Preliminary study of the use of games interactive multimedia module to increase critical thinking of students in senior high school

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Abstract. The poor of students critical thinking skill in senior high school is happened because the materials used do not challenge them to think high. Therefore, it is important to do some efforts to produce challenging materials for students using critical thinking proces. One of them is by developing interactive multimedia module in a form of games to increase students critical thinking skill. The study is research and development using Plomp model. This model consisted of 3 phases: preliminary research, prototyping phase, and assessment phase. In preliminary research, problem analysis use questionnaire followed by literature study. Based on analysis finding in preliminary research, the student interest in learning physics is high enough, it is around 65.3%, the student interest in using multimedia and games is high, they are around 86.2% and 85.6%, however of the use of technology and games level in learning process is low enough, they are around 37.6% and 36.5%. In learning activity, teachers tend to use more lecture methode or teachers center than student center. In the use of materials, especially module, teachers tend to use printed module existed in market. It cause the poor of students critical thinking skill.

1. Introduction

Quality education is the hope and longing for the entire community and the goals of the Indonesian government to produce quality human resources, the benefits for themselves, society, nation and state and high competitiveness in the global era. The aim of national education is to develop capabilities and shape dignified national character and civilization in order to educate the nation's life, aiming at developing the potential of students to become human beings who believe and fear God Almighty, noble, healthy, knowledgeable, capable, creative, independent, and become a democratic and responsible citizen [1].

Education in the 21st century is becoming increasingly important to ensure students have learning and innovation skills. Skills for using information technology and media, as well as being able to work and survive using life skills. Therefore, learning should be directed at developing these three aspects. Learning skills and innovation include critical thinking and problem solving, communication and collaboration as well as creativity and innovation. Technology and media information skills include information literacy, media literacy and ICT literacy. Life and career skills include flexibility and
adaptability, self-regulating initiatives, social and cultural interactions and productivity and accountability.

The Ministry of Education and Culture of the Republic of Indonesia has adapted 21st century education for curriculum development to realize national education goals. The government also made other efforts to achieve national education goals such as providing facilities and infrastructure, making laws and government regulations on education, conducting training for educators, giving awards to outstanding educators and other efforts. This is expected to have an impact on the quality of learning.

The educational process is inseparable from activities in the class. Learning activities are largely determined by the interaction of teachers and students. Teachers are required to be able to present learning materials optimally. Therefore, new creativity and ideas are needed to develop ways of presenting learning materials at school. Creativity that is intended is the ability of a person in choosing the right method, approach and media.

Learning is a system consisting of various components that are interconnected with one another. The learning component in question includes: objectives, material, methods and evaluation. In a learning process integrating various components and activities, namely students and the learning environment to obtain behavioral changes (learning outcomes) in accordance with the expected goals [2]. Learning activities are educational processes that provide opportunities for students to develop their potential to become abilities that are increasingly increasing in attitudes, knowledge, and skills needed for life and for community, nationhood, and contribute to the well-being of human life. [3]. Therefore, learning activities are directed at empowering all potential students to become the expected competencies.

Physics as one of the subjects is a branch of natural science that underlies the development of technology and the concept of living in harmony with nature. As a study of natural phenomena, physics provides a good lesson for humans to live in harmony based on natural law. Physics is related to how to find out about natural phenomena systematically. The physics is not only mastery of a collection of knowledge in the form of facts, concepts, or principles but also is a process of discovery [4]. Physics is also expected to be a vehicle for students to learn about themselves and their surroundings. In addition, the prospects for further development in applying them in their daily lives. Learning physics is not just learning about information, concepts, principles and laws to realize declarative knowledge. It is also learning about how to obtain information about physics and technology as a form of procedural knowledge. Physic is also the habit of scientific work and using scientific methods and attitudes [5].

The new paradigm views educators as not the only determining factor in the teaching and learning process [6]. The presence of teachers can be helped by teaching materials, such as books, modules, other educational software that can be used to learn independently by students. One effort to realize independent learning is to provide a variety of teaching materials [7]. Different teaching materials will provide different experiences for students [8].

The advancement of ICTs offers both conveniences and challenges, including in the world of education. Some of the challenges faced by the world of education today include: 1) the teacher is no longer a primary learning resource, but creates conditions for students’ independence in learning; 2) the teacher is not fixated on lecture learning, but requires media that can stimulate thinking more creatively and independently [9].

