

DEVELOPING STUDENT WORKSHEET MATERIAL ON SIMPLE HARMONIC MOTION BASED ON LEARNING CYCLE 5E

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Abstract

Learning physics is done in the classroom is teacher-centered and have not led to student-centered learning. Teacher lecturing in front of the class, while students are silent, notes and just being a passive listener. Textbooks used in delivering course material. The complete lack of infrastructure which adds to the learning of less activity. The purpose of this study were (1) to determine the needs of students and teachers in the teaching of physics in order to become active learning and (2) obtain a prototype design student worksheets 5E learning cycle based on the material simple harmonic motion. The method used is a research and development (R & D). The preliminary stage is done by spreading questionnaire and literature study. Object of research is the prototype of student worksheets based 5E learning cycle. The subjects of this study were teachers and students. These samples included 29 students and two teachers of physics. Results of the study are (1) Teaching and learning activities rarely involve the students to carry out practical activities. Teachers and students have the same needs that require teaching materials that can develop into learning activities (2) material physics easily categorized considered difficult for students, so that they appear on students' misconceptions. Therefore prepared a hypothetical design prototypes LKS 5E learning cycle based on simple harmonic motion materials to help students move on to study physics.

Keywords: *simple harmonic motion, student worksheets, 5E learning cycle*

INTRODUCTION

Learning is communication activities developed by the components involved as teachers, students and infrastructure. Good learning requires careful planning. Good learning process will occur if the interaction between teachers and students in the form of two-way.

Physics is a branch of science that studies the material and phenomena in the universe. Studied physics means learning to study nature, thus the ability to troubleshoot the main goal of learning physics (Korskunsky, 2004). Skills needed is the ability to change the events that occur in the universe in the form of mathematical equations (Bilgin, 2011). But in reality, students have limitations to do it.

Lecture method is still the method most widely used by teachers in teaching physics in the classroom. Activities that occur more done by teachers. Students only pay attention to the teacher and the teacher notes written on the blackboard. Students are not many activities. In fact, in order to learn to become active, the students have to do a lot of tasks (Siberman, 1996/2013). This coupled with the lack of supporting facilities such as laboratories for physics practice. Not every school has a laboratory space, especially in schools periphery. This limitation can make physics becomes more abstract and difficult

for students to understand (Ornek & Zziwa, 2011). To overcome these shortcomings, the teachers usually use the Student Worksheet (LKS). LKS forms are used generally only contain exercises that should be done students. LKS that there has not lead students to active learning in groups and carry out practical activities.

Effect of impact on the physics of matter that is still easy as a simple harmonic motion of matter, felt it difficult for students. What happens then is a misconception in students. Research conducted Rusilowati (2007) found a misconception on the vibration / wave, while research Mulya (2011) found that the vibration of misconceptions on the material on the definition of vibration, deflection and amplitude differences and the factors that affect the frequency of the spring. Haratua (2013) use the booklet to remediate students' skills in vibration material. Arifiandi (2013) remediate the material vibrations with media flip chart.

This study is a preliminary study of research on the development of teaching materials that would writers do. Research questions that we formulated are (1) *what is the needs of teachers and students in SMK 1 white as the Great in learning physics?* (2) *What is kind of prototype-based student worksheets 5E learning cycle?*

THEORETICAL FRAMEWORK

5E learning cycle is one learning approaches inquiry approach therein. The learning cycle of the development of previous learning cycle. There are 5 steps to be implemented by the teacher in the classroom so that students in learning activities that Engage, Explore, Explain, Elaboration, Evaluation. Each phase has a specific function and contribute to coherent instruction teachers, and students to formulate a better understanding of the knowledge, cognitif, afective, and skills in science and technology (Bybee, Taylor, Gardner, Scotter, Powell, Westbrook & Landes. 2006).

Each steps are as follows: (1) Engage: In this stage the teacher usually gives questions or show something funny and interesting that relate to issues to be discussed to provoke interest and attention of students in learning. The goal is not finding the right answers but makes them ask questions and different ideas. (Feizioglu & Ergin, 2012). (2) Explore: At this stage students discuss in groups to generate some ideas to solve problems. Functions of teachers in this stage as a guide (Feizioglu & Ergin, 2012). (3) Explain: Results of the working group be used as class discussions. Students will exchange ideas to discuss the findings of each group. Teachers make connections between what students are learning and what they already know. Furthermore, the teacher provides questions to help students to prepare lesson concepts. At this stage is the stage of the most centered on the teacher and in a situation that required the teacher to give some explanations at the level of basic knowledge. (Bybee, et. All. 2006) (4) Elaborate : At this stage, students are given a new problem in the form of new, more complex problems. In this way, they learn new concepts that do not exist in their minds. Students are encouraged to use the knowledge, skills, new terms and concepts acquired into a new situation to apply the things they have learned. (Bybee, et. All. 2006). (5) Evaluate : At this stage, the teacher can conduct an evaluation study. Evaluation can also be done at each stage, in order to know the development of the learning process experienced by students. (Feizioglu & Ergin, 2012).

