Initial studies for development of interactive multimedia modules assisted games to increase the critical thinking skill of Senior High School students

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Abstract. This research and development aim to produce a game-assisted interactive multimedia module for 10th grade senior high school students. This interactive multimedia module aims to facilitate the teacher in delivering the material and raises the critical thinking of the students. The method used to find out the results of research with the development of Reeves models. The development of interactive multimedia module that covers learning material; measurement, vector and straight motion. In this paper, we will discuss the analysis of the need to develop game-assisted interactive multimedia modules.

1. Introduction
At the secondary education level is transformed in various kinds of sciences that can be used as a stock of students to develop the potential that is in him. One of the basic sciences taught in secondary education is physics. Physics is placed as one of the most important subjects due to the many physics that produce new findings in the field of science and technology [1].

Physics lessons can equip students with knowledge and understanding of the various natural phenomena, as well as the abilities required to enter higher education levels. These two main objectives can be achieved by the study of physics which is one of the branches of Natural Sciences (IPA) as it relates to processes, attitudes, and scientific products [2]. Physics is needed to study natural phenomena that demands the ability to think so that the experiments and observations of physics in schools are important by students.

In addition, physics also requires students to use critical thinking skills in solving real-life problems, by studying physics students are expected to increase knowledge, skills and admiration to the creator. Thus, physics learning is expected to produce human resources that can develop critical thinking skills so as to create quality human beings. One branch of science is physics, which plays a major role in life. The principles and concepts of physics are applied through technological products that are developing today.

The low learning outcomes of physics students are caused by many things, including: less effective learning media, less precisely the use of learning media selected by the teacher, less optimal and the lack of student harmony itself, or conventional nature, where students are not much involved in the learning process and liveliness the class is largely dominated by teachers and the learning nature of students is less encouraged to develop their thinking skills. Learning is directed to memorize and
hoard information, so students are smart theoretically but poor applications. As a result, the ability to think critically become frozen, even become difficult to develop. In the learning process, students should be encouraged to develop their own knowledge and responsible for the learning outcomes [3].

Based on the results of observations and interviews in Senior High School 15 Padang obtained data as follows in table 1.

| No | Category  | Senior High School 15 | IDEAL |
|----|-----------|-----------------------|-------|
| 1  | Analysis  | 3.77                  | 10    |
| 2  | Evaluation| 3.00                  | 9     |
| 3  | Inference | 1.62                  | 5     |
| 4  | Deduction | 0.73                  | 2     |
| 5  | Induction | 1.00                  | 4     |

Based on the data in Table 1, shows the fact that students’ critical thinking skill ability in physics is still not optimal. From the graph in Figure 1 it can be seen that the comparison between critical thinking skills of learners in the field is still lower than ideal conditions expected. For that needed solution to increase critical thinking skill learners. The low critical thinking skill influences students' learning outcomes. This is evidenced by the results of the critical thinking skill analysis by using California Critical Thinking Skill Test (CCTST) conducted by Djamak et al [4] as in Figure 1.

According Widowati [5]: "there are at least four skills that must be owned by students in the 21st century, namely: creativity and innovation; critical thinking and problem solving; communication, and collaboration ". From Widowati statement is one of the skills that must be owned by 21st century students is critical thinking skills. Critical thinking skills in students not only arise, but should be trained and developed, one of them through education.
Critical thinking skills in these students are trained one of them using technology is interactive multimedia is a form of information technology used in the optimization of teaching and learning activities. The application of multimedia allows one to develop an interactive learning medium that is audiovisual in the hope that can improve understanding of the material learned by learners. In addition to teachers, the application of multimedia learning can develop the ability of learning models with multimedia approaches in accordance with the demands of competence of learning outcomes.

Multimedia in physics learning is used to simplify the power of abstraction (fantasy) done by students. Text, images and animation are used to help students understand the material, to arouse interest in learning, and are expected to improve student learning achievement. As an interactive multimedia that is expected to be part of the learning process. One of the learning media is the use of modules.

The module is one of the learning media that plays an important role in the learning process. With the module, more students can learn to direct at home, even though no teachers. Modules that are accompanied by pictures and examples in everyday life are expected to further increase students' motivation to learn. One of the renewal efforts in the field of education is characterized by the use of various methods that vary with the characteristics of the material, characteristics of students, and existing facilities.

Based on the background of the problem that has been described, the researcher is interested to make the teaching materials physics. This instructional material is expected to increase critical thinking skill learners. Therefore, the title of this study is the Early Study of CTS Improvement of High School Students through the Development of Interactive Module Multimedia Assisted Games.

2. Research Method
The type of research that will be carried out is research and development that is used to produce certain products and test the practicality of the product. This development study uses the Reeves model's development model. The Reeves model's development in this module consists of four stages: problem analysis phase, prototype design and development phase (design and development the prototype), iterative testing and refinements, and implementation phases.

Reeves development procedure, researchers designed this study in four stages, namely analysis of the problem which includes analysis of the needs, studies and theoretical framework. In the development design stage, the preparation and development of solutions is carried out so that it can be implemented on educational issues, on repeated testing and testing improvements are carried out several times so that a valid, practical and efficient interactive media module as well as the implementation stage are summative evaluation to conclude the solution and meet the specifics that have been carried out.

This product trial was conducted to determine the extent of the module's ease of use by the teacher and the extent to which the module was developed capable of increasing the critical thinking skills of students on measurement material, vector and straight motion during learning took place Senior High School 15 Padang.

