CHAPTER I
INTRODUCTION

1.1. Background of The Problem

The 2013 curriculum for natural sciences subjects at the junior high school level was developed as integration-based subjects, not as scientific discipline education. Science subjects are application-focused; they foster critical thinking, curiosity, and the development of responsible and caring attitudes toward the natural and social environments (Ariyana *et al.*, 2018; Ministry of Education and Culture, 2013).

In compliance with Government Regulation 68 of 2013 regarding organizing the junior high school curriculum, it envisaged that science education could be provided holistically through integrated science. Holistic learning is interdisciplinary learning that links various science fields in science learning. Integrated science refers to integrating multiple dimensions, specifically the domains of attitudes, knowledge, and abilities (Ministry of Education and Culture, 2013).

Integrated science is built on scientific attitudes, processes, and products. Science, as an attitude, allows people to work together. As a process, science can be understood as a problem-solving procedure through experimentation, and science, as a product, is defined as a process in the form of knowledge (Aristiadi & Putra, 2018).

Results of direct observations and interviews with school teachers showed that science learning has not been implemented regularly, and scientific attitudes, processes, and products are not visible. The learning process is teacher-centered and focuses on textbooks. Student worksheets only contain questions, practicums

are rarely held, and student learning outcomes are below the Minimum Completeness Criteria (KKM).

Numerous elements significantly impact how well the learning process achieves educational objectives from a technical and non-technical standpoint. For education to be successful, more than just teachers and students are needed; additional factors must also be in place (Sumar & Razak, 2016).

Learning activities require a teacher's creativity in presenting lesson material. The creativity in question is the teacher's ability to choose appropriate methods, approaches and media in presenting teaching material. Apart from that, the teaching strategy chosen by the teacher also influences efficient and effective learning so that it is in accordance with learning objectives. In essence, the teaching and learning process is a separate communication process where teachers and students exchange ideas to develop ideas and understanding. Discommunication often arises and deviations occur so that communication is not effective and efficient, partly due to students' unpreparedness, lack of interest and passion. This form of creativity can be seen through the use of student worksheets (Achdiyat & Andriyani, 2016).

Student worksheets, abbreviated as LKPD, are learning resources containing activities and exercises that help students simplify and improve their understanding of learning material. The contents are designed and developed according to their conditions and situations. In addition, student worksheets create interactive learning when used in teaching and learning activities.

Student worksheets can be made by educators themselves according to students' needs. In the process of teaching, teachers typically use packet books and student worksheets provided by the school because of the emerging paradigm among educators that creating student worksheets is highly challenging, time-consuming, and energy-draining, and teachers do not understand the purpose of student worksheets, which are merely summaries of material and questions. Student worksheets have a summary of the content and a few questions, according to the findings of observations with SMP N 3 Harian teachers. The second truth is that

homework for students typically consists of doing worksheets at home. The 2013 curriculum aims to develop a student-centered learning process; the teacher only acts as a facilitator by guiding students in understanding the material during learning (Silaban *et al*., 2015).

Another aspect that educators need to pay attention to in encouraging the success of the learning process is the approach to learning. The learning approach is an important variant of the learning process (Ayu *et al.*, 2018). The learning approach is a learning conceptual framework used by teachers to guide students so that learning objectives are easily accepted by students. One of the breakthroughs in science learning can be done by applying the Science, Technology, Engineering, and Mathematics (STEM) approach.

STEM is a popular learning approach worldwide that is effective because it combines four main areas of education: science, technology, engineering, and math (Zainil *et al.*, 2022; Dewi, 2019)). When STEM knowledge and skills are incorporated into the teaching and learning process in an integrated way, they have an important and positive influence on student learning outcomes (Fithri *et al*., 2021).

STEM based student worksheets are educational resources created to provide students with an integrated, systematic learning experience in science, technology, engineering, and math. This worksheet allows students to apply these concepts in real-world situations, expands their understanding, and can help improve students' abilities in critical thinking, solving problems, and collaborating with others because it provides an overview of how STEM is related to everyday life day (Khastini *et al*., 2023; Rahmi, 2023).

STEM based student worksheets usually consist of tasks or activities designed to teach STEM concepts through an interactive and practical approach. Some examples of tasks that can be included in students' worksheets with a STEM approach are:

1) Create product or system prototypes that use learned technological or engineering principles.

2) Building a mathematical or physical model that simulates a natural phenomenon or event that occurs in everyday life.
3) Investigate and analyze data collected through experiments or observations to look for correlations and relationships between various variables.
4) Solve real-world problems using the principles of science and mathematics, as well as technology and engineering.

Using a STEM approach to learning with student worksheets can help students apply what they learn in the classroom to real-world phenomena, which will enhance their learning outcomes (Samal *et al.*, 2021). STEM based student worksheets can help students understand the concepts of learning material, and students can also relate the information obtained to everyday life (Hadiati *et al.*, 2021).

