Analysis of Learning Tools in the Study of Developmental of Interactive Multimedia Based Physic Learning Charged in Problem Solving

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Abstract

The main purpose of this study is to produce needs analysis, literature review, and learning tools in the study of developmental of interactive multimedia based physic learning charged in problem solving to improve thinking ability of physic prospective student. The first-year result of the study is: result of the draft based on a needs analysis of the facts on the ground, the conditions of existing learning and literature studies. Following the design of devices and instruments performed as well the development of media. Result of the second study is physics learning device -based interactive multimedia charged problem solving in the form of textbooks and scientific publications. Previous learning models tested in a limited sample, then in the evaluation and repair. Besides, the product of research has an economic value on the grounds: (1) a virtual laboratory to offer this research provides a solution purchases physics laboratory equipment is expensive; (2) address the shortage of teachers of physics in remote areas as a learning tool can be accessed offline and online; (3). reducing material or consumables as tutorials can be done online; Targeted research is the first year: i.e story board learning physics that have been scanned in a web form CD (compact disk) and the interactive multimedia of gas Kinetic Theory concept. This draft is based on a needs analysis of the facts on the ground, the existing learning conditions, and literature studies. Previous learning models tested in a limited sample, then in the evaluation and repair.

Keywords: Analysis, physics learning, interactive multimedia, problem solving.
PACS: 00-01 gb.Communication, education, history, and phylosophy

Introduction

Physics is a science that underlies the development of technology, so students need to learn in the form of General Physics (Halliday, 2011., As a physics teacher candidates are expected later they had a physics teacher professional competence and the ability to think logic high (Haryanto, 2006., Liliasari, 2005., Lawson, 1995., and Piaget, 1964). Increased competence of teachers can not be done either at the Institute of Education Workers (LPTK). Preliminary study conducted Manurung & Rustaman (2011) General Physics learning in one LPTK in Medan indicates that in general the lecturers still dominated learning. Lecturers teach the material with a lecture and question and answer. General Physics practical implementation is still verification. Other findings of the preliminary study (Manurung & Rustaman, 2011) are: (a) Methods used in the lecture General Physics has been made the students glued to listen and really boring, because the learning situation aimed at

learning to know, and problems delivered tends to be academic (book oriented), (2) Students lack the experience to be able to solve the problems and issues are given less refers to contextual issues close to the everyday lives of the students so that learning General Physics less meaningful for students. Furthermore, several weaknesses of learning General Physics for this, namely: (a) the learning process can not bring the phenomenon, (b) the lack of discovery process, (c) lack of instructional media and tend not at all, and (d) a weak understanding of the concept. From studies conducted in the analysis of the material, it was revealed that many material physics featuring diagrams, graphs and mathematical formulas. The low quality of teaching physics, in terms of results and the process of student learning was caused by teachers teach not optimal. (Manurung, 2010).

McDermot (1990) and Slavin (2000) states that one of the important factors that affect the poor performance is the lack of good science teacher preparation process. The main factors in order to improve the quality of teaching and learning is the teacher, thus need to increase the professionalism of teachers in the field of science and technology (Reif *et al*, 1976). Departing from this reality seems to be improving the quality of teachers through teacher education candidates must be constantly carried out. One of them by providing them the knowledge and direct experience in conducting physics experiments, including experiments involving physics concepts are abstract with the use of interactive multi-media relevant because not all experiments can be conducted directly in the laboratory (.Finkelstein *et al*, 2006).

