

The Use of Dry Lab To Enhance Students' Comprehension In Physics Concepts For Under Graduate Elementary Students Teacher (S1-PGSD) of Universitas Terbuka (UT)

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Abstract

The aim of the study was to investigate whether the use of dry labs would enhance students' comprehension in learning physics concepts. The methodology used was mix methods, quantitative and qualitative approach. From the population of the nationwide students, the use of purposive sampling method, four classes of students in the city of Tangerang were used. All of those students were taught with the use of conventional method. Then the pretest was implemented. Shortly after that, the use of dry lab was implemented by using power point provided in all of the physics concepts; mirrors, lenses, and electrics. Then a post test was given. Analysis of the results in pretests and posttests showed a significant different between without using and using dry labs.

Moreover, there were several important findings during the process of instructions in the study. Most of the UT's students sample in the city of Tangerang had their own computers. One female student explained that her family had three laptops; however she did not use the computer optimally. She just used the computer for typing only. She surprised that physics concepts can be understood much easily by the use of dry labs in the computers. The impacts of this study were beyond expectation. Most students promised to use their computers to learn physics or other subject matters by downloading some free dry labs in the internet or buy some science books with CD companion that works as dry labs.

Key Words: Dry labs, power points, physics, instructions,

Introduction

Background

Learn independently performed by student S-1-PGSD Open University has a very important significance in improving knowledge. The reason is the realization of self-learning that can be demonstrated by the student, that he has done skilfully learning, meaning, and learn to find things. This should be reflected in how students learn independently. Some features of the skills learned include: observing, classifying, making surveys, ask questions, formulate hypotheses, conduct experiments, interpret information and communicate. These policies are very help students to master a concept in science education / Physics.

In order to properly implement the learning process , the Open University using a tutorial system to help improve students' academic abilities . The role of organized tutorials Open University is one of the important components of academic support services and one of the teaching and learning activities in distance education system . Skills to experiment / practice in understanding the concept of science / physics in the S - 1 - UT PGSD particular matter physics is one of the subjects that taught in the 2nd Semester. By using a set –Science kit which consists of a kit of Physics and Biology . Kit - science that is destined for the practice extremely simple tutorial that does not want to say very inadequate , in installing the equipment set also require special handling for a variety of existing trials . Experience as a tutor lab science / physics courses with practicum PDGK 4107 showed that mastery of the concept of science / physics students and experimenting skills are very lacking . Support tools and materials to do the lab work is also very minimal, even many of the problems that arise when the inhibitor using Science-Kit, among others;

1. The tools and materials in the Science Kit were fully inadequate
2. Equipment and materials in the Science Kit is not the same and not in accordance with the instructions of laboratory works in Elementary Schools.
3. Existing tools and materials can only be used as an example of the tools and materials

4. The tools and materials difficult to be used as a trial setting

This condition is a challenge for tutors in guiding students to master concepts and skills in science courses PDGK 4107 with a load of 3 credits. The availability of such kits IPA is very simple and felt a lot of shortcomings in the proof of a concept in science. If this is not immediately addressed, the misconceptions and lack of skill in performing science experiments / Physics will always happen, and it is not desired by any student who is also a teacher.

To cover up the weaknesses that exist need to find a solution so that the goal of learning in elementary science practicum course PDGK 4107 nuanced lab / experiments can be conducted properly in accordance with the performance and expectations of the curriculum. These constraints can be done with laboratory facilities by utilizing the existing schools and qualified tutors, or demonstration centers. However, the use of laboratory and studied in Laboratory-science and technology requires a lot of procedures and additional costs to be implement by the student. A question that may arise is how to students existing in areas quite far from real laboratory and schools have science labs. Although this was done as an effort to improve the quality of learning for students of science lab tutorials S-1-UT PGSD

The current development of ICT as a learning medium it is possible to be used as a solution by using the Internet network accessible material in the form of a reenactment of science / physics complete with their parameters. This access can be downloaded in the form of an interactive CD into the lab cleaning. Use of this interactive CD can be done repeatedly without needing a charge, easy, and can be done anywhere with a computer. Thus the process of face-to-face tutorials (TTM), the tutor can more easily give lab works manual directions activities and vice versa will be easy for students to master concepts and improve their skills.

