wiete.com.au/journals/ WTE&TE/Pages/Vol.4%20No.1%20(2005)/03-Kolari2.pdf.(diakses pada tanggal 23 febuary 2016)

Liew C.W.(2004).The effectivenees of Predict-Observe-Explain Technique in Diagnosing Students' Understanding of science and Identifying Their Level of Achievement: Curtin University of Technology. Science of Mathematics Education Centre.

Limbach B. & W. Waugh.(2003). Developing higher level thinking. Journal of Instructional Pedagogies

Mabout. 2006. The Use of A PredictObserve-Explain Sequence in TheLaboratory to Improve StudentsConceptual Understanding OfMotion in Tertiary Physics in Thailand. http://www.Google.co.id.abstrak.dig ilib. upi.edu/.../TIPA0808020 Abstract.pdf. 01 february 2016

Ozmen H. & N. Yildirim (2005).Effect of Work Sheets on Student's Succes: Acids and Bases Sample: Turk Fen Egitimi Dergisi. Journal of Turkish Science Education. Volume 2, Issue 2, November 2005

Suwati.(2008). Sekolah Bukan untuk Mencari Pekerjaan. Jakarta: Pustaka Grafia.

Suparno.(2007). Metode Pembelajaran IPA POE. On line at http://www.metode pembelajaran. WordPress.com. [diakses 8 Februari 2016]

Samosir, Heppy.(2010). Model Pembelajaran Predict-ObserveExplain-Write (POEW) untuk Meningkatkan Penguasaan Konsep Kalor dan Keterampilan. Tesis Pendidikan IPA. Bandung: UPI.

Toman U, Akdeniz A. R, Gurbuz F., & Odabasi Cimer S.(2012). Extanded Worksheet DevelopedAccording to 5E Model Based on Contructivist Learning Approach, InternationalJournal on New Trends in Education and Their Implications, 4(16) 1309-6249

Wu T.Y.(2005).Effects of constructivist- oriented instruction on elementary school students' cognitivestructures. Journal of Biological Education (2005) 39(3)

Yildirim N, Sevil K, Alipasa A.(2011). The Effect Of The Worksheet on Student's Achievement in Chemical Equilibrium. Journal of Turkish Science Education Vol. 8(3): 44-58 pp. Suwati.(2008). Sekolah Bukan untuk Mencari Pekerjaan. Jakarta: Pustaka Grafia.