Preliminary analysis of development electronic module using inquiry based learning model for 21st century

Fitri Nisak* and Yulkifli Yulkifli
Department of Physics, Faculty of Mathematics and Natural Science, Universitas Negeri Padang, Jalan Prof Hamka, Padang, 25131, Indonesia

*fitrinisak@gmail.com

Abstract. The 21st century sign by the development of science and technology rapidly. In this century, all information can be accessed easily any time and anywhere. Physics learning in the 21st century should be able to take advantage fully of technology development. Unfortunately, the using of technology in physics learning activities was not going well. In fact, the printed teaching materials still used in learning. These teaching materials can only be used by students during Physics learning activities in the classroom. This cause the learning objectives have not reach fully. Module is one of teaching materials that can help student to study independently. Therefore it is necessary to develop module that is integrated with technology. The purpose of this study is to describe the physics learning condition include performance, graduation standard, learning difficulties and student characteristic. This research is descriptive qualitative research by processing data using descriptive statistic. The sample of this research were students and teachers form two senior high school in Padang. The data collected using questionnaires and interview sheet. The result of this research is development of electronic module using inquiry-based learning model for physic learning in 21st century needs to be done.

1. Introduction
The 21st century is a century singed by the development of science and technology rapidly. In this century, information can be accessed easily anytime and anywhere. The development of technology that has become more advanced, should be utilized in various fields of life. This is in line with the opinion of BNSP, (2010: 22), which states that one of the characteristics of the 21st century is that the world of life will be increasingly connected with information technology, along with its implications, especially in defense and defense systems, industrial education and communication [1].

21st century education is marked by the shifting of some educational paradigms. Education that is initially teacher-centered is now student-centered. Learning in the 21st century requires that students be more active in learning activities, both in digging up information, processing information, presenting information to assessing the information itself. The role of the teacher in the 21st century has changed, from a dictator to a facilitator. This is in line with Anggraeni's opinion which states that in the 21st century teachers who initially spent time disseminating information to students directly now teachers act as facilitators who guide students in doing their assignments [2].

The changing of teachers’ and students role in 21st century should be accompanied by the changing of technology role. Information and communication technology, or commonly abbreviated as ICT which usually used by teachers in conveying information, now it has to changed its role to learn the students. In the other word learning that takes place is integrated with ICT. Integration means a system that
experiences assimilation to become a unified. So integration of technology in learning means the use technology in all learning activities. This is in line with the opinion of the Directorate of Senior High School Development Directorate General of Primary and Secondary Education of the Ministry of Education and Culture (2017: 4), which states that 21st Century education is education that integrates skills of knowledge, skills and attitudes, as well as mastery of ICT [3].

The Integration of technology in the world of education can be used in several ways, including teaching materials. Teaching materials are every forms of material that used to assist teachers in doing teaching so does learning activities. National Center for Competency Based Training (Prastowo 2011: 16) describes teaching materials as all kinds of materials that used to assist teachers in carrying out learning activities. The Ministry of National Education defining teaching materials as a set of materials that are regularly arranged to generate an environment or atmosphere which makes possible students to learn [4].

One type of material is a module. Modules are teaching materials that emphasize the independence of students. This is in accordance with the opinion of Darmiyatun (2013: 9) which states that the module is a teaching material that designed regularly based on a specific curriculum and packaged in the smallest learning unit forms and can be studied independently in a particular period of time so that students can master the learning competencies taught [5]. Winkel (in Siratte, 2017: 319) also added that the module is the smallest unit of teaching and learning program, which is learned by the students themselves individually or taught by students to themselves (self-instructional) [6]. The use of electronic modules is expected to be able to foster the independence of students, because it facilitates students to be able to study anytime and anywhere.

Physics is part of science that was born and developed by means of the scientific steps which are observation, problem formulation, hypothesis formulation, testing hypotheses through experiments, drawing conclusions, and discovering the theories and concepts (Trianto, 2009: 137) [7]. Physics is one of the subjects that can increase students' curiosity. This is in accordance with the learning objectives of Physics, namely showing scientific behavior (having curiosity; objective; honest; thorough; careful; diligent; tenacious; careful; responsible; open; critical; creative; innovative and caring for the environment) in daily activities as a form of application scientific attitudes in doing experiments and discussions [8].