Research problems

From the above background, the problem is; increase in physical science student mastery of concepts S-1-UT PGSD of electric current and voltage in a simple circuit through existing facilities in PP-science and technology.

Of the main problems there are a few things that will be revealed:

1. Whether the use of interactive simulation cd / dry lab can improve mastery of the concept of science / physics?
2. Whether the use of interactive simulation cd / dry lab can improve the skills of the students do lab work?

Limitation of the problems

Restrictions matter referred to in this study, include;

1. PGSD Students S-1-UT is located in the remote areas.
2. Mastery of science concepts / Physics in elementary school
3. Skills of students doing science experiments in elementary school

Research Objectives

In line with the problem as it has been stated above, the purpose of the use of an interactive CD / dry lab is to know; percentage increase in mastery of the concept of science / physics skills in elementary and perform simulations using tools and materials available.

Benefits of Research

The use interactive simulations or CD has several benefits, among others;

1. The increased of quality tutorials particularly science / Physics in elementary school.
2. Increased knowledge of students through the mastery of science and technology, ICT in concept mastery science / Physics and experimenting skills.

Target of Research

The target in this study were undergraduates S-1-UT PGSD generally, and especially the students of S-1-UT PGSD in Bogor and Tangerang.

Theoretical Reviews

Bryson (2011), stated that dry lab or virtual reality is the use of computer technology to create the effect of an interactive three-dimensional world in which the objects have a sense of spatial presence

Physics is often regarded by students as a difficult subject, therefore the learning of physics must be made more attractive and easy to understand. To anticipate this one needs to be in support of instructional media. Various studies have shown that conventional learning is that learning is not effective and often lead to the wrong concept of the material being taught. For instance students' understanding of the legal concept of reflection, refraction and the light path to the formation of a shadow on a mirror or lens. These concepts are often considered to be easy due to the traditional learning methods.

Bryson (2011), stated that dry lab or virtual reality is the use of computer technology to create the effect of an interactive three-dimensional world in which the objects have a sense of spatial presence. Regarding Dry laboratory, Kirschner and Huisman (1998, p.1) explained in more detail as follows. Practical (laboratory) work in science education has traditionally been used to allow students to rediscover already known concepts and ideas, to demonstrate concepts taught in the classroom or, in the case of inquiry based science curricula, to teach concepts. Often, these laboratory practicals do not achieve their goals and may even confuse or demotivate students. It is not that using 'wet' practicals is intrinsically wrong; rather, it is that they are often used for the wrong reasons. They do have a place in science curricula -- for the conveyance of tacit knowledge that can only be achieved in the laboratory setting. In our view, their use should be restricted to that. Non-laboratory practicals ('dry labs'), and especially multimedia practicals, tend to be used for completely different reasons. They are best used to help students achieve specific cognitive skills (such as analysis, synthesis and evaluation) needed to practice science and to carry out scientific inquiry.

It is beyond the capabilities of traditional teaching approach to creating ideas and correction lack of knowledge about physics students because they are addressed to ignore the possibility that students' perceptions may be different than the tutor (Dermott, 1993; Jimoyiannis & Komis, 2001). The main objective of teaching constructivism approach is the development of conditions that will facilitate student learning and understanding of physics relate them to their own experiences. Moreover, such an approach should enable students to effectively apply the principles and concepts of physics in everyday life. Further research in this study will prove very helpful to improve the simulated form of teaching, as well as designing and developing new learning environment.

One of the things about constructivism approach to teaching is the study of the influence of computers that are directed to facilitate active student hooked on teaching and learning physics. This research provides an alternative form of the invention, based on the teaching of physics through interactive computer simulations. Construction of cognitive and student understanding of the concept of optical geometry investigated. This paper will show the possibilities that computer simulations can help students to build a fundamental cognitive theory away from misunderstanding. Hamalik (1986) in Arsyad (2002) suggested that the use of instructional media in teaching and learning and a desire to

generate new interest, generate motivation and stimulation of learning activities and even carry psychological effects on students.

