CHAPTER I
PRELIMINARY

1.1. Background

Education is something that cannot be separated from human life along with the times. Even in this era of globalization, education is used as the key to a country's development. The success of development in a country is influenced by its Human Resources (HR). Quality human resources are the main capital in competition in the era of globalization. This is due to the increasing number of people in the world so that competition is getting tighter, natural resources are decreasing and technological developments are getting faster.

Clearly, educational objectives in the 21st century will need to distinguish between knowledge and skills a learner must have to cope with the world of works. (Scardamana and Bereite, 2006) research in cognitive science has established that knowledge and skills are richly interwined, rather than knowledge as content on which skills acts as a process. The frameworks therefore categorizes what student need for the 21st century as understanding and how student actualize those understanding in practice as performance based on interwoven content knowledge and process skills which is a more accurate depiction of has the mind works.

The development of the Android operating system, starting from gadgets, PC tablets, smartphones and other applications that have other Android operating systems. Of course, it can support students owning and using android in everyday life. The use of smartphones itself is currently popular in the world and is not behind Indonesia. The existence of a smartphone can have a huge impact on human life and provide a lot of convenience in its use. However, the use of smartphones is only used for social media use and only a small proportion use it to help learning activities and human work. Currently, many applications are offered in one hand, making it easier to find the required information.

Learning is a complex thing. The complexity of learning is seen from two subjects, namely from students and from educators. From the student's point of view,

learning is experienced as a mental process in dealing with learning materials. Meanwhile, from the point of view of educators, the learning process appears to be learning behavior about something.

According to Panen (2004), learning is a process of change that is relatively fixed in individual behavior as a result of experience. Meanwhile, according to Ruhimat (2011), learning is an activity that is deliberate and carried out by individuals so that there is a change in self-ability, by learning that children who were unable to do something, become capable of doing something, or children who were not skilled, become skilled. Learning is an everyday activity for people. According to Warsita (2008), learning is a complex process that occurs to everyone and lasts a lifetime. Thus, one of the functions of learning theory according to Miarso (2004) in Warsita (2008), learning theory is to reveal the ins and outs of (complex) events that seem simple.

The term learning is an outgrowth of the term teaching, and the term teaching and learning which we can argue about, or we just ignore the important meaning of the three. According to Ruhimat, et al (2011), learning is an effort made by a person or educator to teach students to learn. In the concept of education, learning is defined as an effort to manage the environment on purpose so that someone can form themselves positively in certain environmental conditions (Miarso, 2004).

According to Kustandi (2011), media is an intermediary or messenger for messages from sender to message recipient. More specifically, the notion of media in the teaching and learning process tends to be defined as graphic, photographic, or electronic tools for capturing, processing, and reconstructing visual or verbal information. Meanwhile, according to Susilana (2007), in an effort to use the media as a tool, media is classified according to its level from the most concrete to the most abstract. Lesle J. Briggs in Rusman (2008) states that learning media as: the physical means of conveying instructional content, books, films, videotapes, etc. Furthermore, Briggs states that media is a tool to stimulate students so that the learning process occurs.

Multimedia can be different from the point of view of different people in general, multimedia is related to the use of more than one kind of media to present information. According to Geyeski (1993) in Munir (2012), multimedia is a collection of computer-based media and communication systems that have roles to build, store, deliver and receive information in the form of text, graphics, audio, video, and so on. Meanwhile, multimedia in a computer context according to Hofstetter in Munir (2012) uses computers to present and combine text, sound, images, animation, and video with tools and connections so that users can navigate, interact, create, and communicate.

Learning in the 21st century requires integration of learning with the daily life processes. One of the alternatives is to integrate several fields into STEM learning (Science, Technology, Engineering, and Mathematics). STEM is a field that requires numeracy, understanding and analyzing empirical data including critical analysis; understanding of scientific and mathematical principles (Ernst, Williams, Clark, Kelly, & Sutton, 2018; Vulperhorst, Wessels, Bakker, & Akkerman, 2018). Not only that, STEM requires students to apply a systematic and critical assessment of complex problems with an emphasis on theoretical knowledge from the subject to practical problems, ingenuity, logical reasoning and practical intelligence (Mutakinati, Anwari, & Yoshisuke, 2018; Sanchis-Segura, Aguirre, Cruz-Gómez, Solozano, & Forn, 2018).

The understanding and scope of STEM skills vary greatly in various countries (Ernst et al., 2018; Vulperhorst et al., 2018). Supply is relatively clearly identified in terms of qualifications achieved in STEM subjects, although the definition of STEM subjects can vary (Fitzakerley, Michlin, Paton, & Dubinsky, 2013). STEM score subjects usually include mathematics; chemistry; computer science; biology; physics; architecture, civil engineering, electricity, electronics, communication, mechanics, and chemical engineering (Stoet & Geary, 2018).

