

CHAPTER I

INTRODUCTION

1.1. Background

The development of science and technology in the 21st century is accompanied by the development of communication systems, causing changes and progress in various aspects of society, one of which is in the education field. Significant developments make education in Indonesia currently entering the era of the industrial revolution 4.0 where technology and information penetrate and color every life (Nastiti & Abdu, 2020). The way of learning and teaching in the era of the industrial revolution 4.0 is changing. The focus of this era emphasizes digitalization with the aim that the activities carried out can be more effective. The internet, laptops, smartphones are the means used to facilitate the teaching and learning process. The teaching and learning process that used to have to be done face-to-face directly between teachers and students or learning materials that are always brought when participating in the teaching and learning process, can now be done with online classes through social media, online media, or downloading digital books that have been provided in the media. online that supports the online learning process.

In addition, technological developments have also changed the order of education in Indonesia. For example, since 2013 the national examination system has changed from a paper-based test to an online-based test (Pakpahan, 2016), the system for admitting new students from elementary school to university level in Indonesia have done online from registration to announcement of acceptance. Seeing the two situations that initially used paper became paperless media, proves that the current existence of paper will switch to digital. This development also accompanied by the large number of smartphone users especially students who are more interested in viewing information through their smartphones and nowadays, information for learning can be accessed by student using their smartphone, tablet or laptop known as electronic modules (e-modules).

E-module is a form of presenting self-study materials that are systematically arranged into certain learning units, which are presented in an electronic format, where each learning activity in it is connected by a link as navigation that makes students more interactive with the program, which is equipped with video tutorials, animations, and audio to enrich the learning experience (Ditjen Pendidikan Dasar dan Menengah, 2017). In general, the module is a collection of paper containing text or images, the electronic module (e-module) contains digital information that is not only in the form of text or images but also animations and videos. In the module based paper, some materials have not been equipped with illustrations, so that not all materials can be visualized by students, and make students have different understandings of the subject matter (Zuliar & Darmansyah, 2017). Innovation is needed to overcome these problems by providing learning media that can be used as learning resources that are easy to use.

Based on an observation and interview with a physics teacher at SMA Negeri 2 Binjai, it was found that school used teaching material from textbook and there is no use of electronic teaching materials that are made independently. In addition, due to the transition that occurs from online learning to offline make students less interested in print. Students are accustomed to learning by using smartphones and are accustomed to accessing material through their smartphones. Online learning that was less than optimal, students experience difficulties in the process of identifying problems, explaining scientific phenomena that occur, and drawing conclusions in terms of existing problems. This is in line with the scientific literacy test conducted and the results obtained are students' inability to determine what is known, the concepts used to solve problems and conclude solutions to existing problems.

The test has been done in X IPA 7 class using science literacy questions, if measured using indicators of science literacy ability, the test results show that students' science literacy skills are still low. This can be seen from the test questions to 10 students, 8 students have not been able to formulate a situation in the form or physics model using appropriate representations, 10 students have not been able to use physics concepts, facts, and procedures to solve everyday problems, and the

average student have not been able to make arguments based on existing information or problem solutions.

Science literacy is one of the topics that is getting a lot of attention in the academic field. This is because mastering science literacy skills is very important for everyone to solve problems (Chusni et al., 2018). Someone who has science literacy can use scientific concepts, has scientific process skills to judge in making everyday decisions when dealing with other people, society, and the environment (Ariana et al., 2020). Indonesian experience for 20 years participating in PISA (*Programme for International Student Assessment*) it turns out that the latest PISA results in 2018 have decreased student achievement compared to PISA 2015. The latest PISA results in 2018 Indonesia were ranked 74th out of 79 participating countries and scores for Reading, Mathematics, and Science from test results in 2018 are 371, 379, and 396. However, they are still low when compared to the OECD average scores for Reading, Mathematics, and Science, which are 487, 489, and 489 (OECD, 2018).

Various efforts are needed to train the mastery of science literacy. One of the important factors to train science learning is textbooks, especially physics (Muzijah et al., 2020). Many factors influence the students' lack of science literacy. The shortage of teaching materials or teaching materials circulating in Indonesia is one of them when compared to other countries in developing students' science literacy (Nurjannati & Rahmad, 2017). One of the branches of science is Physics, a subject that examines various natural phenomena and has a very important role in the development of science and technology. There are three science literacy competencies that PISA must achieve, including: (1). Describing scientific phenomena, (2). Evaluating and designing scientific investigations and (3). Interpret data from facts scientifically (Sukowati et al., 2018).