The use of instructional media will greatly assist the effectiveness of the learning process as well as the delivery of messages and content that can help students improve comprehension because it presents the information in an interesting and reliable . Besides learning media can also facilitate interpretation of the data and condense information. This allows the achievement of learning objectives , which in turn can improve the process and outcomes of learning . During its development , instructional media appear in various types and formats . Computers as an additional tool in the learning process . Benefits include computer information presentation , subject matter and content of training or a combination thereof . This way is known as Computer Assisted Instruction (CAI) or Computer Based Learning . Media type of computer that has been developed and used in teaching physics lately such as spreadsheets , computer-based laboratories (computer-based labs) , multimedia , simulations , exploratory environments (environmental investigation) and intelligent tutors . Hamalik (2003) also describes four forms / types of computer teaching software , namely : (1) training and practice , (2) tutorial, (3) simulation, (4) teaching with computer instruction (computer managed instruction) .

Now a lot of available ICT applications , to stimulate the activity of the students and provide employment gains under very difficult conditions , saving cost and time for use in the classroom or even a physics laboratory . The use of CAI application has been developed into a new study on the teaching of physics . Since then radically change physics teaching framework that is being understood and applied .

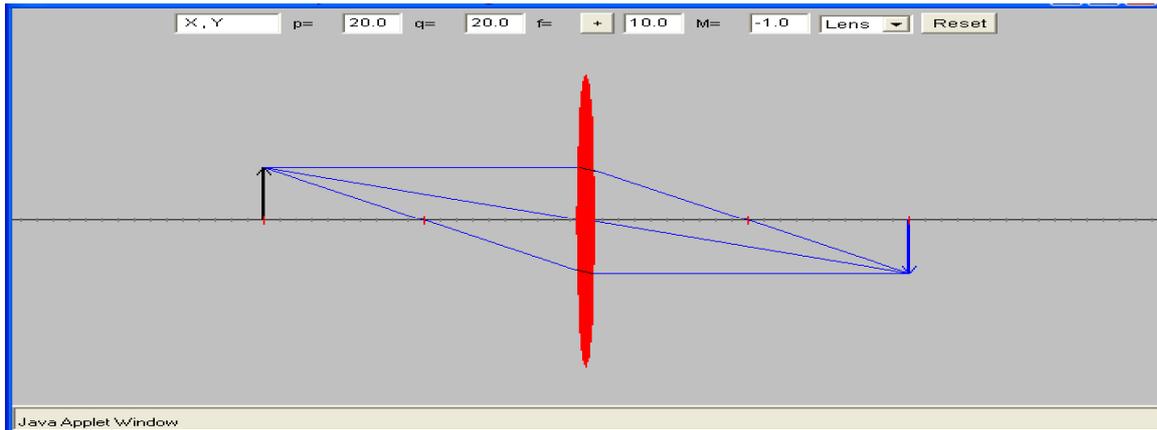
According to Bliss (1996) in Jimoyiannis & Komis (2001) there are two types of teaching physics with computers , namely :

1. Exploratory models (model investigation) , which is built by experts to bring local knowledge . Usually they are in the form of micro - worlds that simulate natural laws and processes . Micro - Worlds as it encourages students to investigate and interact with it , deal with parameters and observe the results
2. Expressive models that allow students , expressed their own ideas on the matter . They provide lessons with specific media to describe relationships between concepts , concept relations and investigate the consequences of earlier ideas and learn through an active process models that represent their own.

Interactive Physics with a dry lab is virtually laboratory physics in 2 -dimensional geometry simulates the basic principles of optics . Simulations generated by the system based on applets that run in a web browser (such as Internet Explorer , Netscape Navigator , and other has Java Runtime) . The benefits given dry lab program for students , namely :

1. Improve their understanding of the phenomena and laws of physics through a hypothesis and verification process of making idea.
2. Isolate and manipulate the parameters that help students to improve understanding of the relationship of physics concepts , variables and phenomena
3. Presents a presentation (image , animation , vector graphics and data numeric monitor) that helps in understanding the basic concepts , relationships and processes
4. Expressed their presentation and thinking about the world of physics
5. Investigate the phenomenon that is difficult to do in the classroom or laboratory because it is so complex , difficult technique , substantial cost or need more time or happens too fast .

