

Development Of Learning Tool Of Physics Based On Interactive Multimedia Charged On "Problem Solving" (Mmi-Ps) To Increase Problem Solving Ability For Prospective Teachers

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ABSTRACT: The research aims to develop a product in the form learning tool of physics based on multi-media interactive charged on problem solving to improve the thinking ability of prospective teachers. This type of research is the research development (R & D). Subjects included in the study are experts, professors, and students majoring in physics education FMIPA Unimed. Data were collected through validation sheet, conducted sheet, questionnaire, and test. Data has been collected were analyzed descriptively. Learning tool is developed include: lesson plan (RPP) and the Student Worksheet (LKM). The quality of learning tools in terms of three aspects, namely validity, practicality, and effectiveness. The validity of the learning tools is based on the opinion of the validator, the practicality based on implementation and response of lecture and students, and effectiveness is based on problem solving ability of students. Development of learning tools followed procedure of development product is a research development in the field of education. Research includes three stages: the stage of defining, the stage of designing, and the stage of development. In this study, the steps being taken only to produce the final product and not be deployed widely. The results showed that the learning tool of Physics has a valid, practically, and effectively. Implementation of plan of teaching (RPP) has the following characteristics: (1) prepared in accordance with the stages learning from learning model increasing thinking ability, (2) develop logical thinking ability of students, (3) oriented contextual physics problems, (4) arranged in a systematic, (5) Trained students in solving physics problems. Student Worksheet (LKM) have characteristics: (1) provide an overview of material coherentl., (2) provides an overview of the learning activities, and (3) include with the completion of tasks / training.

KEYWORDS: learning tools of physics, learning tools of Physics based on interactive multimedia, problem-solving ability in physics, learning model, Thinking ability

1. INTRODUCTION

Physics is a science that underlies the development of technology, so students need to learn in the form of General Physics. For a physics lecturer candidates are expected they had a physics lecturer professional competence and have a high problem-solving ability. Improvement of lecturers competence have not been able to do well at the Training Institution for Educational Personnel (LPTK). In fact of a preliminary study conducted Manurung & Simarmata (2015) on learning of General Physics in one of LPTK in Medan showed that in general the lecturers still dominated the learning. They teach the subject using lecture and question-answer method. Experiment of general physics still on verification, so it seems only carry out each step in the procedure such as recipes lab models which aims to prove the existing theories, which are less encouraging students to develop their thoughts in experimenting and finding new things. Also found also: (a) Method lecture used in the course of General Physics has been made the students fall silent to listen and really boring, because learning situations aimed at learning to know, and the problem set tends to be academic (book oriented), (2) Students lacked the experience to be able to solve the problem and the given problem is less refers to the contextual issues that close to the everyday life of students so that learning General Physics less meaningful for students. This is because the low participation of students during discussions in the teaching and their learning achievements also unsatisfactory. Furthermore it is found there are several weaknesses of learning General Physics so far, they are: (a) the learning process can not bring the phenomenon, (b) lack of process discovery, (c) lack of instructional media and tend not exist at all, and (d) understanding of the concept is weak. This causes difficulties students to understand the concepts of General Physics and graphs presented in the learning of physics. From studies conducted in material analysis, revealed that physics learning materials featuring many diagrams, graphs and mathematical formulas. The low quality

of physics teaching, seen from results and process of students learning, because lecturers less optimal teaching. (Manurung&Simarmata, 2015).

McDermot (1990) states that one of the important factors that affect the poor performance science lecturers is bad training for teacher candidate. A major factor in improving the quality of teaching and learning process is a lecturer, hence the it is needed to improve the professionalism of lecturers in the field of science and technology (Depdiknas 2010).

It is thus necessary an efforts to improve the quality of lecturers through education lecturer candidates and continuously performed. One of them by providing them the knowledge and direct experience doing physics experiments involving physics concepts that abstract with the use of multi-media interactive relevant because not all the experiments can be conducted directly in the laboratory.

Misanchuk& Hunt (2005) have designed a model of problem solving and lab content on Web-based Basic Physics lectures and provide results that retention distance students as well as direct interaction. Simulation and virtual labs for a variety of basic physics concepts through project-based algebra PhET (Physics Education Technology) reported by Finkelstein *et al*, (2006), to overcome high number of participants at Physics courses at various universities. Furthermore, Finkelstein *et al* (2006) and Jonassen (1997) says that the computer can be used to support the implementation of good physics lab to collect data, present data, and process data. Further Finkelstein *et al* (2006) promoted a number of forms of interaction can be generated through a computer media such as the presentation of practice and training, tutorials, games, simulations, discovery, and problem solving. According to Jonassen (1997) the use of multimedia in learning to encourage students to learn the process of the invention (discovery learning process) and can solve problems that ill-structured problem (Cunningham, 2009).

Problem Solving is a complex process and it is important in our daily lives to study physics. Most of the problem-solving tests given in class focused on the end result or the middle of a learning process, while it should be consider to the quality of the procedures and reasoning that leads to results. Problem solving skills that is developed in General Physics is present situation in which certain information is given, more often as the numerical values for the variables in the situation, and the value of other variables can be determined. So the problem is likely to well defined. While the physics problem in everyday life or physics problem that owned by physicians are ill-structured problems, problems that must be solved through innovative learning physics (Cunningham, 2009). Lawson (1995) stating problem-solving ability is a person's ability to solve problems, able to think and devise a solution with a logical order (makes sense).