STEM education provides opportunities for teachers to show and practice the concepts, principles, and techniques of science, technology, engineering, and mathematics that can be used in an integrated manner (DeCoito, 2016; Irwandani & Rofiah, 2015; Irwansyah, Sukarmin, & Harjana, 2018; Ritz & Fan, 2015). Thus, STEM

learning provides real output for age development, including computational thinking with the development of comparative thinking that facilitates the people to send data quickly (Syukri, Lilia, & Subah, 2013)

The development of science and technology cannot be separated from the contribution to the development of physics. Physics is the study of natural phenomena that occur in matter or energy that occupies space and mass (Chodijah, et al., 2012). Physics studies about the nature, natural laws, and their application in everyday life. Physics has the nature of abstract and concrete concepts. The abstract physics concept is difficult to visualize, so that it makes it difficult for students to study and understand it. This is what makes students think that physics is difficult and unattractive so that it requires educators to develop strategies in learning physics so that they are easily understood by students.

Newton's law is a basic concept of classical physics which has been widely used for its application in the field of technology. Newton's law has an important role in technological development, so it is necessary to learn about technology and engineering techniques in a teaching material. However, references to existing teaching materials are mostly only focused on science and mathematics, while for technology and engineering techniques are still few. According to (Reeve. 2015) STEM learning is a priority learning model in solving global issues and problems facing the world today, for example: global warming, air and water pollution, clean drinking water, and food safety. For this reason, teaching materials are needed whose contents are capable of covering science, technology, engineering and mathematics. Based on this, teaching materials that use the STEM approach are needed.

According to previous research, researchers stated that the habit of increasing knowledge through reading is increasingly being carried out due to the impact of technological developments. Most of the students prefer to play games with laptops or gadgets compared to reading both in class and outside the classroom, even though the role of reading is very large because reading is a source of information.

The school chosen by the researcher is SMA Negeri 2 Percut Sei Tuan. Based on observations of interview result, it was found that The physics learning resources used were still lacking, especially during the Covid-19 pandemic, the source of student learning only from elusive handbooks and can't lead students to learn independently and explore the knowledge, all students in class XI MIPA 1 all have android phones, have not used the STEM learning approach, have never made Android-based teaching materials. Based on questionnaire result the percentage of student who like physics lessons is only 22.5% while biology higher at 32.5%. Not only that, 63% of students stated that the physics subject was less fun and 67.5% of students stated that the had difficulty in newton's law. Furthermore, the researcher conducted task analysis, concept analysis, and determining learning objectives with reference to the syllabus. Based on the results of the front end anlaysis and the result of the student's analysis, the researcher is very appropriate to develop this handout.

Based on the description above, the researcher is interested in conducting development research with the title **"The Development Newton's Law Handout Based On Android Integrated Stem (Science, Technology, Engineering, Mathematics)"**.

1.2. Problem Identification

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

1. There are no Android-based handouts yet
2. The teacher has never made Android-based teaching materials
3. Not yet using a student learning approach that can solve complex problems in the future, namely learning using STEM (Science, Technology, Engineering and Mathematics).
4. There is no STEM integrated Android-based handout teaching material.
5. Less optimal use of smartphones among high school students has been to expedite the learning process.

1.3. Problem Formulation

Based on the background of the problem and problem identification, the problem formulations in this study are as follows:

1. What is the feasibility level of developing a Mobile Learning Application based on the Android Integrated STEM On Newton's Law of Motion being developed?

2. How to develope effective Newton's Law Handout Based On Android Integrated STEM (Science, Technology, Engneering, Mathematics)?

3. How do students respond to The Development of Newton's Law Handout Based On Android Integrated STEM that was developed?

1.4. Problem Limittation

So that the research focus does not widen from the objectives, the problem boundaries in this study are as follows:

1. The subjects of this study were even semester high school students of Class XI MIPA 1 SMA Negeri 2 Percut Sei Tuan

2. The material that is the focus of research is Newton's Law

3. Development Newton's Law Handout Based On Android Integrated STEM (Science, Technology, Engneering, Mathematics) is packaged in android application form.

4. This research is focused on developing Newton's Law Handout Based On Android Integrated STEM (Science, Technology, Engneering, Mathematics) which is used as a learning resource.

1.5. Research Objectives

The objectives of this study are:

1. To determine the feasibility level of the Newton's Law Handout Based On Android Integrated STEM (Science, Technology, Engneering, Mathematics).

2. To determine student's response to the Newton's Law Handout Based On Android Integrated STEM (Science, Technology, Engneering, Mathematics).

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3. To determine the improvement of student learning outcomes to the Newton's Law Handout Based On Android Integrated STEM (Science, Technology, Engneering, Mathematics).

1.6. Benefits of Research

1.6.1 Theoretical Benefits

As a new development in android-based learning media especially in Newton's law handout material.

1.6.2. Practical Benefit

1. For Researcher

Increase knowledge and train skills as prospective educators and in making teaching material or media innovations.

2. For Teacher

Can be used as an alternative source of learning for teaching, especially when learning online.

3. For Student

Can be used as a learning resource when learning online, especially in Newton's Law material.

1.7. Operational Definition

1. The handout referred to here is a handout in the form of an application that can be used on Android. This handout is based on the STEM approach.
2. Android is a Mobile Operating system (OS) based on Cornel Linux which is currently being developed by Google and can be operated in all types of smartphone.
3. STEM is a growing movement in education, not only in the United States but around the world. STEM-based learning programs are intended to increase student interest in pursuing higher education and careers in these fields. STEM

education usually uses a new mixed learning model that combines traditional classroom teaching with online learning and hands-on learning activities. This mixed learning model aims to give students the opportunity to experience different ways of learning and problem solving.