Applets that use a file extension and downloaded from the Internet . - Applet . This applet displays an abstract objects can be real and not imagined objects. Physical quantities such as angle , focus length , the position of the object and the shadow of the object and image magnification can be measured in digital form , graphics and formatting bar when the simulation is run . Interactive Physics with java applet to easily program through a series of interactive objects such as ;



1. Buttons that allows students to add commands directly on the workspace applet without requiring the help of the dialog box .
2. Controls that allow students to adjust parameters in the simulation before and during the simulation run .
3. Meter , allowing students to take measurements of physical quantities that are relevant in a digital form or format of the bar graph .
4. The Menu , Enables students to choose the workspace that will be dry lab in the menu provided.

Example of the use of interactive CD from downloaded lens and mirror concepts.

Figure 1. Dry Lab Physics interactive (simulation of the image shape in mirrors and lenses)

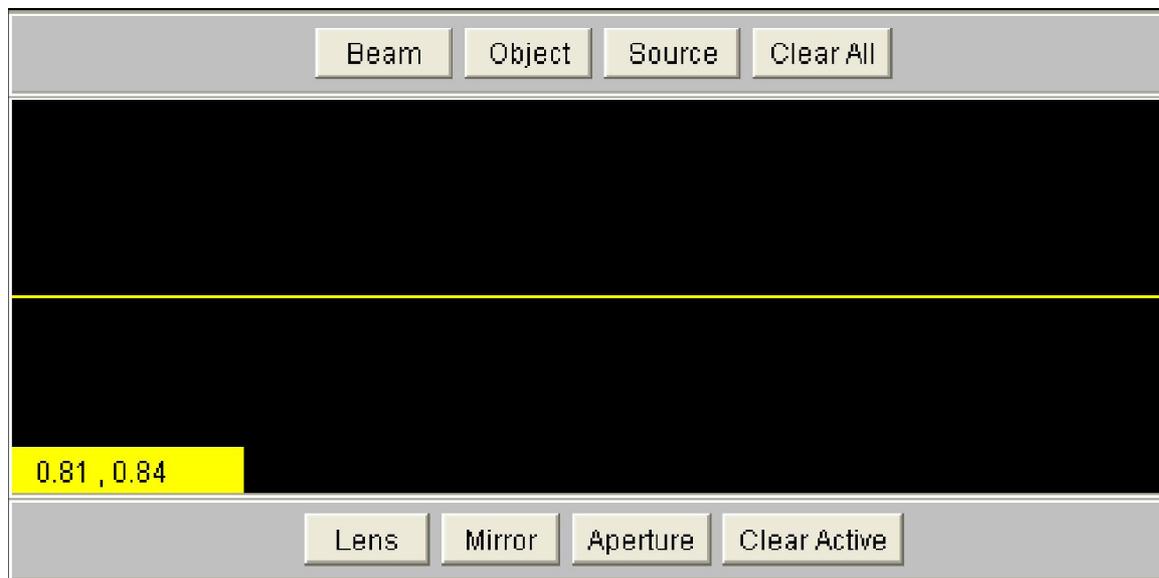


Figure 2 . Interactive Physics dry lab (Simulation Reflection , Refraction and reflection Formation on mirrors and lenses)

Interactive Physics with java applet program can be used in teaching and learning physics as :

1. The Virtual Laboratory through modeling and presentation of phenomena and processes
2. Expressive learning space where students can demonstrate their ideas, predict , lowering the laws of physics and solve the problems .

Experiments reflection , refraction and reflection on the process of formation of a mirror or lens becomes difficult for demanding laboratory skills of students in the experiment . Simulations using a Java Applet as one alternative approach that provides a real benefit teaching . With the simulation students can do a java applet eksperimen many times until they need to understand the laws and principles of reflection and refraction . Simulation concepts and physical phenomena simulation through a Java applet may be effective in teaching the students of Junior High School (SMP) because :

1. Supports strong learning space in studying physical symptoms
2. Easy to use and flexible
3. Easily accessible in a computer environment

In the same way the experimental activity using an interactive CD can be carried out in accordance with the content material inside the module yangbada Practicum in elementary science PDGK 4107

Research Methodology

1. Kind of research

This research is a class / group that is qualitative and concerns the role of the tutor and student. As the control variable is the dependent variable , whereas treatment in the form of a tutorial is a free variable . While the analysis is the procedure regarding the problems faced by students , and the aspects made by the tutors running the tutorials .

