

A Preliminary Validation Study of Developing An Interactive Multimedia Modules in Physics Learning

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Abstract—Some of skills required in the 21st century are critical thinking, Information Communication Technology (ICT) literacy, and socio cultural interaction. Physics learning should be directed to develop these aspects. This paper describes a preliminary validation study of developing an interactive multimedia module that covering the 21st century skill. The method of this research is Research & Development. The subjects of this developing study were 10th grade student of senior high school in Padang, Indonesia. The data presented are the result of the define, design, and validation phase of product. Based on questionnaire analysis show that students interested in learning physics using ICT reached 76.7%, but the fact that teacher have not been using teaching material based on ICT, Problem Based Learning (PBL) model is not maximized, the students' critical thinking skills are only 69.3% and the learning outcomes of students yet fully achieve the minimum completeness criteria. Based on the analysis of questionnaires and observation, generally seen that not maximal adherence to the learning process that impact on the learning outcomes of students. One way that can resolve these problems is using interactive multimedia modules in PBL model aided games. The validation of design show that interactive multimedia modules is valid.

Keywords: *Critical Thinking, Interactive Multimedia, Instructional Modules, Physics Learning, Problem Based Learning.*

I. INTRODUCTION

Education in the 21st century it is important to ensure students have the skills to learn and innovate, skills in using information technology and media, as well as be able to work and survive by using life skills. One of skill to learn and innovate include critical thinking and problem solving. The skills in using information technology and media include; (a) the information literacy, (b) media literacy and (c) ICT literacy. While the life and career skills include; (a) flexibility and adaptability, (b) the initiative and organize themselves, (c) social interaction and culture, (d) the productivity and accountability. Science education should be directed to develop these three aspects.

Physics as a science, should taught with fun. In the learning process, educators stimulate learners with the knowledge of the natural phenomena around learners and presented in the media of information technology. So that the learning of physics in schools should provide opportunities for learners to use technology and to train the critical thinking skills of students in solving physics problems through collaboration and communication with peers, teachers, or others who have the same interests.

Results of research [1] show that computer assisted learning can contribute to the student's attention is relatively high compared to the usual learning. This is also consistent with the results of [2] which suggests that the effectiveness of interactive media reached the category of very effective, based on the results of student learning, which reached 87% and improving the competence of students. While, results of research by [3] showed that the use of animation and graphics in learning can facilitate assimilation of scientific knowledge. Furthermore, the results of research suggested by Lee and Osman [4] the use of multimedia modules allow to help learners visualize abstract concepts.

Interactive multimedia module allows educators to present learning materials with interesting and varied. Interactive multimedia module to make it more attractive, educators also can combine with the game, considering the use of game-containing education will be beneficial for learners. Results of research conducted by [5] indicate that the game can teach academic and non-academic skills, and

motivate learners to collaborate, share information, and improve the work of learners. Results of research [6] showed that the use of game-based multimedia modules in science learning proved to be more efficient.

In addition, to realize the process of learning physics as expected in the national education goals, then we need a model to student-centered learning. One model of learning that is recommended in the curriculum of 2013 is a model Problem Based Learning (PBL). PBL is a learning model of learning that exposes students to the issues interesting and relevant to everyday life. During learning, learners are not given the issue directly but through stages, ranging from the presentation of phenomena, situations, demonstrations, or other sources.

The research conducted by [7] on the Problem-Based Learning and Nature of Science (NOS) showed that PBL can help teachers to explain some aspects of the natural sciences. One of the advantages of PBL is to foster critical thinking skills of students through problem solving. As the results of research [8] which showed that the model PBL can improve students' critical thinking skills reached 32% in physics learning materials. Furthermore, the results [9] showed that the use of interactive multimedia software module with PBL has effectively enhance the understanding of physics concepts and learning outcomes of students. So with the application of this model is expected not only to improve learning outcomes but also improve critical thinking skills to solve problems.

In this article, we will describe the process of designing interactive multimedia modules in the PBL model aided games, to improve students' critical thinking skills in learning physics and results of the validation of the design.

II. METHODS

A. Type of Research

The type of this research was development research. To initiate the development of this research, it conducted preliminary research to uncover the needs analysis used in the development of interactive multimedia modules. Research procedure can be seen in Figure 1.

