Curriculum analysis in developing interactive multimedia teaching materials scientific model assisted games for physics learning

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Abstract. Students in the revised 2013 curriculum are required to have creativity and critical abilities. Therefore, efforts must be made to improve critical thinking skills using interactive multimedia teaching materials assisted games. As the first step in developing the ADDIE model, descriptive curriculum analysis is needed to determine the application of the revised 2013 curriculum in physics learning. Based on the results of the analysis found in the field, the revised 2013 curriculum demands have not been fulfilled. This is because, most of the learning media used by students have not been able to make students active. Students are only invited to read and write, but are lacking in carrying out activities that include critical thinking skills. Facing these problems, it is necessary to develop a form of interactive multimedia teaching material scientific model assisted games. The development of this teaching material makes students not only read and write, but also do activities that can hone creativity and thinking skills. Teaching materials assisted games will help students become happier in learning activities.

1. Introduction
The purpose of national education to make a quality human can be achieved by preparing a curriculum which is a set of plans and arrangements of content, objectives, lesson materials and how to use them as a guide in organizing learning activities. Preparation of the curriculum as one aspect in achieving the goals of national education is designed in order to foster the character, competence, and literacy of students. These three things are needed so that students are able to face a changing environment, overcome complex challenges, and can apply the skills they have for daily activities.

In line with the curriculum developed to foster the character, competence, and literacy of students, in this millennium era students are required to dominated by technology and science. Science can be defined as (1) a process of obtaining information through empirical methods; (2) systematic and logical investigations to obtain information; and (3) a combination of critical thinking processes that generate reliable and valid information [1].

The curriculum is one component of education that influences the successful implementation of education. A good education process will be achieved if the six components of education, namely curriculum, teachers, facilities and infrastructure, educational technology, students, and evaluation can interact well. Therefore, curriculum development must be effective in order to prepare graduates in accordance with the public interest [2].
The physics which is one of the branches of science studying the phenomena through a series of processes known as the scientific process and the result is released as a scientific product. Physics also aims to enable students to develop a scientific attitude, develop experience, develop reasoning skills in thinking inductively and deductively, and master physical concepts and principles [3]. Based on the purpose of the subject of physics, it can be seen that by studying physics students can develop the ability to think critically and scientific attitude through problem solving and process approach.

Physics learning that is able to develop the ability of critical thinking and scientific attitude required by students as stock in continuing study and plunge into society. Therefore, in addition to the active involvement of students, it is also necessary for teachers to raise their ability to solve problems, independent, and to think critically.

The government made various efforts in improving the quality of education, such as the improvement and development of curriculum so that learning is more directed as time develop. The existence of curriculum development carried out by the government is to face the challenges of the future, avoid negative perceptions of the community, and reduce negative phenomena that occur in the educational environment [4]. The government also seeks to improve the quality of teachers through upgrading, training, seminars, and improving facilities and infrastructure in learning. Teachers also routinely do the subject teachers’ forum to discuss issues of education they face in school and share knowledge about various things to improve education. Teachers in learning also have used learning media that are expected to attract students to learn so that the quality of education can also increase.

The reality in the field shows that students of senior high school Padang are still constrained in studying physics. Based on the observation result, in Physics learning, students tend to memorize Physics formulas, so if given high level problem (complex), students are less able to answer the problem well. Physics learning is only a collection of formulas, and students must memorize. Formulas memorized by students are often mixed so students find it difficult to distinguish in terms of how the formula is used [5]. The dependence of students in memorizing the Physics formulas is also directly proportional to the lack of mastery of students in mathematics. The character of the students who still receive what is given by the teacher is still one of the problems of the lack of achievement of the educational objectives in Indonesia, this is caused by some of the factors, the lack of variety of teaching materials or learning resources used in the learning process. The teaching materials used are less able to help students to be active and creative, students only focus on one of the handbooks or books used by teachers to teach, so that students only accept what is conveyed by the teacher. This will have an impact on the achievement of competence and improvement of students' critical thinking skills [6].

Faced with these realities, students should spend more of their time to practicing solving physics problems related to their daily lives. Because with the practice, students can see that the formulas that exist in Physics does not need to be memorized everything, but can be seen from the phenomena that occur around it. However, the reality in the field is to fill free time, students spend more free time with playing online games at internet cafes or playing on their android. Filling free time by this way makes time wasted and can cause addiction for students if the activity continues. Research on learning, motivation and low critical thinking skills student, senior high school of Padang has been carried out by previous researchers. Who noted that the average critical thinking skills of high school students in Padang City were 35.13% [7], 38.83% [8].

