

Efforts to Improve Learning Outcomes by Using Simple Teaching Media Through Lesson Study Activities on General Physics Courses

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Abstract

General Physics is one of the compulsory subjects not only for the Physics Education program but also for others including the Biology Education program. General Physics encompasses a wide range of materials that require a practicum. Unfortunately, not all laboratories could facilitate and had supporting tools for such practicum activities. It was believed that simple props can be used in learning activities especially to explain the concept of subject matter found in everyday life. This study aimed to determine the quality of General Physics learning by using simple media of learning in the Biology Education program, University of Papua. The research was conducted through the stages of Lesson Study activities namely Preparation Phase (Plan), Implementation (Do), and Reflection (See) in each cycle. The data was obtained through observation and video recordings during the learning activities. The results show that the quality of learning including the activities, cooperation, and mastery of the subject matter by the students are increasing in each cycle.

Keywords: Simple Media of Learning; Lesson Study; Quality of Learning

1. Introduction

General physics is one of the subjects that must be programmed for students of biology education study programs. General physics includes a variety of materials that require experiments, but not all laboratories can facilitate the availability of supporting equipment for practical activities. The problem was also experienced in the Department of Physics at the University of Papua, namely the lack of supporting facilities for practical activities so that the use of media in learning was very much needed, one of which was a simple medium of teaching aids. Media simple teaching aids can be used in learning, especially to explain the material concepts that are often found in everyday life.

Simple props are simple experimental devices that utilize local materials as the main equipment in making them. Simple props do not have to be bought at high prices or waiting for help from educational institutions, because various unused items around us can be used to make simple props (Suliyati, Mugasam, & Yusuf, 2016). Simple props can be made from simple items around the school, even used items (Widyaningsih & Yusuf, 2015). Props can clarify the teaching material given by the teacher to students so that students more easily understand the material or questions presented by the teacher (Prasetyorini, 2013). Using teaching aids, educators are expected to try to give and create an impression on students that physics is a fun science so that their understanding of abstract physics concepts becomes more real, (Widyaningsih, 2011). The design of simple teaching aids media in this study was carried out jointly through project assignments to students and applied to the learning of General Physics at the University of Papua. The learning process is carried out through lesson study activities.

Lesson study activity is a cycle of investigations conducted by the teaching team related to lessons learned in class to make improvements based on the results of observations during learning (Lewis, Rebecca, Friedkin, & Jillian., 2012). In lesson study activities the teaching team works together to formulate learning objectives and collaborate in planning lessons. In the implementation of learning, one person as a model and the other observes the activities of students in the classroom (Perry & Lewis, 2008).

According to (Susilo, 2013) Lesson Study is one model of educator professional development by studying collaborative and sustainable learning processes and is based on the principles of schooling and mutual learning to build a learning community. Sururuddin

(2013) said Lesson Study appeared to overcome the problem of learning practices which had been considered ineffective. Educator professionalism can also be developed through Lesson Study activities because in these activities sharing knowledge, experience, and mutual input are related to the lessons learned (Copriady, 2013). In this study, the application of General Physics learning was carried out by using simple teaching aids media through Lesson Study activities in the Department of Biology Education at the University of Papua.

The purpose of this research is to know the application of simple teaching aids media to improve student learning outcomes through learning General Physics at the University of Papua through Lesson Study activities.

2. Research Methodology

This study used the Lesson Study stage involving a team of lecturers consisting of 5 lecturers as observers with educational backgrounds in UNIPA FKIP. The stages of the lesson study included planning, implementing, and reflecting learning. Lesson Study activities involved the collaboration of the teaching team in preparing learning plans and various strategies that can be applied in improving aspects observed during learning (Fernandez, 2002). The initial stages of the lesson study included the planning stage. In the planning stage, discussions were held on developing Semester Learning Plans (RPS), Chapter Design, Lesson Plans, and media props that were used in each cycle. At the implementation stage (do) learning was carried out by the lecturer model and the learning process was observed by other lecturers as observers. Furthermore, in the reflection (see) stage, a review was made of the results of the implementation of the activities to obtain input and suggestions from the observer and the improvement plan to be carried out in the next cycle.

The success of learning in each cycle was assessed based on student learning outcomes. Student learning outcomes assessment instruments in the form of essay questions consisting of 10 number questions. Learning outcomes assessment was carried out in each learning cycle and analyzed using the N-gain test to see improvement in learning outcomes in each cycle.

3. Findings and Discussions

The implementation of Lesson Study begins with the implementation of a Workshop that presents experts namely Dr. Ibrohim, M.Sc. from Malang State University. During the Workshop, a Semester Learning Plan (RPS), Chapter Design, and Lesson Plan was carried out. In addition to these preparations, a simple preparation of media teaching aids designed by students on project assignments that have been produced includes simple calorimeter experiments, Pascal's Law, and experiments on determining the homogeneous object's center of gravity. Figure 1 shows the display of simple props used in learning.