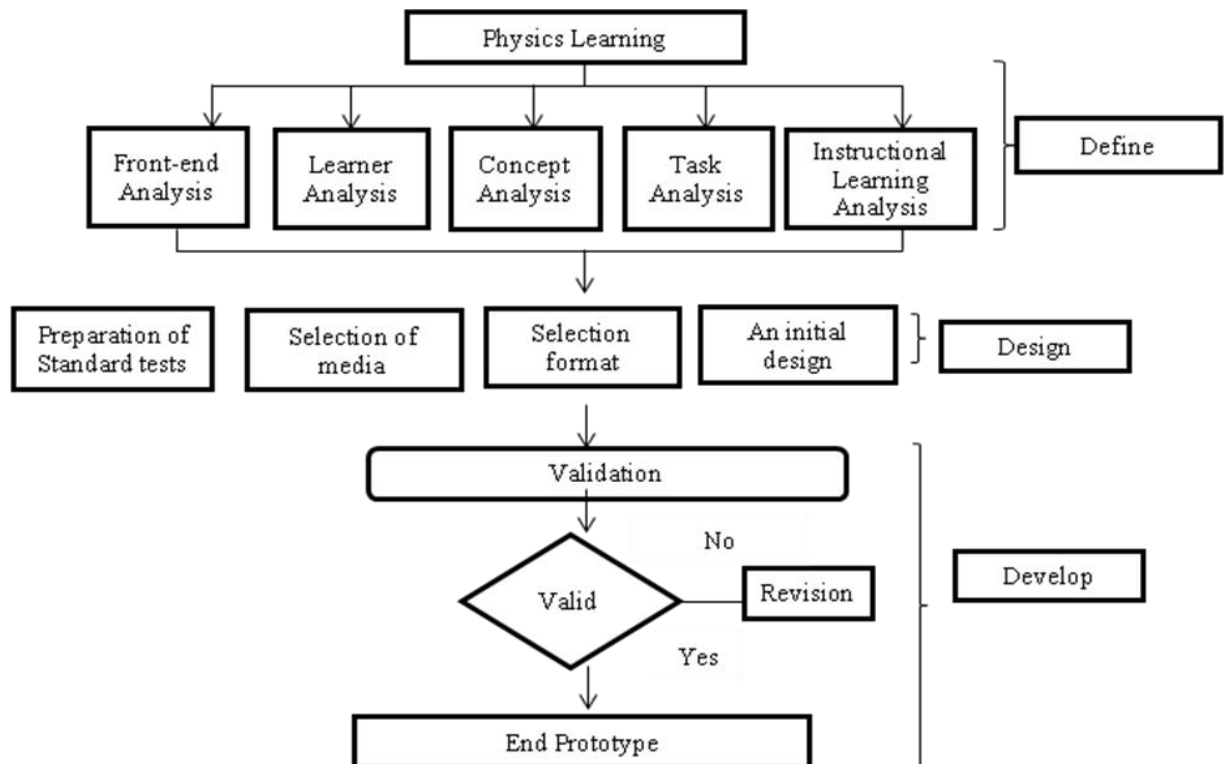


Figure 1. Research Procedure

B. *Research Subject*

The subjects of this developing study were 10th grade student of senior high school in Padang, Indonesia Academic Year of 2015-2016.

III. RESULTS AND DISCUSSION

The results obtained at each phase of development regard to the development process of interactive multimedia modules in PBL model aided games can be described as follow:

A. *Stage 1: Defining*

Before carrying out the research, the researchers identification of the needs analysis for development of interactive multimedia module include; front end analysis, learner analysis, concept analysis, task analysis, and instructional learning analysis.

Front End Analysis

Based on front end analysis, the implementations of PBL models in the learning process amounted to 82.4%. The average percentage of use of learning materials in class only 51.9%. Furthermore, the results of questionnaires showed that the average motivations of learner in physics learning using interactive multimedia are reached 76.7%. But in reality, educators do not use interactive multimedia instructional materials in teaching physics. Based on interviews, it is known that the teaching materials are used in the form of printed teaching materials in the form of textbooks and student worksheet released by publisher

Learner Analysis

Critical thinking skills at the beginning of the students obtained 69.3%. Previous research by [10] showed that the overall average of the critical thinking skills of students of SMAN Padang is only 32% are included in the category is not critical. In detail, the critical thinking skills of students can be seen in Figure 2.

