# CHAPTER I
# INTRODUCTION

## 1.1 Background to the Study

One of the opponents of a country's progress is the advancement and superiority of human resources, which can be enhanced by improving educational quality. According to the most recent Human Development Index (HDI), Indonesia is less developed than two of its ASEAN neighbors, Malaysia (64th) and Singapore, and is placed 121st out of 185 nations with an HDI of.629 (18th). The region's average score was 0.683. To increase the rate of HDI and GDP incomes, Indonesia must prioritize the acceleration of educational system development (Sahar, 2019).

Education is a deliberate and organized attempt to establish a learning environment and process in which students actively develop their potential for religious spiritual strength, self-control, personality, intelligence, noble character, and the required skills for themselves, community, nation, and state. This is mentioned in article 1 of the National Education System Law of the Republic of Indonesia No. 20 of 2003. The realization of quality education is supported by harmony between the components of education which include students, educators, curriculum, and infrastructure.

Nowadays, the curriculum plays a significant role in the education system by providing academic content through processes or procedures such as a term, session, instruction time, and so on. A curriculum exists to establish educational objectives with the purpose of acquiring competences and to act as a guideline in the execution of instruction at all levels of education. Today's curriculum is from 2013. This curriculum combines educational improvements, notably increasing the learning process, the 21st-century competence framework being one of them (Uce, 2016).

One of the 21st-century competencies, which is also consistent with Permendikbud No. 64 of 2013, is the ability to think critically and create solutions,

where students are able to apply various arguments to various situations in terms of overcoming problems (Trilling and Fadel, 2009). Therefore, learning in the 2013 curriculum is focused on shaping students' critical thinking skills.

Reaching the goal of accelerating educational development necessitates an international standard in worldwide study, also known as PISA. The Organization for Economic Co-operation and Development (OECD) administers the Program for International Student Assessment (PISA) for students from over 70 countries. PISA is used in the Indonesian educational system to assess students' knowledge and skills. According to the OECD's 2018 PISA study findings, Indonesian students scored an average of 371 in scientific literacy, compared to an OECD average of 487. The average mathematics score was 379, with an OECD average score of 487. Furthermore, Indonesian students' average science score was 389, compared to the OECD average of 489 (Ministry of Education and Culture, 2019). Students' low achievement in Indonesia reflects their lack of understanding of scientific literacy-based questions designed to assess students' critical thinking skills.

According to UNESCO, the literacy rate in Indonesia is presently about 95% yet, other educational indicators reveal that the quality of research and instruction in Indonesia's higher education system falls well short of the "internationally competitive" system. As a result, this situation may cast considerable doubt on the efficacy of the 2013 curriculum implementation (Sahyar, 2019).

This research was conducted in MAN 2 Model Medan one of the public schools in Medan that uses the 2013 Curriculum to promote learning. The physics learning process follows the implementation of the 2013 curriculum, which focuses on the ability to think critically. Based on observations, it was discovered that the questions used in the implementation of physics learning so far are questions sourced from student LKS books in the form of essays and multiple choices that are not based on scientific literacy and not the accordance with the indicators of critical thinking skills. These questions are still classified as questions that assess thinking skills at cognitive levels LOTS (Low Order Thinking Skill) criteria, only achieving the ability to remember, understand, and apply.

The results of the interviews concluded that the questions given by the teacher had not fully implemented high-level thinking questions likewise the scientific literacy- based test instrument. Students are given basic questions first to increase reinforcement of physics concepts and slowly train students to work on higher-order thinking questions. The teacher believes that not all material can be made into scientific literacy-based high-level thinking questions and scientific literacy-based tests are limited so students are less trained in working on and solving a problem in physics.

According to the Pisa Draft Science Framework (2015), the essence of the PISA assessment, one of which is scientific literacy. The main components of PISA for scientific literacy are (1) Competence; explaining the phenomenon of science and designing science inquiry, interpreting science data and evidence, (2) Knowledge; knowledge of science materials related to physics, biology, earth and space sciences, procedural knowledge, epistemic knowledge, and (3) Attitudes; interest in science, appreciation of scientific approaches, and environmental awareness. Dani (2009) defines scientific literacy as having four components: scientific knowledge, the investigative nature of research, science as a means of knowing, and the connection of science, technology, and society.