Based on the above, this article will explain the improvement of problem solving skills through physics learning model based on interactive multimedia charged "problem solving" (IMM-PS), because the learning model Physics-based multi-media interactive charged problem solving can improve thinking ability and skill to solve problems that are ill-structured problem (Shin et al, 2003)

2. METHOD

This type of research is the development of research (developmental research). In this study, the learning tool that will be developed include lesson plans, Worksheet mahaiswa (MFI), and material testing problem-solving abilities. Research using the model of development Thiagarajan, consists of three phases, known as 3-D models (four D Model). The third stage is the stage of definition (define), stage design (design), and the stage of development (develop). Definition phase aims to establish and define the learning needs by analyzing the goals and limits of the material. Furthermore, the design stage, the purpose of this phase is to design a learning tool, in order to obtain prototype. All the tools that will be produced in this stage is called draft I.

The development phase aims to produce a draft revised learning tool based on the input of experts and data obtained from field trials. This phase consists of assessment experts in the field of mathematics and field trials. Based on data analysis and input validation learning tools to experts, it is a learning tool Draft I then revised in order to obtain a learning tool Draft II.

Data collection methods used in this study is the expert validation, test methods, the method of interview. The research instrument used is a learning tool validation sheet, student activity observation sheet, observation sheets of activity of lecturer, and test problem solving abilities.

3. RESULTS AND DISCUSSION

In this research. Learning tool based on interactive multimedia charged on problem solving developed successfully is lesson plans, student worksheets, and problem-solving tests. Model of development of tool in this study refers to the model Thiagarajan consisting of three phases, the definition, design, and development. The first stage is the stage of defining the five main steps, namely the front-end analysis, analysis of students, material analysis, task analysis, and specification of learning objectives. Indicators produced in the specification of learning objectives used as a basis for drafting the learning tools with a realistic approach to physic learning in theoretical material

The design phase of the study consisted of four steps, namely the preparation of the test, media selection, election format, and the initial design. At the design stage is generated Draft I. The next stage is the stage of development, at this stage produced draft II learning tools is revised based on input from experts and then is conducted tests on the second draft. From the results of test is obtained the practicality and effectiveness of the learning tools and the result is called a draft III (the final). The result

of validation, namely: 1. Component of lesson plan (RPP) is developed consists of preliminary activities, core activities, and cover the load characteristics and the steps of learning based on interactive multimedia-based charged on learning problem-solving. 2. Student Worksheet (MFIs) is the indicator refers to the indicators of learning that will be achieved as well as characteristics of kinetic theory of gases (TKG). 3. Tests of problem solving ability was made based on the material taught using by physics learning based on interactive multimedia based on problem solving, This test consists of seven different descriptions about the problems in daily life.

The results of analysis of the development of learning tool based on interactive multimedia based. resulting criterion validity, reliability, practicality, and effectiveness in order to know the learning tools is said to be a decent / good. Criterion validity of the learning tools is obtained from the analysis of the validation by experts. The analysis showed that lesson plans (RPP), student worksheets (LKM), and problem-solving tests are said to be good. Thus, the learning tools developed has met the criteria of validity. Criteria practicality learning tools obtained from the analysis of the activity of the lecturers during the learning takes place during the two meetings. the percentage of teachers in managing learning activities in the first meeting reached 81.25% in the good category, and at the second meeting reached 85.4% in good categories. This indicates that the learning tools has met the criteria of practicality learning tools and lecturer are able to manage it well. Criteria for the effectiveness of learning tool based on interactive multimedia based on charged on problem-solving are derived from the analysis of student activities at each meeting. From the analysis of the activity of students the percentage of student activity at the first meeting reached 82.9% in good categories, and the second meeting reached 86.6% in good categories. From the analysis of the problem-solving test shows that mastery learning of student are reached 83% seen responses of showed that more than 80% of the students responded positively to the learning tools is developed. Thus, the learning tools developed meets the criteria of effectiveness.

Examination of problem solving is shown as validity and reliability

Validity

Validity is conducted in physics class Dik B 2015, with the number of students as many as 47 people. The amount of matter is validated much as 7 about the shape description. Based on the validity of the tests carried out showed that the valid questions that there are 6 items and items that are not valid. Data validity of the tests are shown in Table 1

Table 1. Analysis for testing validity

Nomor Soal	r_{tabel}	r_{xy}	Kategori Validitas Tes	Keterangan
1	0,2876	-0,0370	Notvalid	Can not be used
2		0,6901	Valid	Can be used
3		0,3254	Valid	Can be used
4		0,6127	Valid	Can be used
5		0,5302	Valid	Can be used
6		0,7024	Valid	Can be used
7		0,6279	Valid	Can be used

Reliability Tests

Reliability is the consistency of a test when used on the same subject in a different time would give the same measurement results. Based on the calculations, the reliability of the test amounted to 0,459 with moderate reliability criteria. Data validity of the tests are shown in Table 2

Table 2. Analysis for testing Reliability
Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.459	.520	7

4. CONCLUSIONS

Based on the results of data analysis and discussion, it can be concluded that: (1) the process of software development based learning based on interactive multimedia charged on problem solving is used 3-D model Thiagarajan which consists of three phases: definition, design and development (2) Results of development is obtained is physics learning based on interactive multimedia charged on learning problem-solving consists of learning Implementation Plan (RPP), Student Activity Sheet (MFI), and the test problem solving are good categorized, because it has to meet three eligibility criteria learning tools that validity, practicality, and effectiveness. The learning tools product has a valid category.

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