The achievement of learning objectives is a necessary thing in learning. The learning objectives of physics can be achieved to the maximum by using a learning model. One of the learning model that suit for physics learning is the one that can increase the curiosity of students. That is a learning model that can explore further the knowledge of students. The learning model that is believed can increase students' curiosity is inquiry based learning (IBL) model. The IBL model is the process of finding new things in the form of a causal relationship where students are more active in learning activities. In the IBL model participants are trained independently to be able to formulate hypotheses and obtain answers through experiments or observations. IBL emphasizes the sense of responsibility of students in obtaining information, all information comes from students. So that the role of the teacher is only as a facilitator in strengthening information that has been obtained by students [9].

The reality in the field is that currently teachers still use ICT as a tool to deliver learning material, whether it displays videos or presents subject matter. If this is allowed, the existing technology cannot teach students. This causes the role of teachers in the class to dominate learning activities and students are passive. This study aims to describe the learning conditions of physics in terms of performance, graduation standards and learning difficulties and characteristics of students. This research is analysis research that will be used for the development of electronic modules based on inquiry-based learning models in 21st century physics learning.

2. Research Method
This research is the first step in development research named analysis phase. At this phase conduct preliminary analysis of the students and the teacher used the questionnaire and the interview sheet. The Data processed using descriptive statistics in the form of graphs. Data used in the form of performance
data, graduation standards and learning difficulties and characteristics of students. The samples from this study were class X students from two schools in the Padang city, named SMAN 4 Padang and SMAN 15 Padang.

3. Result and Discussion

3.1. Result

The following are presented by the results of the research obtained from teacher interviews and questionnaires.

3.1.1. Needs Analysis. In the needs analysis three analyzes were carried out, namely performance analysis, graduation standard analysis and analysis of learning difficulties. Performance analysis is seen from the learning process carried out by the teacher and the use of facilities and infrastructure in learning activities. Furthermore, graduation standard, it is seen based on the competency of the students, namely competence in attitude, knowledge and skills. Then the analysis of learning difficulties is seen from the teaching materials used in this module and the learning model used by the teacher. Based on the graph above, it appears that the performance analysis has a lower value than other analyzes.

![Figure 1. Graph of Needs Analysis](image1)

Furthermore, the results of the performance analysis can be seen in the Figure 2.

![Figure 2. Graph of Performance Analysis](image2)

Based on the results of data processing, obtained a value for teacher identification that is equal to 55.68%. Teacher identification is related to learning activities carried out by the teacher, such as
implementing learning models and using learning media. Based on the interview result that conducted with teachers, it was found that the 2013 curriculum was still unable to be fully implemented at SMAN 4 Padang or SMAN 15 Padang. Students are still not fully active in learning activities so learning is still focused on the teacher.

Facilities and infrastructure at SMAN 4 Padang and SMAN 15 are complete if viewed in terms of Physics laboratory or computer laboratory. But the utilization of the two laboratories is still low. Based on Figure 2, we can see that the use of facilities in this case the Physics laboratory and computer laboratory are at a still low level of 4.75%. The eye teacher of the Physics student concerned said that practicum activities were carried out in the classroom. In other words, practicum tools and materials are brought to class. Besides that, Physics learning activities are very rarely done in computer laboratory. This is due to lack of learning resources or computer-integrated teaching materials. The absence of learning schedules for physics in the laboratory is another cause.

The next analysis is the analysis of graduation standards, in this case related to the three competencies of students. The results of the graduation standard analysis can be seen in the Figure 3.

![Figure 3. Graph of Graduation Standard Analysis](image)

Figure 3 shows that the competency of students' attitudes, especially spiritual attitudes are in the good category. This shows that during this time the learning of Physics at SMAN 4 and SMAN 15 has connected with spiritual students. For the social attitudes of students, they are still in the less category, which means that the learning of Physics implemented does not train the social attitudes of students. Knowledge competency of students has the lowest value among the competencies of other students. This means that the learning that has been carried out has not improved students' understanding of Physics. Furthermore, seen from the competency of skills, the results are far below the attitude competencies, but are above the knowledge competencies. Which means that students' skills are better than students' knowledge of Physics.
In the analysis of learning difficulties, conduct analysis of two aspects, learning model and teaching material. Teaching materials used by students can only be used during learning hours. This causes students not to have teaching materials at home, so the teacher takes a long time in explaining the concept to students. Furthermore, in terms of the learning model used, the teacher still uses traditional learning models. The teacher still explains the overall learning material, this causes the students to be inactive during learning Physics.