Misanchuk & Hunt (2005)., Ivers & Barron (2002).,and Santyasa. (2006). has been designing and problem solving laboratories content on Web-based Basic Physics lecture gives the result that the 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) undertaken and reported by Finkelsstein et al (2006), used to treat many participants basic physics courses at various universities. Furthermore, Finkelstein et al (2006) says that the computer can be used to support the implementation of good physics lab to collect data, present, and process data. Finkelstein *et al* (2006), Srinivasan & Crooks (2005) 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) and Jonassen & Grabinger (1990) the use of multimedia in learning to encourage students to learn the process of discovery (discovery learning process) and can solve the problem of the ill-structured problems (Cunningham, 2009., Jonassen, 2004).. Solving the problem is a complex process and is important in everyday life studying physics. Although there are many efforts to improve students' problem-solving in the education system, Gerace (2001) said that there is no standard way to evaluate a written problem solving applicable, reliable, and easy to use. Problem solving skills developed in General Physics is to present a situation where certain information is given, more often as numerical values for the variables in the situation, and the values of other variables that can be determined. According to Heller & Heller (2010), Heller & Hollabaugh (1992b), Gick (1986), and Gick & Holyoak (1980) show that there are 5 steps of problem solving strategy, namely: Focus on problem solving, Explanation Physical, Planning Implementing, Implement planning, and Evaluating of response. While the problems of physics in everyday life or physical problem that is owned physicists are ill-structured problems, problems which must be solved through innovative learning physics (Cunningham, 2009).

Lawson (1995) states the ability to think, think creatively, make decisions, and solve problems is very important in getting a job, because they have the ability to ensure its survival. The ability to think logic is a person's ability to solve problems, able to think and devise a solution with a logical sequence (sense). managing careers and work. Furthermore Liliasari (2005) suggest a high level thinking skills can be developed through the teaching of science with models of information technology-based learning in science (chemistry, physics, and biology). Based on the above, it is necessary to do the

development of physics-based models of learning interactive media multi-charged problem solving to improve thinking skills and problem-solving skills that are ill-structured problems (Shin *et al*, 2003, Darmadi, 2007., Dori & Belcher, 2005). Learning conceptual understanding of physics that suppress the problem-solving activities conducted through the process so physically understand not just memorize formulas.

Originality of this research is to improve the course General Physics II based on interactive multimedia charged able to overcome the problem solving physics problems are ill-structured problems are always present in everyday life, has never been investigated (Budiman *et al*, 2008, Burke, 1998, and Gayeski, 1993)).

Research Methods

The research method in the first phase is the implementation of a preliminary study of the physics-based multimedia interactive learning and planning for students who attend lectures general physics I. Location and Subjects Research in the Department of Physics, State University of Medan, involving 36 students. The subject of research that consists of these students were divided into six groups of five students in each group. The research instrument at one stage in preparing the analysis of the needs is 1) Gazette observation experience of using interactive multimedia media, At the stage of preliminary study (and Fraenkel *et al*, 2012). developed the necessary instruments for field studies as shown in **Table 1**.

Table 1. Step of Research Instrument

No	Aspect	Indicator
1	Student perspectives on the ability of facing an interactive multimedia learning in I general physics course.	Discourse move related to the problem solving
2	Attitude and viewpoint of lecturers	Attitudes and views of lecturer on the implementation of interactive multimedia based physic learning
3	Attitude and viewpoint of students	Attitudes and views of students on the implementation of interactive multimedia based physic learning
4	Problem solving ability in the implementation of the lecture	Utilization of problem solving activities in the lecture
5	Logical thinking ability	Utilization of logical thinking ability

No	Data Source	Instrument	Time
1	Lecturers	Observation sheet (conducted by education experts)	At the time of the lecture on the topic of work and Energy
2	Lecturers	Observation sheet	Before implementation of learning model
3	Students	Observation sheet	Before implementation of learning model
4	Process of lecture for lecturer and student	• observation sheet • questionnaires • Sign- posts • interview	Before implementation of learning model
5	Students	test	Before and after implementation of learning

