

CHAPTER I INTRODUCTION

1.1. Background

One of the activities that is very important for the survival of living things is learning in an orderly manner in order to obtain and improve human behaviour in various aspects of life. Learning is a process by which individuals acquire knowledge, skills, understanding, and attitudes through experiences and learned materials, in the learning process it involves changes in individual behaviour. Efforts that can be made by humans to obtain good individual abilities and personalities outside and within themselves can be obtained through education.

Education has a very important role in shaping individuals, communities and nations. With a good education, individuals can develop their potential, gain knowledge, and contribute to sustainable development, this is in accordance with education according to Law No. 20 of 2003 article 1 paragraph 1 explained that education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves, society, nation and state. Good education must be able to achieve the goals of national education, which states that: 'national education functions to develop and shape the character and civilisation of the nation which aims to develop the potential of students to become quality human beings with the characteristics of faith devoted to God Almighty, noble, healthy, capable, creative, independent, and become democratic and responsible citizens.' Education is therefore a major factor in determining the quality of human resources and the progress of a nation. Education has the ability to produce innovative ideas that are able to adapt to changing times. Curriculum development is a tool to improve the quality of education.

One of the solutions provided by the government in an effort to improve the quality of education in Indonesia is to update the current curriculum. This curriculum shift was created to support learning recovery and provide teachers and students with opportunities to learn. The independent curriculum, based on Ki

Hadjar Dewantara's philosophy, then became a flexible curriculum framework that focused on basic materials and met learners' learning needs (Etikamurni et al., 2023). The independent curriculum is a learning method that gives students the opportunity to showcase their natural talents in a relaxed, fun, stress-free and pressure-free way (R. Rahayu et al., 2022). To be able to create learning that is in accordance with the characteristics or uniqueness of students (readiness, interest and learning style), learning is needed that can help students understand the subject matter, especially in physics. Physics is a branch of science that plays a very important role in shaping a good mindset and its application in everyday life. The subject of physics is closely related to numeracy skills, because it presents symbols related to basic mathematics (Liliawati et al., 2022). Numeracy literacy is the ability to understand and use various symbols and numbers related to basic mathematics to solve practical problems in everyday life and then analyse the information to make decisions (Maghfiroh Lailatul et al., 2021). Thus numeracy literacy as an important skill to improve problem solving ability in physics in learners

Based on the results of observations of the physics learning process at MAN 2 Model Medan with class XI students totalling 46 people, it was found that 50% of students felt physics was difficult and this was reinforced by interviews with physics teachers found that few students were good at problem solving skills in physics and based on student motivation research measured in a questionnaire with 20 statements obtained a value of 58.20% where this value is still quite low. This is of concern to researchers because students must have physics problem solving skills and motivation so that they can understand useful concepts. in terms of improving problem solving skills, teachers can improve problem solving skills in students by meeting the learning needs of each student, such as student learning styles. By paying attention to the different learning needs of students in the classroom and considering that students in the classroom do not have the same learning style. then the learning style of each student is fulfilled, students can develop optimally in absorbing lessons, so that in the end students will have a strong memory. In addition, another problem that arises which causes students to be difficult in solving problems in physics is the lack of development and mastery of technology in learning, especially in physics learning. The problem faced by students in learning

physics at school is the problem solving ability of students in understanding and imagining physics concepts that are often too abstract and mathematical so that it requires a sophisticated analysis structure.

One of the solutions that can be used to improve problem solving skills, especially in the era of an independent curriculum, is differentiated learning. Differentiated learning is creating a diverse classroom and providing opportunities for students to acquire content, process ideas, and improve the results of each learner which allows learners to learn more efficiently. (Suwartiningsih, 2021). Differentiated learning must be shaped by a teacher's mindset that assumes that every child can grow and develop optimally according to his or her abilities. (Kristiani et al., 2021). Teachers also need a learning model with a structured and logical direction to achieve learning objectives so that it can be more optimal in conducting differentiated learning. One of the suitable learning models is inquiry, the inquiry learning model is a student-centred model where students are directly involved in learning, making it suitable to be applied in physics learning. This is also supported by previous researchers (Rahmah et al., 2022) which states that the differentiation approach in the inquiry model is appropriate to be applied in the classroom because it can improve students' numeracy skills compared to classes that only apply the inquiry model alone. This is because the combination of the differentiation approach and the inquiry model is proven to be effective and efficient for planning a teaching and learning process that can be a foundation for students to start learning and can optimise students' thinking skills, because students are encouraged to be able to develop the ability to think systematically, critically, logically and analytically with investigation activities. Ertmer & Ottenbreit-Leftwich in (Masnuri et al., 2021) In line with that, it is said that good learning is when students can use relevant information and communication technology as a useful pedagogical tool. This is so that educators can prepare students with 21st century skills so that they can adapt to the times. Therefore, to support learning as a material in increasing students' interest in learning physics, it is necessary to use TPACK which can be used as a solution in overcoming this problem. TPACK is a structure that combines three main components: technology, instruction, and content or knowledge materials (Amrina et al., 2022). There are 7 components in