3. Results and Discussion
Research conducted by Ahmad Mukhlisin [6] improving students 'critical thinking skills through the RMS model to learn the basic concepts in science in the RMS model influences critical thinking Students' skills, where students are able to think critically of students. Research methods which are development and research. the development phase includes analysis, design, development, implementation and evaluation. The method used in processing data uses a questionnaire. Subsequent research is the research of Seyed Ahmad Hashemi [7] Use of Critical Thinking in Social Sciences Middle School Textbooks: A field study from the province of Fars in Iran that can influence and influence students' critical thinking skill. This study uses research and development (R & D) method based on Borg Gall's model. This model becomes a formula and can improve students' critical thinking.
The research linkage that will be carried out with previous research is that the module will continue to assist with Guided Inquiry assisted game models to improve students' Critical Thinking Skill. The modules that will be developed are expected to improve students 'critical thinking skills, therefore to assess students' critical thinking skills. The research phase that will be carried out until the implementation stage in the research uses the RMS model.

The results of the research are the elaboration of the implementation of the study as a whole. This chapter presents the process of developing interactive multimedia assisted games. The development process starts from the problem analysis stage, the solution stage, iterative testing and refinements, namely the stages of repetitive testing and improvement to get a valid and practical product. Finally, the implementation phase is the implementation of interactive multimedia assisted games modules to see their effectiveness in increasing critical thinking skills of students.

3.1. Result of Research Stage Problem Analysis
The problem analysis stage is the initial stage of development, at this stage a problem assessment is carried out which includes the final preliminary analysis, material analysis and student analysis. Final preliminary analysis. In the final preliminary analysis there is performance analysis, SKL analysis, job analysis and analysis of learning difficulties. The results obtained from each of these analyzes are described as follows:

3.1.1. Final preliminary analysis.
In the final preliminary analysis there is performance analysis, SKL analysis, job analysis and analysis of learning difficulties as shown in Figure 2. Performance analysis consists of teacher performance, facilities and infrastructure, school policies and social climate. The performance analysis averages 88. Need analysis is an activity to identify supporting factors and inhibitors of the learning process in order to choose and determine the right and relevant media to achieve learning objectives and lead to an improvement in the quality of education. Needs analysis is 80. Analysis of learning difficulties shows the causes of learner’s difficulties in learning. Analysis difficulties studied an average score of 57.

![final preliminary analysis](image)

Figure 2. Result of final preliminary analysis

3.1.2. Student Analysis
Analysis of students is a study of the characteristics of students in accordance with the design of the development of games assisted modules. The sample taken is the value of critical thinking skills through a CCTST questionnaire because the developed module is designed to increase students'
critical thinking skills. Based on the results of the CCTST questionnaire analysis, the analysis of students was still low.

3.1.3. Learning material analysis
In learning material analysis, the identification of the main materials that will be taught and compile them systematically and look for the relevance of concepts.

3.2. Design and Development the Prototype
This stage is the stage of designing interactive multimedia handouts. The design of interactive multimedia-assisted game modules refers to the analysis that has been carried out in the previous stage. The interactive multimedia module consists of several parts, namely, (1) general instructions that contain KI, KD, indicators, instructions for using handouts. (2) teaching materials (3) student worksheets and questions that are in accordance with the subject matter.

3.3. Iterative Testing and Refinements Phase
3.3.1. Validation Phase
After the design phase of an interactive multimedia assisted game module to increase students' critical thinking skills, the interactive multimedia module is validated. Validation results are valid

3.3.2. Practicality
Practicality is taken from the results of the questionnaire responses of teachers and students while participating in learning using interactive multimedia modules to increase students' critical thinking skills. Practitioners assess the practicality of practical interactive multimedia modules.

3.4. Research Results Implementation Stage
Providing quizzes at the end of the meeting with this can increase students' knowledge, the value of their attitudes also increases and their skills. From the results above, the results obtained are the explanation of theoretical studies is very clear, so that at this stage will be seen the compatibility between the results of the study with the theoretical studies that have been described. In this discussion will be explained about the results achieved in the study, the limitations encountered, and some alternative solutions.

3.4.1 Stage Problem Analysis
The results of this planning phase are in line with expectations that the objectives at the planning stage can be achieved well. The results of the initial preliminary analysis found that students had difficulty translating and solving problems with a high level of reasoning.

3.4.2. Phase Design and Development the Prototype
The learning steps developed in RPP, modules and assessments refer to games-assisted interactive multimedia modules to increase students' critical thinking skills. It aims to assist learners in achieving their goals in accordance with the objectives set out in the analysis of learning objectives.

3.4.3. Iterative Phase Testing and Refinements
Language validity based on the results of the research that has been done is found that interactive multimedia assisted games modules are developed valid in terms of devices and language and practicality test

3.4.4. Phase Implementation
The module is said to be effective if after learning using interactive multimedia modules there is a positive impact on students. After 80% of students are complete.

4. Conclusion
Based on research procedure of development of Reeves model on development of interactive multimedia module supported games to improve critical thinking skill learners obtained the findings as follows (1) Stages of problem analysis, the need for good material delivery materials to improve learning motivation and critical thinking skill learners. (2) the need for good teaching materials to improve learning motivation and critical thinking skills of the students. (3) Iterative testing and refinement stage, interactive multimedia module supported games developed valid and practical. (4) Implementation phase, interactive multimedia assisted games modules are developed effectively in increasing critical thinking skills.
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