Chiappetta in a Quantitative Analysis of High School Chemistry Textbooks for Science Literacy Themes and Expository Learning Aids recommends four components that must be considered in developing science teaching materials in the form of science modules. The four components are: Science as a body of knowledge, Science as a way of investigating, Science as a way of thinking, and the

interaction of science, technology, and society (Chiappetta et al., 1991). Adam & Suprpto, 2019 state that a meaningful learning process can make students understand concepts and can carry out scientific processes and analyze phenomena that are familiar to their lives. The younger generation is required to have science literacy skills to face the global Community so science literacy skills are very important to be introduced and applied to students in the learning process (Khoiriah & Kholiq, 2020). Based on previous research conducted by Titin Dwi Kurniawati, Raden Wakhid Akhdinirwanti (2021), an electronic module was developed to improve students' scientific literacy. This e-module is designed for Android-based smartphone users to make it easier for students to learn independently and to train student literacy.

Android is one of the operating systems that continues to grow today and can be used as a learning medium. Android is an operating system for mobile devices originally developed by Android Inc. Android provides an open platform for developers to create their applications that will be used for various mobile roles. Android, which is open source, can be used as an operating system that helps solve various problems in the learning process. One that can be implemented is an Android-based e-module. In the current era, almost all students always carry a smartphone and access it anywhere and anytime. Creating an Android-based e-module allows learning not to be limited by time and place (Dewantara et al., 2020).

The development of android-based e-modules is carried out using the android studio application with some assistance from other applications in the creation of content and material content. Android Studio is an application that can help create applications that are compatible with the Android operating system. The result of the e-module development is a file in .apk format that can be installed on Android-based smartphones. The purpose of using the android studio application is to make it easier for developers to build applications and make it easier to upgrade versions if additional materials or other materials are needed.

The development of this android-based e-module is expected to help students learn and obtain material thoroughly, encourage students to learn independently, make the learning process interesting and not boring, can be used as

an alternative for students if the teacher is unable to attend to deliver class material, and can train students' science literacy.

Based on the description above, therefore researchers are interested in conducting Development of E-Module Based on Android to Train Student's Science Literacy in Impulse and Momentum Material Grade X SMA Negeri 2 Binjai.

1.2. Problem Identification

Based on the description in the background of the problem above, the problem identification in this study is as follows:

1. The students have not studied independently by using existing teaching materials
2. The module currently is not interactive because it is still paper-based and has not kept up with technological developments
3. The absence of an Android-based electronic module (e-module) used in physics subjects at SMA Negeri 2 Binjai.

1.3. Problem Formulation

The formulation of the problem in this study is as follows:

1. How is the process of developing an Android-based e-module on impulse and momentum to train science literacy?
2. How is the feasibility level of the android-based e-module on impulse and momentum to train science literacy?
3. What is the response of student teachers to android-based e-modules on impulses and momentum to train science literacy?

1.4. Problem Limitation

So that the research focus does not widen from the goal, the limitations of the problem in this study are as follows:

1. The object of research is the students of SMA Negeri 2 Binjai in the academic year 2021/2022.

2. The material that is the focus of research is Impulse and Momentum
3. The development of an android-based e-module on impulse and momentum material to train student literacy in the form of an android application.
4. The e-module development uses the 4-D development concept and has just reached the 3rd stage, namely define, design and development.

1.5. Research Objectives

The objectives of this research are:

1. To know how to systematically develop an e-module based on android in impulse and momentum material to train science literacy.
2. To determine the feasibility level of e-module based on android in impulse and momentum material to train science literacy.
3. To find out the response of teacher and students as users of e-module based on android in impulse and momentum material to train science literacy.

1.6. Research Benefit

Based on the research objectives to be achieved, this research is expected to have benefits in education, either directly or indirectly. The benefits of this research are as follows:

1. Theoretical Benefits

As a new development in Android-based learning materials, especially on impulses and momentum to train student literacy

2. Practical Benefits

1) For Researchers

Improving insight, ability, experience, knowledge, and skills as prospective educators in making innovations in teaching materials.

2) For Teacher

Can be used as an alternative learning resource for teaching, especially independent learning.

3) For Students

Improving students' knowledge and learning experience using teaching materials as learning resources during independent learning on impulse and momentum materials.

4) For School

This research is expected to contribute to improving students' science literacy in schools to train the quality of physics learning at SMA Negeri 2 Binjai.

5) For Further Researchers

This research can be used as material for further research.

1.7. Operational Definition

To avoid different interpretations in understanding each variable in this study, an operational definition is given to clarify it. The operational definition of the researcher is:

1. E-Module referred to here is Electronic Module in the form of an application that can be used on Android-based smartphones. This E-Module is to train science literacy
2. Android is a Linux-based Mobile Operating System (OS) currently developed by Google and can be operated on all types of smartphones.
3. Research and development (R&D) is a type of research that aims to produce a product, concept, method, tool, program, or method to simplify and solve problems faced by humans (Prasetyo, 2015).
4. According to PISA, science literacy is “The ability to use scientific knowledge, in identifying questions and drawing evidence-based conclusions to understand and help make decisions about nature and the changes made through human activities” (PISA, 2018).