

CHAPTER I

INTRODUCTION

1.1 Background

The advancement of the times has been a catalyst for profound changes in various aspects of human life, including economic, social, cultural, technological, and communication. These transformations have created major shifts, especially in the technology and communication sectors, which have become more visible in the current era of the 4.0 industrial revolution. Humans have made technology and communication a crucial element in their daily lives. The era of the Industrial Revolution 4.0 is also known as the era of innovation because it has led to various fundamental innovations in human activities in almost all sectors, including in the context of education. In this era, technology has changed the way we learn, teach, and interact in the education process. In other words, the era of the Industrial Revolution 4.0 has strengthened the role of technology and communication as the main drivers of change in all aspects of life, including education. This requires the world of education to continue developing education that is relevant to the needs of the times, utilizing technological innovation, and ensuring that every individual has equal access to the learning opportunities offered by this era. According to Lase (2019), education in this rapid technological development reflects a variety of methods to integrate science and technology, both in physical and virtual form, into the learning process.

With the rapid development of technology, teachers face increasing challenges in carrying out their roles and helping students acquire knowledge in the global era. The use of technology is unavoidable in today's era. Teachers must keep up with these changes and developments to prepare students for the future. One of the consequences of the rapid advancement of science and technology is the need for quality human resources—those who are competent in mastering science and technology and can balance and utilize them effectively. In facing the era of globalization, mastery of technology is crucial for students to ensure they are not left behind. Technological advancements can influence educators' mindsets in meeting their students' learning

needs, particularly through the use of learning media. Engaging learning media, such as visuals or displays generated from these media, can help students easily remember and absorb the material presented by the teacher (Sari et al., 2021).

One of the elements that is crucial to the teaching and learning process is learning media. Teachers frequently use learning media to communicate content to students in a way that is understandable to them. Learning media can foster new interests and wants, inspire motivation, and even psychologically impact learning when used in the teaching and learning process (Wulandari et al., 2023). Media utilizing Information and Communication Technology in the current era is a promising factor for the success of the learning process. Teachers now need to understand technological advances to keep up with their students. They must act as facilitators for students, especially in utilizing various learning resources, so that teaching and learning activities become more effective, efficient, and interesting.

One of the fastest-growing technologies today is the smartphone. Smartphones have become very useful because of their internet facilities, which allow users to exchange information globally. This causes the number of smartphone users to increase every year. The Ministry of Information reported that in 2022, the number of smartphone users increased significantly in 2021 by 3.9 billion, this figure increased compared to the previous year's 3.4 billion (Newzoo, 2021). Indonesia ranks fourth with the highest number of users in Asia. KOMINFO states that smartphone users in Indonesia have reached 89% (Fitria, et al., 2022).

It is important to carefully approach technology, particularly smartphones, as it is now evolving more and more. For improved human survival, the advantages of having this technology must be further investigated. In the field of education, the phenomenon of the large number of smartphone users is undoubtedly both a challenge and an opportunity. The difficulty comes from abuse for bad purposes. The development of technology that is helpful in the field of education is greatly facilitated by the existence of cell phones, which is both a difficulty and a fantastic opportunity. Utilizing this technology as an efficient, original, and informative learning medium is one of the advantages that may be gained from its existence. So that new educational

application media, such as Augmented Reality (AR) technologies, can be produced. Although some individuals may still find this technology strange, many smartphone applications presently use it. In the past, this technology was typically employed in desktop PC programs. However, thanks to advancements in technology, there are now a variety of smartphone applications that make use of augmented reality.

Augmented reality is an application that combines physical reality with the virtual world in two or three dimensions, which is displayed simultaneously in a real environment. Augmented reality innovation emerges as a solution to overcome the limitations of human memory for information that is only available in written form. Augmented reality technology can virtually display 3D science objects on a smartphone screen, creating a more interactive learning experience by involving students in the process. The augmented reality approach is a new way to enhance learning through three-dimensional representations (Kristina, et al., 2021).

Learning Media that utilizes AR technology has an effect in improving the learning process and student interest in understanding the material because AR has visuals that can increase student interest in learning, and playing. So that in their activities students can involve the five senses in directly projecting the use of AR technology. The reason for students' interest in technology is because AR has characteristics and functions similar to learning media, namely to convey information between the sender (teacher) and the receiver (student), to clarify the delivery of information provided by the teacher to students in the learning process, and to be able to provide motivation and a sense of interest in learning activities (Prasetyo et al., 2020). Another beneficial aspect of AR in the learning process is that it can offer a student-oriented space. In addition, learning materials can be accessed by students easily wherever they are, adapted to the student's place. Learning media based on advanced technology can change the way of looking at the existing learning process (Macariu et al., 2020).

Based on the results of observations at SMA Negeri 1 Sidikalang, during the chemistry learning process there is interaction between teachers and students, but students are still less enthusiastic and responsive during the chemistry learning process due to limited teaching media facilities, which are still in the form of print books and ppt explanations, and the utilization of technology and information as learning media is also still lacking. The results of the student analysis questionnaire also show that 100% of students already have smartphones, but their utilization as learning media is still lacking. Therefore, media innovation is needed in learning modern, interesting media that can make students learn actively and interactively. To realize the goals of national education, innovation in information and communication technology innovations that can be applied as learning media. Therefore, currently, one of the developing technologies is augmented reality in the world of education, which allows users to interact realistically. World of education that allows users to interact with the system in real time. With the system, augmented reality can combine the real world with the virtual world made by computers. This technology is expected to be a solution to current educational problems, especially the demand for the application of ICT in every subject, especially chemistry.

Referring to this background, the researcher was motivated to conduct research entitled: Development of Android-Based Augmented Reality Learning Media on Chemistry Learning In Senior High School.

1.2 Problem Identification

Based on the background explanation provided, the emerging issues can be outlined as follows:

1. The entry of the era of the Industrial Revolution 4.0 led to demands for the application of technology in all lines of life, including education.
2. The underutilization of engaging technology-based learning media in the classroom learning process is lacking.
3. The utilization of Android as a support for learning is still insufficient.

4. The development of Android-based Augmented Reality learning media for chemical bonding material has not yet been carried out to facilitate students' learning process.

1.3 Problem Scope

To ensure a clear and focused research problem that aligns with the specified objectives, the researcher has restricted the scope of the problem to the development of Augmented Reality-based chemistry learning media for chemical bonding material in Grade X at SMA Negeri 1 Sidikalang. Furthermore, the products resulting from this development can only be utilized on Android smartphones.

1.4 Problem Formulation

1. What are the needs and problems of students in learning chemistry?
2. What are the results of developing learning media using Augmented Reality technology?
3. How is the validity of android-based augmented reality learning media on chemical bonding material?
4. How do students respond to android-based augmented reality learning on chemical bonding material?

1.5 Research Objectives

1. To find out the needs and problems of students in learning chemistry.
2. To get chemical bond learning media using Augmented Reality technology.
3. To know the validity of the Android-based Augmented Reality learning media on chemical bonding material.
4. To know students' responses to the Android-based Augmented Reality learning media on chemical bonding material.

1.6 Research Benefits

The development of Android-based Augmented Reality learning media is expected to:

1. For schools, it can serve as an appealing educational media reference for students.

2. For teachers, can utilize this research as a resource for technology-based learning media and anticipate that the research's output can be applied in the teaching process.
3. Students are expected to incorporate the research's outcomes into their learning journey, providing them with a fresh learning experience.
4. For further researchers, it can serve as valuable information to support the development of subsequent studies on Augmented Reality-based learning.