Figure 1. Examples of medium simple props

Student learning outcomes were analyzed before and after the application of learning using simple teaching aids media through Lesson Study activities. In this study, there were 3 cycles. Student learning outcomes in each cycle can be seen in Table 1

Table 1. Student learning outcomes in each cycle

Assessment	Result Pretest	Cycle 1	Cycle 2	Cycle 3	(Pretest with Cycle 1)	N-gain (Cycle 1 with Cycle 2)	(Cycle 2 with Cycle 3)
Average	41,6	69,9	73,3	84,5			
Standard Deviation (SD)	26,9	4,07	2,76	19,22	0,36 (Moderate)	0,39 (Moderate)	0,43 (Moderate)

In the first cycle, the planning stage was carried out in preparation for learning including simple experimental media preparation, namely a simple calorimeter experiment. This experimental device is made from used milk cans that are given gergagi powder on each outside and placed in plastic and inserted a thermometer. In this experiment, students are expected to be able to determine the heat of various types of metals.

At the implementation stage, learning is done by dividing several students into study groups. A simple calorimeter is given to each group consisting of 6-7 people. Model lecturers convey a general explanation of the objectives of the lecture to be achieved. Students conduct experiments by selecting several types of metals and determining their density. Students work together to weigh the mass of objects, measure temperature, and calculate the heat of the type of metal selected. Most students look active in conducting experiments using simple teaching aids. Some students take data, record the results of measurements, and analyze the measurement data. The collaboration is seen during the learning process.

In the reflection phase, discussions were held with observers. At this stage, it is obtained that learning takes place well. However, there are still less active students namely students number 13.4 and 12.4. The student seems to only pay attention to the work of his group members and does not have the initiative to cooperate. The mean of learning outcomes in cycle 1 ($69.9 \pm SD 4.07$) which indicates that there is an increase from the previous one with an N-gain value (0.36) or medium category. Even though there is an increase, but the learning outcomes have not reached classical completeness. Therefore, it is recommended that in the next cycle the division of members in groups be minimized so that all students can be actively involved. Student involvement in learning is very important so they can build their knowledge (Mumu, Prahmana, & Tanujaya, 2017).

In the second cycle of the planning stage, preparations for learning are carried out, namely the preparation of a draft division of groups of 3-4 people in the group. The next preparation is a simple media prop for Pascal pressure material. This experimental device consists of two spoites that are different sizes and are connected by a small hose filled with water. In this experiment, students are expected to be able to determine the force experienced by the influence of different spoite cross-sectional areas.

At the stage of the implementation of cycle 2, learning is done by dividing the study group with a smaller number of members, namely 3-4 people in a group. Simple teaching aids are found in each group. Each member of the study group and collaborates in an experiment to determine the magnitude of the style experienced by each group connected. Students seemed enthusiastic about conducting experiments using simple media props. The main function of simple teaching aids is to help develop the concept so that students can understand the true meaning of the concept. By looking at, feeling, and manipulating objects, students experience real experiences experimenting (Suharjana, 2009). Experimental activities need to be carried out directly by students so that their scientific attitude can be formed (Yusuf, Widyaningsih, & Purwati, 2015).

In the cycle 2 reflection phase, it was found that all students actively collaborated in study groups. But there are still some students who have difficulty learning. This is because the division of groups is less attention in terms of their cognitive abilities. The level of cognitive abilities of students in a group looks the same so they have difficulty in taking data and need guidance directly from the lecturer. Student learning outcomes in cycle 2 ($73.3 \pm SD 2.76$) were higher than in cycle 1. Increased learning outcomes obtained N-gain value

(0.39) which showed an increase in the medium category. The learning outcomes in cycle 2 still have not reached classical completeness. Therefore, it is suggested that in the next cycle improvement of learning can be done in the form of group division by paying more attention to the cognitive level of students so that each student can be mutually diverse in his group.

The planning stage in cycle 3, made preparations, namely dividing the study group by paying attention to the cognitive abilities of students who are still divided into small groups as in cycle 2 which consists of 3-4 people in each study group. The other preparations are the preparation of simple teaching aids for the material for determining the homogeneous object's center of gravity. In this experiment, students are expected to be able to determine the location of the homogeneous objects that are hung

4. Conclusions and Suggestions

Learning using simple teaching aids is done by utilizing local materials or used materials in the surrounding environment as a supporting tool for experimental activities in the General Physics course.

Lesson Study activities are carried out by involving a team of lecturers to jointly make continuous improvements to improve student learning outcomes. Learning with the help of simple teaching aids through Lesson Study activities can improve student learning outcomes in general physics courses.

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