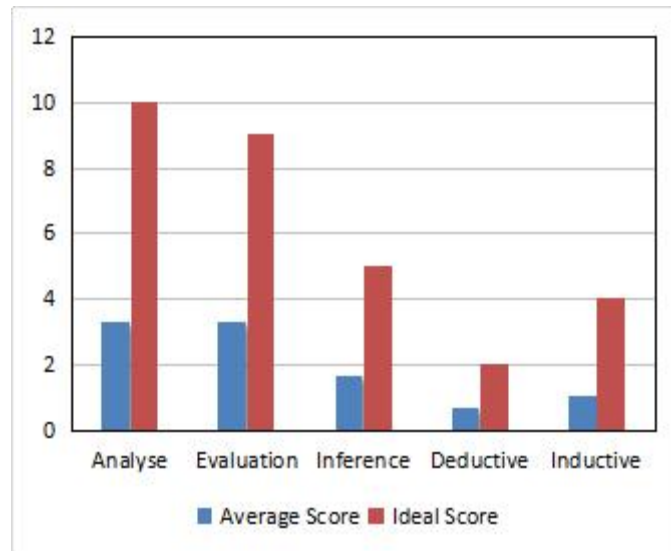


Figure 2. Critical Thinking Skills Of Students

Based on Figure 2 can be seen that the level of critical thinking skills were highest evaluation level (36%) while the lowest is at the level of induction (26%). Based on the analysis of questionnaires and observation, is generally seen that not maximal adherence to the learning process. It is also an impact on learning outcomes of students who are not yet fully reached the minimum completeness criteria (KKM) as shown in Table 1.

Table 1. Learning Outcomes Of X Mia 5 Sma N 1 Padang 2015-2016

No	Aspect	Learning Oucomes in Projectile Motion
1	Average Value	73,78
2	The number of learner completeness	13
3	The number of learner incompleteness	19
4	The Number of learner	32
5	percentage of completeness	49%
6	percentage of incompleteness	51%

(source: Physics Teacher of SMA N 1 Padang)

Based on the analysis of questionnaires and observation, is generally seen that not maximal adherence to the learning process. It is also an impact on learning outcomes of students who are not yet fully reached the minimum completeness criteria (KKM) as shown in Table 1.

Concept Analysis

Learning outcomes of learners in mind that the value of daily test students on the material parabolic motion is very low. Therefore, the authors tried to improve the learning process in a parabolic motion of matter. To optimize learning in this matter, it is necessary to analyze the concept. Based on the analysis of the concept, it is known that the motion of a satellite dish consists of material facts, concepts, principles, procedures, and metacognition.

Task Analysis

Based on the results of interviews about the task given by the teacher in mind that the task given in the form of training and home work. The tasks given not stimulate learners to think critically and do not lead learners to use ICT.

Instructional Learning Analysis

In reality, physics learning implemented to date have not been as expected. This is evident from the results of observations conducted in SMAN 1 Padang, on 15 April 2016 through a questionnaire. The statements in the questionnaire refer to indicators of use of teaching materials, implementation of PBL models in the learning process, critical thinking skills, and motivation of learners in learning physics using interactive multimedia.

Based on the observation that has been described above, it can be concluded that there are some things that cause low competence of learners. First, the low percentage of learners critical thinking skills can be caused by educators do not implement the learning process according to the syntax model used. Second, the students have not been involved to the maximum in solving the problems of physics so that learners are not very active in learning activities. Third, instructional materials used does not comply with the conditions of learners, the low interest of students towards the material being studied. Besides that the teaching materials used do not stimulate learners to develop critical skills.

To overcome these problems educators as facilitators need to make quality instructional materials for the process of learning physics fun, meaningful, and interesting that not only increase the interest, motivation, activities, and understanding learners but also can improve students' critical thinking skills. One way that can be used is to use interactive multimedia modules which, combined with the game, considering that 70% of students prefer to play games in spare time, rather than studying the physics of matter. This required learning model application of Problem Based Learning to the maximum to enhance the critical thinking skills of learners.

B. Stage 2: Design

Based on the needs analysis and then created a prototype as shown in Figure 3. Interactive multimedia module design using Adobe Flash Profesional CS 6. The menu in interactive multimedia produced has interactive buttons, video, sound, text, images, simulations and games.



Figure 3. Design Of Interactive Multimedia Module For Learning Material Of Parabolic Motion

The component of interactive multimedia modules are modul description, instruction, learning scenario, learning activity, author, and reference. The material appropriated with KI and KD in the curriculum. To make student interest do the task, evaluation laid in the game.

C. Stage 3: Validation

Validation is done by several experts and practitioners. The tests showed that products made are valid, with the score validation in Table 2.

Table 2. Result Of Validation Stage.

Validator	Score
Validator 1	94,87 %
Validator 2	93,48%
Validator 3	95,56 %
Validator 4	93,68 %

IV. CONCLUSION

Based on the results of define phase has been known that in the implementation of learning in a high school in Padang city, never use interactive multimedia-based teaching materials. Percentages of critical thinking ability of learners are still low. Implementation of the PBL model in physics teaching is not optimal. One way to overcome this is using interactive multimedia modules in the PBL models aided games to enhance the critical thinking skills of learners. Based on the validation results, the interactive multimedia modules that have been produced are valid. In the future will conduct product testing for learning physics to determine the effectiveness and practicalities of the product.

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