3.1.2. Analysis of Students Characteristic. The results of analysis student characteristic at SMAN 4 and SMAN 15 can be seen in the Figure 5.

Analysis of the students’ characteristics can be seen from six aspects, including interest, motivation, learning style, attitude of knowledge and skills of students. Based on the graph, it can be seen that students have a low interest in learning physics, this is because the learning carried out is still focused on the teacher. The low interest of students is also accompanied by the low motivation of students still at 60%. Judging from the learning style, students already know the learning styles that make it easier for them to understand the learning of Physics. Unfortunately, the learning style has not run optimally in the classroom, so that the knowledge of students is also still low at 59% of 100%. Which means that students’ knowledge still needs to be improved. Judging from the competency attitude, students have shown good attitudes in learning physics. Among the three competencies attitudes of
students are better than knowledge competencies. Furthermore, in terms of skills competency, it can be seen that skills are better among all student competencies.

3.2. Discussion
According to the results of needs analysis and students’ characteristics analysis can be seen that at present physics learning is still not in accordance with the characteristics of 21st century education. In 21st century education, students should be more active in learning activities either in searching for information or processing information itself. In accordance with Anggraeni's opinion that states the role of teachers in 21st century education should be able to teach students; students are directly involved in learning activities and teachers are only as facilitators. One step in learning is to use the scientific approach and the appropriate learning model, one of them is the inquiry-based learning (IBL) model. It is because by applying IBL model, students are more active in seeking information, assessing information and even presenting that information (Pedaste, 2009) [9].

In fact, the teachers in both schools, SMAN 4 and SMAN 15 Padang still have not applied the scientific approach to the maximum in learning activities. The inquiry-based learning model has not been used well in learning activities. Some even apply traditional learning methods, namely the lecture method. This results in students being less involved in learning activities so that students' interest in learning is low. The low interest of students in learning physics, also affects the motivation of students. Based on the results of the analysis of the characteristics of students, it was found that student motivation was still low. This means that students are less enthusiastic during the Physics learning activities, and are not eager to learn Physics material at home.

The lack of student motivation in learning Physics can be overcome by the use of teaching materials in the form of modules. This is in accordance with the opinion of Darmiyatun (2013: 9) which states that the module is a systematically designed teaching material in the form of the smallest learning unit and allows learning independently by students. With the module as learning material at home, students can prepare themselves for further learning [5]. The use of modules as an independent learning material at home, can help students to have better initial knowledge than students who do not use modules. This initial knowledge is expected to be able to help students to understand classroom learning better and faster. Increased student understanding also impacts on increasing student learning outcomes. Based on Ramadoni's research results (2019: 5), it was found that the use of modules can improve student learning outcomes which is marked by an increase in the percentage of students completeness in learning. The results of the study stated that the percentage of student’s completeness after using the module was at 92% [10].

In fact the results of the analysis of learning difficulties states that teaching materials used by students today are still in the form of printed teaching materials. The existing teaching materials are still not able to help students to be able to learn independently. Teaching materials in the form of learning textbooks are still not integrated with technology, so students can only use these teaching materials while at school. This certainly cannot facilitate students to study anywhere and anytime. The use of printed teaching materials is not in accordance with 21st century learning which expects maximum use of technology in learning activities.

The 21st Century learning is learning that integrates technology in every learning activity. This is consistent with the opinion of the Directorate of High School Development Directorate General of Primary and Secondary Education Ministry of Education and Culture (2007: 4), which states that 21st Century education is education that integrates knowledge skills, skills, and attitudes, and mastery of ICT [3]. Based on the results of a questionnaire and interview analysis aimed at teachers at SMAN 4 and SMAN 15 Padang, ICT is still not fully utilized in learning Physics. The teacher tells us that currently technology is still used to convey learning material and to show phenomena related to physics learning. The computer labor as for the teacher is not used in learning activities Physic. The results of the analysis of the characteristics of students stated that they preferred learning integrated with technology, such as for example practicing using a laboratory. Learners also enjoy game-based learning. Therefore we need
a learning material in the form of modules that are integrated with technology so that learning Physics is liked and desirable by students.

4. Conclusion

Based on data analysis results, it was found that, first, the physics learning process in two schools in the city of Padang had not yet fully used the learning model suggested by the 2013 curriculum. Second, the use of computer laboratory in Physics learning was not well implemented. Therefore, it is important to develop an electronic module using inquiry-based learning model for 21st century physics learning.

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