Bilgin research results (2013) states that the 5E learning cycle to provide high yields to obtain a change in the concept of learning science concepts as well as the students' understanding of the words of the concept in science. Fajaroh and Dasna (2003) states that the 5E learning cycle provides opportunities for students to actively understand the concept in groups. This model also can strengthen students' understanding of concepts through learning activities that are repeated and expanded in the fifth cycle of learning. Model Learning Cycle applied also give students the opportunity to be active in learning, so as to enhance the activity through experiments or lab involving students directly (Kulsum, 2011). 5E learning cycle model is a model of learning that provide active learning experiences and promote student inquiry and exploration as a process of learning science. Students construct new understanding and develop new skills. (Ornek & Zziwa, 2011).

The effectiveness of the learning cycle 5E in learning to use worksheets have been carried out, such research has been done Acisli, Yalcin and Turgut(2011) on displacement and force, states that students can discover and learn the main concepts of self-learning by questioning, searching, using the knowledge of primary, associating with everyday life, set of observations, experiments and observations independently. Kusuma(2014) present the results that the use of the 5E learning cycle can make students apply higher-level thinking skills (HOTS). Kulsum(2011) also gives the results of such research activity of students in learning increased. This means that the use of the 5E learning cycle as a learning model can improve the process of learning activities. Once students realize their own reasons and applying new knowledge to work, they are more effective in finding new patterns (Hirca, Calik & Seven,2011). 5E cycle use in the lab with materials readily available and low cost also give good results as done by Ornek & Zziwa(2011), which calculates the gravitational acceleration using materials around the school. The ability of students' understanding of concepts also became better (Nurina,2014). Moreover, Kusuma(2014) developed a curriculum based LKS 2013 for vocational students.

This preliminary study focused on the material simple harmonic motion. The term used in the Education unit level curriculum (KTSP) 2006 is called vibration (Permendiknas No. 23/2006), while in books college physics more often called simple harmonic motion.

METHOD

The method used is the research and development. Development refers to the measures proposed by Borg and Gall (Gall, Gall,&Borg,1983). Of the ten steps of development, this study is restricted to be done until the preliminary stages and planning. The preliminary stage is done by distributing questionnaires, conduct interviews, literature studies and field observations to obtain the required data. The questionnaire was circulated to know the needs of teachers and students in learning. Interviews were conducted to find out. Activity literature study to find literature in the form of the results of previous studies that support this research. The planning stage is done by drafting a prototype of worksheet students. This is done by examining the documents required in the curriculum used in the school. The study was conducted in SMK N 1 Seputih Agung. Central Lampung. These samples included 29 students and 2 teachers of physics.

RESULTS AND DISCUSSION

Results of the questionnaire that was distributed is as follows, the question number one to determine communication of the fact of the matter is simple harmonic motion in daily

life, 19 students (67%) stated in the communication of the class teacher ever. This means that not all students see the usefulness of the material fact or in everyday life. Question number two of the teachers do frequently asked questions about the material being taught, 59% of students (17 people) claimed never questioning by teachers, while 12 students said never. Question number three to determine the use of worksheets in teaching, 16 students (55%) reported never using worksheets in a physics lesson. It shows teachers are already using teaching materials other than textbooks in learning physics. Question number four, the experience of doing physics lab, 13 students (45%) reported never doing practical work. Results of direct observations show that this school has not had a physics lab.

Question number five, 69% of students (20 people) claimed never perform the task group work in physics. This indicates that the student has the desire to share knowledge in the study of physics. Question number six, when asked chores experience in front of the class, only 10 students (34%) who had experienced, while the other 19 states have not. This shows that students still do not dare to disclose the results of their work to other students. Question number seven, when asked necessity of doing a practicum in teaching physics, 100% of students stated need. This means demanding the teacher to create a device that includes a practicum in teaching. Question number eight, 29 students or 100% agree if in learning physics using worksheets. This means that the students want them to have activity in the learning of physics in addition to record and listen to what the teacher.

While the questionnaire given to the teacher gives the following results, question number one, when asked about the delivery of the facts in the life of the material taught, 100% of teachers stated already delivered. Submission of this fact is important as the first part in getting the students' interest and attention to the matter. Question number two, 100% of teachers answered already doing debriefing with students related to the material being taught. This activity is one way to do a teacher to reveal the ability of students when learning takes place.

Question number three, on the need for students to do when studying physics lab, 100% of teachers answered yes. Physics lesson is a lesson that many are abstract so that the necessary translation that can be answered by doing a practicum. The fourth question, 100% of teachers said that they had to use worksheets to teach physics. While the fifth question about the experience of making LKS, 1 teacher and one person said that they had not yet been declared. Questions number six, on the use of worksheets in teaching physics would cause a change in the student activity, 100% of teachers answered yes. The seventh question about the need to include practicum in LKS, 100% of teachers answered yes. The eighth question, 100% of teachers to provide support for the development of LKS based 5E learning cycle.