The use of technology in learning is very useful, especially in the learning of physics, which is mostly abstraction. The use of technology in physics learning is partly abstract. The use of technology such as the presentation of animated physics is expected to explain material that is abstract and can present phenomena that cannot be seen directly. Computer assisted learning can contribute to students attention which is relatively high compared to ordinary learning [10]. The effectiveness of interactive media reaches a very effective category, based on student learning outcomes reaching 87% and increasing student competencies including high categories [11].
Based on the above research, information technology should be applied in the learning process so that learning becomes more interesting and effective. One of them is the use of interactive multimedia modules that display various simulations and animations.

The interactive multimedia module allows the educator to present material in an interesting and varied manner. Multimedia modules can be combined with games to make them more attractive. The use of games that contain elements of education can also provide benefits for students. Games can teach academic and non-academic skills, motivating students to collaborate in sharing information and improving the work of students [12]. The use of multimedia modules based on games in science learning proved to be more efficient [13].

Apart from that in games based learning there are self-evaluation activities. The students are able to assess themselves so that better learning results are obtained because students know their weaknesses and strengths. The application of learning with authentic assessment and self-assessment can improve problem solving skills and self management [14].

Quality learning cannot only be realized through the use of technology. Quality physics learning can also be through the use of appropriate learning models. The learning model recommended by the 2013 curriculum is a scientific learning model.

However, the reality in the field shows that teachers have not used the teaching materials recommended by the 2013 curriculum. Based on the results of interviews with physics teachers at Senior High School (SMA) 1 South Solok regarding the implementation of Physics learning in schools, teachers have implemented the 2013 curriculum. However, teaching materials used are not in accordance with the 2013 curriculum. Although the 2013 curriculum has been applied nationally and training has been conducted on 2013 Curriculum, teachers still use teaching materials that are not in accordance with the 2013 curriculum principles. The teaching materials used have not shown any steps with scientific approaches and learning models recommended in the 2013 curriculum. In addition, teaching materials used by teachers have not varied. The teacher only uses teaching materials in printed form. The printed material used is fixated on instructional materials from the publisher.

Seeing the reality above, students should fill more time when they study with various learning resources. However, the reality in the field in filling free time, students fill more by playing Online Games in internet cafes (internet cafes) or playing on their android. Filling free time in this way makes time wasted and can cause addiction for students if the activity continues. According to a survey held by TNS Indonesia, it was mentioned that internet access in Indonesia was dominated by teenagers. The survey said that teens who use the internet play online games as much (35%), and as many (55%) online game users are young men [15]. This is a challenge for educators how to make the game an educational arena.

Based on the description above. It is known that various efforts have been made to improve the quality of physics learning. The author tries to offer a solution to the need for developing interactive multimedia modules. Like a scientific model with games in order to increase the critical thinking skills of high school students.

So, from that as a first step the author needs to do a preliminary study. Needs analysis through observation, interviews, questionnaires conducted at Senior High School (SMA) 1 South Solok in class XI students, teachers, materials (curriculum) and conditions and labor activities. So that the
The development of multimedia modules with scientific models is aided by games in order to increase critical thinking skills of high school students really need to be developed.

2. Method

The type of research chosen is research and development. This study uses a plomp development model developed by Tjeerd Plomp. The learning development model according to Plomp consists of three stages, namely the preparation stage (preliminary research), the second stage of development (prototyping phase), the three stages of assessment (assessment phase) [16]. This research is the initial stage of the Plomp model development model. The first stage of the plomp model is the preparation stage (preliminary research). Preliminary research activities consisting of three activities, namely the initial analysis, analysis of the characteristics of students and material analysis. The preliminary research stage is to get information about existing problems. Including student interest in physics learning, availability of learning resources, use of media and difficulties encountered in secondary school learning. It is through observation and direct interviews with students, teachers and using questionnaires in order to obtain characteristics students, teachers and observing the circumstances and activities that exist in schools and labor accompanied by literature studies to obtain an overview of the gap between the existing situation and the expected one so that a solution emerges.

Preliminary studies were carried out at South Solok in class XI MIA 1 students, as well as conditions and labor activities in the 2018/2019 academic year. Data from observations, direct interviews and questionnaires were analyzed using descriptive analysis techniques. It is namely by calculating the index of each indicator of observation instruments, so as to illustrate whether the use of existing teaching materials. It is optimal if not whether the development of interactive multimedia teaching materials that are games-assisted in order to improve HOTS is one of the critical thinking skills of participants being educated based on the indicators observed.