TPACK learning, namely content knowledge, technological knowledge, pedagogical knowledge, pedagogical content knowledge, technological content knowledge, technological pedagogical knowledge, and technological pedagogical content knowledge. The integration of technology, pedagogy and content certainly provides new challenges for teachers in improving the process and learning outcomes of students in the 21st century. In learning, physics has been named as one of the difficult subjects. Because to understand the concept, a student must do practical activities or illustrations that help students understand more deeply. Meanwhile, students' motivation to learn physics is still quite low.

Research using innovative learning models in the era of the independent curriculum and the demands of the 21st century in the use of technology in improving problem solving skills and student motivation is important, It is intended that the learning perspective of the independent learning curriculum becomes a strong basis for mobilising learning elements in an integrated and meaningful way to produce graduates who are superior and globally empowered (Suryaman, 2020). so that research is carried out with the title: The Effect of TPACK-Based Differentiated Inquiry Learning Model to Increase Motivation and Physics Problem Solving Ability in MAN 2 Model Medan.

1.2. problem identification

Analysis of the problems that have been stated, then what can be identified is as follows:

1. Physics learning at MAN 2 Model Medan for some students has not been divided according to their respective learning styles.
2. The model used at MAN 2 Medan Model is generally teacher and student-centred, the inquiry model is student-centred so it is necessary to conduct research on this model and its effect in increasing Motivation and Physics Problem Solving Ability.
3. Lack of problem solving skills of students at MAN 2 Model Medan to understand abstract and mathematical physics lessons.
4. Lack of student motivation in physics learning because they rarely do practical activities or illustrations that help students.

1.3. Scope

The scope of the problems discussed in this study is the effect of the TPACK-based differentiated Inquiry Learning Model on Light Wave material on motivation and problem solving skills in MAN 2 Model Medan students as a supporter of the merdeka curriculum.

1.4. Problem Limitation

This research is limited to the following:

1. The research objects are students of class XI F1 A and XI F1 C at MAN 2 Model Medan.
2. The learning model used is differentiated inquiry. Researchers chose differentiated inquiry because the conditions of students and classes at MAN 2 Model Medan support the learning process of differentiated inquiry.
3. This research will limit the discussion to the use of technology that supports the differentiated inquiry-based learning process, such as PhET, Google forms and Learning Videos.
4. The use of TPACK as a supporter of the differentiated inquiry learning model.
5. Learning materials are only limited to light waves.

1.5. Problem Formulation

Based on the problem limitations above, the problem formulation will be as follows:

1. How is the difference in physics problem solving ability of students using TPACK-based differentiated inquiry learning model and students in conventional learning in XI MAN 2 Model Medan ?
2. How is the difference in physics problem solving ability of students who have high motivation and students who have low motivation in class XI MAN 2 Model Medan ?
3. How is the effect of TPACK-based differentiated inquiry learning model and student motivation on students' problem solving ability on the subject matter of light wave ?

1.6. Research Objectives

In accordance with the formulation of the problem above, the objectives to be achieved in this study are:

1. To see the difference in physics Problem Solving Ability of students using TPACK-based differentiated inquiry learning model and students in Conventional learning in XI MAN 2 Model Medan.
2. To see the physics problem solving ability of students who have high motivation and students who have low motivation in class XI MAN 2 Model Medan.
3. To observe the TPACK-based differentiated inquiry learning model and students' motivation on students' problem solving ability on the subject matter of light waves in class XI MAN 2 Model Medan.

1.7. Research Benefits

The results of the research are expected to provide benefits for all parties who are involved in the research. The theoretical benefit of this research is that it can provide information from TPACK-based problem solving skills and student motivation that can be improved through the use of differentiated inquiry learning models.

- a. For teachers as educators, it can be used as a reference in using physics learning models and media.
- b. For writers, it can be used to increase knowledge in equipping themselves as prospective physics teachers and to find out the problem solving ability and motivation and management of student learning using the TPACK-based differentiated inquiry learning model.
- c. For other researchers, it can be used as a study material and reference for further research.