The reality in the field should be attention of teachers in order to design an interesting learning activities for students. Thus, students are motivated to study Physics not only during school hours, but at the time of filling their spare time so as not to be filled with activities that waste time. In addition, by utilizing technology, it can be developed an interesting form of teaching material to be used by students in learning. The teaching materials in question are a set of printed or non printed materials systematically arranged to create an environment / atmosphere that allows students to learn [9]. Development of teaching materials is not only useful as a teacher and student guide in directing its activities during the learning process, but also useful as an evaluation tool to see the achievement of learning outcomes.
Presentation of material in teaching materials is presented in the form of interactive multimedia. So that the messages and information obtained by students come not only through one medium, but come from many media such as text, video, graphics, images, animation, sound. The use of multimedia can create dynamic and interactive presentations that combine text, graphics, animation, video, and audio. In addition, students not only pay attention, but also interact during the learning process. The use of media in learning is important because it is reinforced by the opinion by Edgar Dale, who proposed a theory known as the Theory Cone of Experience. In this theory, the level of learning experience gained by students determines success in learning. The experience that teachers provide through student learning activities becomes the determinant factor of students succeed in learning. The cone of experience as shown in Figure 1 below:

Figure 1. Edgar Dale’s Cone of Experience

Figure 1 shows that learning is not just reading or listening, but learning is an integrated unit to create a maximum learning process. Therefore, we need media to increase the level of information we remember. Furthermore, the media is able to make students pay attention to the learning provided by the teacher. Interactive multimedia can make students directly and interact well during learning. As a result, the use of interactive multimedia will give maximum results for student learning outcomes.

There are six forms of learning interaction that can be applied in designing an interactive multimedia, which are: (1) Tutorial; (2) Drill and practice; 3) Simulation and Games; 4) Invention; 5) Problem solving. The presentation of multimedia in the form of games can provide a sense of pleasure for students and attract students’ interest in learning. Games that still refer to the learning process, make learning activities while playing.

The use of interactive multimedia teaching materials assisted games is expected to foster students' competence and literacy through critical thinking habituation. The existence of games in physics learning is also expected to create learning that is more fun, meaningful, and easy in understanding learning. In connection with students' interest in games at Senior High School in Padang city, a study was conducted and obtained high results, which is 56.26%.

Furthermore, the values of the characters must remain accustomed to the teacher in learning and as much as possible included in the developed teaching materials.

The purpose of this study is to analyze the implementation of the 2013 revised curriculum in the current Physics lesson, revealing the form of teaching materials used, the way of teaching to equips
students with character values, the ways for teachers to improve creativity, learning motivation, student activities, and constraints that faced by teachers to familiarized students to solve problems. This information gathering activity is the first step of the development model used is ADDIE Model. All the information obtained will be used as the basis in designing (Design) interactive multimedia teaching materials assisted games with the scientific model for Physics learning.

2. Research Method
This research is an early stage of the development model is ADDIE model. The first stage of the ADDIE model is Analysis. The analysis was done by distributing the instruments in the form of questionnaires and interviews to students and physics teachers. Physics learning conditions in the revised 2013 curriculum that want to be disclosed include: the form of teaching materials used, the way of teacher to equips students with character values, the way teachers improve creativity, learning motivation, student activity, and constraints faced by teachers to familiarize students to solve problems.

This research was conducted in one of the Senior High Schools in the City of Padang, namely Senior High School 13 Padang. The data collected from this study are processed and displayed in the form of graphs or tables which are then analyzed.

3. Results and Discussion
Physics learning conditions in the curriculum 2013 revisions in schools are described through the provision of instruments in the form of questionnaires and interviews with students and Physics teachers.

The results of the analysis of the learning conditions of Physics that took place at Senior High School 13 Padang up to now are described in Figure 2.