Scientific literacy and critical thinking have a fairly strong relationship and a positive or in-line relationship pattern if the ability to think critically is higher so literacy skill is increasing in any case (Khayati et al., 2020). This is based on the findings of Rahayuni (2016)'s research, which found that students with strong critical thinking skills have a higher value for their scientific literacy skills. To measure students' critical thinking skills can use questions based on scientific literacy.

The measurement of science literacy is important to know the extent of students' sensitivity to the concepts of science that they have learned. Students' science competence is low because students are not trained to express opinions or ideas that are in their minds, so when given questions related to the meaning and linkage of the material with the environment around the student (Mardhiyyah, 2016).

According to the result of a study conducted by (Rizkita et al, 2016), the low ability of students' scientific literacy is due to their inability to identify scientific opinions, conduct effective literature searches, understand the elements of research design, create appropriate graphs from data presented, use quantitative ability in solving problems, interpreting basic statics, and drawing conclusions.

As a result, scientific literacy-based test may be used to evaluate a person's critical thinking skills based on scientific literacy skills. One method for improving students' critical thinking abilities is the creation of scientific literacy-based test instruments. Students' low scientific literacy skills results from a lack of opportunities to communicate their thoughts or ideas, hence students have difficulties answering questions that need them to express their perspectives (Mardhiyyah, 2016).

The Ministry of Education and Culture is also worried about the student's low capacity to pass the test based on scientific literacy. The Ministry of Education and Culture devised a nationwide evaluation that conforms to PISA, and the question test also measures students' scientific literacy. All Indonesian schools will take part in this examination.

Based on this description, it is important to conduct research on "Development of Scientific Literacy-Based Test Instruments to Measure Students' Critical Thinking Skills" which is valid and reliable in measuring students' critical thinking skills.

## 1.2 Problem Identification

Based on the background of the above problems, then the problems can be identified as follows:

1. The lack of scientific literacy-based physics test instruments to measure students' critical thinking skills.
2. The low ability of students to do scientific literacy-based questions.
3. The questions used by a teacher toward students tend to be LOT questions that cannot measure students' critical thinking skills.

## 1.3 Research Question

To clarify the problem as the basis for this research, the problem is formulated as follow:

1. How is the feasibility (based on aspects of validity, reliability, discrimination power, difficulty level, and effectiveness of distractor) of scientific literacy-based test instruments developed?
2. How are the students' responses to scientific literacy-based test instruments to measure students critical thinking skills?

## 1.4 Scope of Problem

To clarify the scope of the problem to be studied, it is necessary to explain the limitations of the problem in the study, namely:

1. This research developed a scientific literacy-based test instrument that was developed only to assess cognitive aspects in the form of a test instrument following scientific literacy indicators.
2. This research focuses on aspects of validity, reliability, discrimination power, difficulty level, and effectiveness of the distractor (deceiver) of the test instrument developed.
3. This research was conducted at MAN 2 Medan by taking two of the classes on XI level as the subject of this study.

## 1.5 Study Objectives

Based on the formulation of the problem above, the objectives of this study are:

1. Determine the feasibility (based on aspects of validity, reliability, discrimination power, difficulty level, and distractor effectiveness) of the scientific literacy-based test instruments developed.
2. Determine students' responses to scientific literacy-based test instruments to measure students' critical thinking skills.

## 1.6 Research Purposes

Based on the objectives to be achieved, the expected purposes of this study, namely:

1. Theoretical Purposes

   Research helps the development of knowledge, especially related to the development of physics test instruments based on scientific literacy.

2. Practical Purposes

   A. Existing test instruments can help in measuring students' critical thinking skills and as a reference for developing scientific literacy-based test instruments.

   B. Become a reference for further research related to the development of scientific literacy-based test instruments.

## 1.7 Operational Definition

To clarify the terms used in this study, an operational definition was made as follows:

1. Test Instruments

A test instrument is a method for making systematic observations of a person's behavior and describing that behavior using a number scale or a classification system. The purpose of the test is to determine the level of learning or competencies attained by students in a specific field, based on the basic competencies to be attained. Test results provide information about a person's or group's characteristics.

2. Scientific literacy

Scientific literacy is the ability to contribute to issues of science and scientific ideas as a reflective citizen. People with scientific literacy are willing to engage in logical issues regarding science and technology, which necessitate the capacity to explain phenomena scientifically, assess and plan scientific research, and scientifically analyze data and evidence (OECD, 2019a).

3. Critical thinking

Critical thinking is defined as the act of thinking in a reasoned and reflective manner to emphasize making decisions about what to believe or do (Surip, 2017).