3. Results

The results of this studies contain data about the conditions of physics learning at Senior High School 1 South Solok in class XI MIA 1 2018/2019 academic year with indicators consisting of (1) the interest of students in physics learning, (2) Availability of multimedia facilities, (3) critical thinking, (4) student interest in the game, (5) use of games in learning (6) enthusiastic students about the game, (7) student interest in multimedia use, (8) use of technology, (9) learning difficulties, (10) use of learning models, (11) expectations of students and the dimensions of teaching materials prepared by educators and the use of teaching materials used by students.

The eleven indicators are described in several sub-indicators, then written in the form of statements filled by students in accordance with each individual.

The results of the analysis of the characteristics of students seen from the conditions of physics learning at SMAN 1 Solok Selatan in students of class XI MIA 1 are expressed in graphical form as follows.
Figure 1. Results of Learning Condition Analysis

The form of teaching materials prepared by educators and teaching materials used by students in learning in class can be seen from the following graph.

Figure 2. The Material That Arranged by The Teacher
4. Discussion
Judging from the graph one the conditions of physics learning at Senior High School 1 Solok Selatan in class XI MIA 1 2018/2019 academic year obtained the interest of students in physics learning 65.3%, availability of computer devices 80%, difficulties in learning 60.3%, usage of the model of 62% of use technology in learning 37.7% of participants' interest in multimedia use 83.6%, interest in games 62.6%, enthusiasm of students towards the use of games in learning 80.4%, expectations of educators to succeed 80% and critical thinking skills of students is 43.6%.

Here, it is seen that student learning outcomes are still below the expected standards, this is characterized by students’ critical thinking skills of 43.6%. From the data, it can be seen that this is due to the use of instructional materials that have not been able to stimulate critical thinking skills. The application of models in learning that are not optimal, lack of utilization of informative technology in learning and lack of educator attention to the development of students' interest in multimedia and games.

From graph three the use of teaching materials by students is seen 63.5% of student use printed teaching materials where 88% use printed book, 38% use module and 12% use internet source. Students have not used varied learning resources and used information technology.

Besides that, from graph two, 92% of educators compiled print modules and 2% compiled information sheets and only 3.8% made non-print teaching materials. Teaching materials produced by educators are still limited to print teaching materials.

Here, it can be seen that the teaching materials prepared by educators and used by students have not been able to stimulate students' critical thinking skills. So that classroom learning will focus on educators as the main learning resource.

On the other hand, the development of information technology is very rapid and the response of students to ICT is very high but on the contrary the level of use by educators in learning is still lacking, and the absence of innovations made by educators use information technology that is relevant to the existing material. It is seen that the interest of students in multimedia learning is very high, but the use of multimedia by teachers in learning is still low, this is a challenge for educators to use the potential of existing students to multimedia as a capital to improve the learning process in the classroom.

On the other hand, after learning activities students fill it with playing games, this is indicated by the results of analysis that shows a high interest in the game. This allows educators to present material
with multimedia modules combined with games to make it more interesting. The use of games that contain elements of education can also provide benefits for students. Games can teach academic and non-academic skills, motivating students to collaborate in sharing information and improving the work of students [12]. The use of multimedia modules based on games in science learning proved to be more efficient [13].

However, with the use of technology in learning, it is very useful, especially in the learning of physics, which is mostly abstinent. The use of technology in physics learning is partly abstract. The use of technology such as the presentation of animated physics is expected to explain material that is abstract and can present phenomena that cannot be seen directly. Computer assisted learning can contribute to students' attention which is relatively high compared to ordinary learning [10]. The effectiveness of interactive media reaches a very effective category, based on student learning outcomes reaching 87% and increasing student competencies including high categories [11].

Based on the results of the field study. It seems very urgent to develop an interactive multimedia module using a scientific model with games to increase the critical thinking skills of high school students.

5. Conclusion

Based on the results of the analysis and discussion, it can be concluded that the students' learning outcomes in learning physics especially the students' critical thinking abilities are low because the application of learning models used in classrooms is not optimal, existing teaching materials have not been able to stimulate students' critical thinking skills, the lack of utilization of information technology in learning and the low educator's response to students' high interest in multimedia and games. For this reason, it is necessary to develop interactive multimedia teaching materials using scientific models with games to increase students' critical thinking skills.

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