![Figure 2. The results of the analysis of Physics learning conditions through a questionnaire instrument for students](image-url)
The results of the analysis of interviews regarding the development of student character values show that Physics teachers in Senior High School 13 Padang have tried to equip students with character values through habituation to character values such as religious, honest, tolerant, discipline, and others into the learning process or delivered verbally by the teacher. If the teacher develops a teaching material, the teacher also includes the character values that should appear in the activities or sections that are in the teaching materials. However, out of the 18 character values that should appear in learning in the curriculum 2013 revision, not all of them were observed by Physics teachers.

In addition to the results of interviews regarding student character values, in accordance with Figure 2, it can be seen that 66.7% of students felt able to answer analytical questions. The results of this analysis are supported by the results of interviews conducted with the teacher that after studying Physics, students appear to have increased ability to analyze problems related to Physical phenomena. However, the cognitive level achieved by the students at this time only reached the level of analysis and has not reached a higher level of evaluating and creating. Although, from the results of interviews, Physics teachers try to make problems that have a high level of thinking and also familiarize learners with using technology, but this has not been able to improve students' cognitive achievement. In fact, education in the 21st century is demanding that students can think high level (High Order Thinking Skills). For that, teachers should need more intensive in familiarizing the students to be able to process the problems of HOTS or do activities that can hone the ability of high-level thinking.

The result of the next analysis is about the basic literacy capability are listening, speaking, reading, writing, and calculating. Which is worth 75%. Students' basic literacy skills are seen and assessed by Physics teachers through class discussions and tests conducted on students. Literacy skills are important for understanding, knowing, and applying the knowledge gained in school. In addition to life in school, literacy skills also relate to student life, both at home and in the surrounding environment. However, literacy in schools is more focused on reading literacy [15].

The basic literacy that students now have must also be accompanied by creativity, liveliness, independent attitudes, and good communication in learning. Based on Figure 2 can be seen the results for creative and independent is 64.6%, liveliness in conducting experiments or practicum 60.4%, and able to communicate and give criticism respectively 69.8% and 62.5%. This result is quite low compared to the basic literacy that students have. Physics teachers are also trying to improve creativity, innovation, student activeness in Physics learning through group discussion, practice, tasks, and enrichment. However, there are still students who are not active, creative, and innovative in Physics learning. To improve the students’ creativity, activeness, and innovation, it is necessary to present a learning environment that is not always in the form of class discussion or group work, but it needs to be familiarized so that students can work independently so that teachers can see students who are lacking in activeness, creativity, and innovation in Physics learning. This can be done for example the teacher making a form of interactive learning materials in which there are games in the form of quizzes. So students can give their answers independently.

The next analysis result of teaching materials used and developed by Physics teachers in the form of handouts, Student Worksheets, Books, and animation. From the results of the analysis, there are still few forms of non-printed teaching materials developed by teachers. In fact, based on Figure 2 students have been able to utilize technology as a learning resource (75%). However, due to the less motivation of students in finding other learning resources other than those provided by the school (55.2%), the ability of this technology becomes less useful and the students are not updated about the latest things in Physics (63.5%). In order for student motivation to appear to learn from non-printed learning resources that utilize technology, it is necessary to develop a form of teaching material that appeals to students to use it.

The use of ICT in learning in schools is good (66.6%), but because the use is still in a less interactive and fun form for students, it is necessary to develop a form of interactive multimedia teaching material that is fun for students, such as interactive multimedia teaching materials assisted games. Teaching material in this form is felt to be a solution for the lack of student motivation. Based on Figure 2, students feel they will be more understanding if learning with the help of games (70.8%).
Games are believed can increase students' intrinsic and extrinsic motivation in learning physics. In addition, games that have relevance to everyday life make learning activities much more interesting [16].

Many of the students are using technology for futile things such as playing games online become a concern in the effort to develop teaching materials are assisted games. Due to the existence of games-assisted instructional materials, students will gain knowledge and skills that benefit him. Learning while playing is something students really like. So, it is expected that with this teaching material, high-level thinking skills, creativity, liveliness, innovation, and students' motivation in learning can increase.

4. Conclusions and Recommendations

Based on the result of analysis of the Physics learning condition in curriculum 2013 revision at Senior High School 13 Padang, which became the school where the research was conducted, the following findings are found: a) High Order Thinking Skills (HOTS) of students are still lacking. b) The creativity, innovation, and activity of students in Physics learning are far from ideal. c) Physics learning conditions that have not optimized the use of ICT-based teaching materials. d) Need to develop interactive multimedia teaching materials assisted-games

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