Modification from Robert & Campbell, 2013

Results and Discussion

Preliminary research results indicate: (a) only 60% effective face to face lectures, because lecturers burdened with many activities, such as teaching PLP; (b) the percentage of synchronization between face-

to-face lecture materials and lab resulting of interviews conducted by only 30%; (c) the percentage of student involvement in the process of building concepts in mathematical equations, and graph obtained only 32%, this is due to the role of professors who dominate the class by giving students homework without direct troubleshooting steps to train reasoning thinking. Given exercises do not follow the pattern of effective problem solving or reasoning so the thinking lines are not well-trained students. Interaction learned more in one direction i.e from the lecturer to the students; (d) The lecture very much, so that in the lecture students are burdened with many tasks; e) only 17% lab activities that can improve the understanding of the concept of student, it is because the characteristic of lab only verification using detailed instructions and a lack of benefit (e) only 15% response activities that involve students in the process of solving the problem systematically..Based on the results of preliminary studies, the characteristic of an assessment of the physical learning system is shown in **Table 2**.

Table 2. Characteristics of Assessment of Physics Learning System

No	Element	Positive Component	Negative Component
1	Effective face-to-face lectures	60%	40%
2	Synchronization of lecture material in the lab	30%	70%
3	The involvement of students in the lecture	32%	68%
4	Lecture material is quite dense	10%	90%
5	Linkage lecture materials with previously accepted concept	18%	82%
6	Practical activities to improve understanding of the concept	17%	83%
7	Response activities involving students	15%	85%

Based on data obtained from preliminary studies as in **Table 2** to be a reference and encourage to develop an interactive multimedia based learning methods performed in this study, is expected to help students, lecturers and teachers in understanding topics / concepts General Physics I or concepts more complicated in physics. Therefore, teachers or prospective teachers to master the use of interactive multimedia important to improve the professionalism, because it can enrich the user experience in speaking, thinking, and even in the formation of academic culture. In addition, teachers can also collect, organize, and analyze empirical evidence and theoretical basis for a more comprehensive answer tough questions about the understanding of the concept.

Problem solving initial response sheets is given to the three experts who are competent in the field of assessment and general physics of matter, and obtained some important notes about the suggestions and responses to the development of problem solving model as shown in **Table 3**, which summarized the results of interviews and feedback sheets

Table 3. Responses and expert advice on scientific arguments based learning model

No	Substantion	Expert 1
1	Syntax of problem solving	More precisely if compiled syntax of problem solving that corresponded to the teaching theory and lecture
2	Latticework	Be required of indicator problem solving skills
3	Guide to do problem solving in general physics I course	Necessary introduction and direction signs in the problem solving
4	Other responses	Implementation in the poblem solving lecture is conducted based lectures highly anticipated as a result of standardized
No	**Expert 2**	**Expert 3**
1	Try using a more efficient sentence	Integrate multimedia avtivities based learning in the RPP. Adjust the allocation of time lecturing
2	Latticework in terms of problem solving adjusted to basic	Latticework in terms of problem solving corresponding with learning syntax

	competence in I general physics courses	
3	Should be implanted and cultivated in every lecture commonly	As an initial stage is expected to be a model for all science-based lecture
4	Preliminary studies are expected to be sharper explored further is done in-depth analysis through discussion with several experts and other specialists. There should also be tested against several subjects to gain sharpness models.	This is still an preliminary study. Required a long way to earn academic recognition

Generally, validator is considered that the problem solving based learning in the classroom is very inquiry is expected to change the paradigm of thinking about college physics student general I so the concepts contained in the course will be more easily understood. Of the five substances proposed to be taken validator researchers showed that the problem solving is very need to be developed in the implementation of public lectures I general physics spesifically. Validator also expect there is a specific guidance on problem solving on Igeneral physics course I. In this case, the problem solving will be developed in order to be adapted to the basic competencies in I general physics. Required material also has to use indicators of problem solving so the implementation can achieve the goal of learning about conceptual understunding understanding in general physics I course. To be able to measure an activity can be expressed in accordance with the development probem solving is certainly necessary observation sheet. This observation sheet dedicated to the observation group was formed. The observation sheet must be prepared in accordance to the conditions of the class, and can facilitate observer groups provide an assessment of the observed activity. Generally, validator is considered that the scientific arguments based learning in the classroom is very inquiry is expected to change the paradigm of thinking about college physics student general I so the concepts contained in the course will be more easily understood. Of the five substances proposed to be taken validator researchers showed that the scientific argument is very need to be developed in the implementation of public lectures particularly physics I. Validator also expect there is a specific guidance on scientific arguments on general physics I course. In this case, the argument science will be developed in order to be adapted to the basic competencies in general physics I. Required material also indicators argue for scientific skills so that the implementation can achieve the goal of learning argues that understanding the concept of general physics I. To be able to measure an activity can be expressed in accordance with the development scientific argument is certainly necessary observation sheet. This observation sheet dedicated to the observation group was formed. The observation sheet must be prepared in accordance to the conditions of the class, and can facilitate observer groups provide an assessment of the observed activity.