2. Population

The study population was all students PGSD S1 - UT who take science courses Practicum in PDGK 4107 and weighs 3 credits in semester 2 (input from high school) or 7 (input from PGSD DII) at the time of registration is in UPBJJ 2012.1 - UT . The number of students who involved were 120 students into 4 classes of study groups.

3. Samples

Sampling was done in layers , ie randomly select at any grade pokjar . The number of students who used a sample of 40 people who were taken from 4 pokjar classes each of 10 students in each class of study group sampling taken randomly . In this study, the researchers identified three research instruments , namely ; initial tests (pre-test) , treatment / tutorial using CD Interactive , and final test (posttest) .

Testing Instruments

After the data collection tool was considered good enough , then tested to a group of students at UT - S1 PGSD study group area of Tangerang Regency . This activity is aimed at trying to do a set of tests and get comments from the instrument device in understanding work instructions , statements in each question , the clarity of the language used and the amount of time and in accordance with the student 's ability . The result of all this activity is taken into consideration for improvement of the overall data collection tool .Furthermore factor validity and reliability of the instruments used for compliance needs to be seen .

1 . Validity

The instrument is an instrument whose validity is reviewed to understand instructions on how to work , the statements in each question , according to capability clarity reading, writing, and arithmetic's skills at a basic level . Overview of validity more emphasis on logical and rational consideration and assessment or consideration of some experts . Drafting instruments (tests) performed through several stages , namely;

- a. thinking of topics that have been proposed
- b. construct the lattice
- c. preparing instructional objectives and their specific aspects.
- d. prepare the instrument (test).

To avoid any discrepancy steps being taken , put to the people who know better / expert for the requested advice. As such instruments and their addresses graduates citizens prepared to learn a basic level of literacy is considered representative and have adequate validity remedy used in the study .

2. Reliability of Instruments / Test

To review the reliability of an instrument / test , the internal consistency of the procedures used by the Kuder Richardson technique . The reason instrument / test only one device prepared instrument / test to a group of study subjects . In addition this technique is very simple without compromising objectives , assessment of reliability .

Data Collection

That the data obtained in this fieldwork reflect the real situation , before carrying out the data collection activity was preceded by preparatory stage . The preparatory phase of the transactions are carried out , is ;

1. Meet head - UT Regional office to submit research permit where the research data will be retrieved
2. Meet the head of the head of the Education Department for to get a permit study in which the data will be retrieved
3. Inform all activities during the retrieval of data , and the length of time required and the number of S1 PGSD - UT students who are involved in research

Data Analysis Procedures

This study covers the goals as follows ;

1. Saw the proportion of concept mastery level science / physics ever ruled during this
2. Saw the proportion of skill level before and after the tutorial lab tutorials on material taught before and after using the CD
3. Analyze the role of the tutor in providing a guide to the use of interactive CDs and other demonstrations during the tutorial processes.

**Table of Students (S1-PGSD UT) Skills
In percentage for the test items of 1-3 and 5-8**

Item #	Students' ability to construct the science instruments in the topics of simple electrical circuit		Summary
	Before	After	
1	100	100	The improvement of students' soft skills after attending the tutorials in the science and technology parts were 82.083%-35% = 47.3%
2			
3	22.5	90	
4			
5	45	77.5	
6	42.5	77.5	
7	37.5	72.5	
8	32.5	75	
Sum	210	492.5	
Average	35	82.083	

Results of the study

The data showed that the average score for the sample students to take the pretest was 35. However, after the use of dry lab the average score of the sample students was 82,083. The was a 47.3 % increase.

Other issues appear in this study was most of the students involved in study were very enthusiastic in learning physics then before the use of dry lab implemented. One female student told the researcher that she had three laptops at home. However, actually she use the computer rarely. Her children and husband use them a lot. She just used the laptop to do her tutorial tasks for typing only. She was amazed that the computer used in the dry lab demonstration like the one she has at home. She promised to use her laptop at home to learn physics and other subject matters.

When students were asked whether they have computers or laptops at their home, they responded that most of them had their own computers or laptops.

Conclusions

The use of dry lab or virtual reality in physics teaching can enhance students understanding in more detail concepts than that without using it. Therefore the use of dry lab is recommended. The use of dry labs, actually help students with visual media or animations to comprehend the complicated concepts, however the laboratory works is still compulsory for teaching physics or science.

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