Science cannot be understood just by reading, student learning outcomes also depend on cognitive activities andskillstudents in carrying out advanced exercises which are generally packaged in student worksheets. These factors cause the learning process to involve less students, resulting in student learning outcomes that tend to be low. Learning outcomes include cognitive, skillsa nd affective. Cognitive learning outcomes relate to knowledge, understanding and mastery of concepts. Psychomotor learning outcomes involve physical skills and motor abilities. Affective learning outcomes are related to changes in students' values, attitudes and beliefs (Samal *et al.*, 2021; Siregar & Amdayani, 2024).

The results of interviews with school teachers showed that most students could not master the concepts in science learning material, one of which was vibration, wave, and sound. The material of vibrations, waves, and sound is one of the materials that, in some processes, is real and complex; the concepts taught are not rote but understood. The student worksheets can enable students to understand the material based on their experience and search for information. Looking at these problems, the expected situation is that students can understand the concepts of vibration, waves, and sound so that the learning obtained can meet or exceed the criteria for completeness.

Vibrations, waves and sound are science materials that are very suitable for the STEM approach because they cover broad and deep concepts from science and mathematics. Here are some reasons why this material is suitable for a STEM approach:

1) Interdisciplinary: Vibrations, waves and sounds material involves concepts from various scientific disciplines such as physics, mathematics, and engineering. This allows students to integrate knowledge from various fields and understand the relationship between various concepts.
2) Applications in technology: Concepts in vibrations, waves and sound often have applications in technology, such as the development of communication tools, the development of medical devices, and the design of musical instruments. This allows students to see the connection between science and technology in everyday life.
3) Experiments and observations: Direct experiments and observations can strengthen concepts in vibrations, waves, and sounds. This allows students to develop important observation, measurement, and data analysis skills in a STEM approach.
4) Relevance in everyday life: The phenomena of vibration, waves, and sound are very relevant in everyday life, such as in natural sounds, voice communication, or the use of electromagnetic waves in modern technology. This allows students to relate academic concepts to their experiences in the real world.

Vibration, wave, and sound materials support conceptual learning and enable the development of broad skills and understanding in line with a STEM approach.

Based on this description, the researcher is interested in conducting research on "The Effect of Using student worksheets with a STEM approach on Vibrations, Waves and Sound Material on the Learning Outcomes of Class VIII Students" at SMP N 3 Harian for the 2023/2024 academic year.

1.2. Identification of Problems

Based on the background of the problem above, the researcher identified the problem as follows:

1) Science learning at SMP N 3 Harian still focuses on textbooks
2) The student worksheets used only contain questions
3) There are no STEM based student worksheets at SMP N 3 Harian
4) Student learning outcomes in science subjects are relatively low, as can be seen from the number of students who have not reached the minimum requirement criteria (KKM).

1.3. The scope of Research

The scope of this research is as follows:

1) The object of the research is the development of student worksheets using a STEM approach to science learning in junior high schools
2) The subject of this research is class VIII of SMP N 3 Harian
3) The research location is SMP N 3 Harian
4) The research was conducted during the even semester of the 2023/2024 academic year.

1.4. Scope of Problem

Based on the background of the problem and identification of the problem, it is necessary to limit the problem in this research, namely:

1) This type of research is experimental research to determine the effect of using student worksheets using the Science, Technology, Engineering and Mathematics approach
2) The materials used in this research are vibrations, waves and sound
3) The research was conducted on class VIII students at SMP N 3 Harian

1.5. Formulation of The Problem

Based on the background, problem identification and problem boundaries explained above, the problems formulated in this research are:

1) Is the influence of using STEM based student worksheets on vibration, waves and sound material on the learning outcomes of class VIII students?
2) How do students respond of using STEM based student worksheets on vibrations, waves and sound on the learning outcomes of class VIII students?

1.6. Research Purposes

Based on the problem formulation above, the objectives of the research are:

1) Knowing the effect of science learning using STEM based student worksheets on the learning outcomes of class VIII students in the vibrations, waves and sounds material
2) Knowing students' responses to using STEM based student worksheets in vibration, waves and sounds material

1.7. Benefits of Research

The benefits of this research are as follows:

1) Theoretical Benefits

   Theoretically, the benefits of this research can be used as relevant further study material and used as a new reference related to the determain the effect STEM based student worksheets on vibrations, waves and sounds material for class VIII.

2) Practical Benefits

a. For Teachers

   Used by teachers as an alternative in the science learning process in vibration, waves and sounds material for class VIII

b. For Students

Students can learn actively per the demands of the 2013 curriculum, namely holistic and integrated learning, especially on vibration, waves and sounds material.

c. For Students and other Researchers

As a source of knowledge and insight to develop learning tools on other materials.

1.8. Research Hypothesis

The hypotheses in this research are:

H_0 : There is no influence of using STEM based student worksheets to the learning outcomes of class VIII students at SMP N 3 Harian on Vibration, Waves and Sounds material.

H_a : There is an influence of using STEM based student worksheets to the learning outcomes of class VIII students at SMP N 3 Harian on Vibration, Waves and Sound material.