According to analysis of the textbook, characteristic of the multimedia activities based physics learning charged in problem solving, in particular, the management and the learning environment "thinkers" noticed aspects are as follows: 1) handle situations students multi-task; 2) adjust to the speed of completing different tasks; 3) monitor and handle the student work; 4) management of the equipment and materials; 5) regulate the movement of students (in the computer lab and science lab) and behavior happen outside the room (for the solution of which requires vasalah outdoor activities). Lecturer role as facilitators directly involved in the process of group (assist students in formulating a plan, act, and organize group), some of the needs in a research (knowledge of vetode used), and also function as an academic counselor (.Yahya, 2008). In this study, students were assigned to solve the physical problems that result 1 is shown in table 4.

Table 4. Data description scores in the domains of problem solving aspects

	Focusing on problem solving	Explanation Physical
Mean	1.01	1.00
Std. Deviation	.58	.53
Minimum	.00	.00

	Planning Implementation	Evaluating of response
Mean	.83	.83
Std. Deviation	.61	.61
Minimum	.00	.00

In learning that utilizes the MMI, the problems related to the limitations of working memory is how to build a complex understanding that integrate information from visual sources (pictures, diagrams, graphs, films) and verbal (text, lecture). Woolfolk (2009b) provides guidance: make sure the information-information is available at the same time or focused on small pieces; give students many ways to understand (images and description), but do not overwhelm the working memory by means of visual and verbal information pack together with pieces 26 pieces the size of a "one bite" (or the size of the memory). This statement would be used as the basis of MMI development for the lecture Physics for prospective teachers of Physic Education LPTK. In this study, the steps to follow the development of MMI project-based learning development measures proposed MMI Ivers and Baron (2002) with the adjustment of the development of project-based learning MMI to MMI development. Evaluate this phase occurs in each process. Identification Finkelstein et al. (2006) on the characteristics of the MMI that contains simulated physics that supports student learning need to be considered in designing the MMI for physics. These characteristics include: (1) engaging and interactive approach; (2) the existence of a dynamic feedback; (3) using a constructivist approach; (4) the existence of space to play and do something; (5) the existence of a visual model or access to visual models; (6) the existence of a barrier for the purposes of improving the productivity of the student. Based on preliminary studies, planning, observation (observation) and a questionnaire to all students who attend public physics lectures I obtained the results illustrate that the implementation of classroom based learning arguments for inquiry is still new and needs to be explored more deeply and continuously to obtain alternative methods to improve understanding the concept of students, especially students of the first semester. Follow up on this situation (Gerace, 2001). Based on preliminary studies from various sources shows that interactive multimedia based learning physics require their initial statement as a , in accordance with that shown by Clark & Sampsonn (2006), Driver et al (2000) stated that the process then performed through the interactive muti media could improve thinking ability of students.

Conclusions

Produce needs analysis, literature review, and learning tools in this study could improve thinking ability of physic prospective student. Product of research has an economic value on the grounds: (1) a virtual laboratory to offer this research provides a solution purchases physics laboratory equipment is expensive; (2) address the shortage of teachers of physics in remote areas as a learning tool can be accessed offline and online; (3). reducing material or consumables as tutorials can be done online. Application of physics learning based on interactive multimedia to increase effectiveness learning, both in terms of process and of learning outcomes.

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