The average yield answers to the questionnaire of students obtained 65.9% and an average yield response questionnaire was 93.75% teachers. From the results of a questionnaire distributed seen that teachers still use traditional methods, which still use the lecture method for the delivery of content. Though the lecture method that teachers lead students to acquire knowledge only orally so that the knowledge gained knowledge of students is abstract, whereas physics is closely related to the concept and the environment (Damayanti, 2013). The existence of physics textbooks are not found in the library. Submission of the fact that the teacher is also considered less striking students

so that students' interest and curiosity about the subject matter being taught. Activities debriefing made less going well. Students feel less challenged by the situation, as a result less students are given the opportunity to develop the skills of thinking (Puspitasari, 2014). Students should ask a lot of activities, discussions, convey an idea or ideas. This shows a good student activity in learning. Active learning means that students are looking for something that all potential students will engage optimally in learning (Arsiti, 2008).

Use the lecture method that teachers do not get out of the presence of existing infrastructure in schools. From the results of the questionnaire showed that many students claimed teachers rarely do practicum. Results of field observations showed that the school does not yet have space physics lab. Practical implementation must often be done in order to explain the concept of physics. Ornek and Zziwa (2011) provides an example of doing a practicum calculate the value of the acceleration of gravity by using easily available materials and simple. This suggests that if schools have no means a complete physics laboratory practice equipment, can be anticipated to perform simple lab using simple equipment. Results of field observations can be seen in Table 1.

Table 1. Availability of facilities to support the learning process

Item observations	Description observations
Use of Textbooks	Wearing a textbook as a handle in teaching
Use of student worksheet	Nothing
Instructional Media	Book
Physics Laboratory	Nothing
internet Network	exist
Library	exist, but there has been no physics books

From these results, the authors see no similarity needs of teachers and students in learning physics at SMK 1 Seputih Agung, which requires an improvement in the learning process. Improvements especially in increasing student activity when studying physics and overcome the shortage or lack of teaching materials in schools. Shortage of teaching materials can be overcome by making LKS. Meanwhile, to increase student activity, applied 5E learning cycle.

LKS is a way to facilitate teachers in implementing the learning process and facilitate students to learn independently and learn to understand and execute a written assignment. Written assignments that students can be given theoretical and practical tasks. Duties can include reading assignments theory of learning resources, create resumes and practical tasks can be either laboratory work or field work (BSNP, 2006).

Use of LKS provide more effective results if the comparison group given individually (Kurnaz & Calik, 2008), whereas if doing practicum, lab materials can be used from the environment and low-cost (Ornek & Zziwa, 2011) and increased student motivation if the lab materials use appeals to students (Turk & Calik, 2008). For middle school students, the content is more abstract LKS accordance with the level of mental development they are already capable of formal thinking (Suyanto, 2011).

The knowledge of students is determined on the amount of information in its possession and developed according to the situation and the experiences of the students. This is the basis of constructivist approach. Application of this approach to learning is done in various ways such as learning cycles, one of which is the 5E learning cycle.

An analysis of curriculum documents held by teachers at SMK N 1 Seputih Agung gives the following results; (1) The syllabus used still using the syllabus prepared by BNSP results (Depdiknas,2006a) ; (2) Learning Implementation Plan (RPP), which made the teacher not include elements of elaboration, exploration and confirmation, but the implementation is still using the lecture method; (3) the allocation of time for Competency standards of simple harmonic motion only 4 hours of lessons. (Depdiknas,2006b)

From the results of the study authors then beginning to develop LKS draft. Prototype learning device in the form of worksheets based on the material cycle 5E simple harmonic motion refers to the guidelines that had been developed BNSP on student worksheet (BNSP, 2006). Preparation sequence includes a brief description of the material, the purpose of the activities, tools / materials needed in activities, working steps, questions for discussion, the conclusion of the discussion, and practice questions of understanding. Diagram form of prototypes based LKS 5E learning cycle can be seen in table 2.

Tabel 2. LKS based 5E learning cycle prototype parts

Front Side	Content	Back Side
- Front cover	- Competency Standards	- Evaluation
- Preface	- Basic Competencies	- List of References
- Table of contents	- Learning Indicators	- Back Cover
	- Learning Objectives	
	- Learning Activities	
	➤ Engage	
	➤ Explore	
	➤ Explain	
	➤ Elaboration	
	➤ Evaluation	

CONCLUSION

The conclusion of this study are (1) students rarely learn activities due to the method applied in the classroom teacher and the limited means of support. The questionnaire results showed that teachers and students have the same needs that require teaching materials that can develop into learning activities (2) simple harmonic motion of matter is an easy matter physics. The difficulties experienced by students is expected to be reduced with the use of teaching materials. This preliminary study is limited to the planning stages of the preparation of hypothetical design prototypes LKS 5E learning cycle based on simple motion of matter. However, further research will be done to produce LKS writer valid and can be used for learning physics.

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