

CHAPTER I

INTRODUCTION

1.1. Background

Indonesia's Ministry of Education, Culture, Research, and Technology has launched the Independent Curriculum to improve educational quality through comprehensive assessments tailored to student needs. This curriculum encourages teachers to evaluate both learning outcomes and student experiences throughout their educational journey (Kementerian Pendidikan dan Kebudayaan, 2021). These assessments measure theoretical knowledge alongside critical thinking and problem-solving skills essential for real-world application (Fahira et al., 2022; Lestari et al., 2023; Sari et al., 2022). This approach supports the Merdeka Curriculum's goal of developing student competencies and character holistically. Effective assessments must evaluate knowledge, skills, and attitudes using various methods, including formative and summative evaluations that provide complete pictures of student abilities. Quality assessments should offer constructive feedback to educators and students, supporting continuous improvement in education. Research by Sunra and Samtidar (2023) shows that good assessments increase student motivation and provide valuable feedback for development. Therefore, educators must design assessments aligned with curriculum principles, supporting government efforts to provide equitable, inclusive education for all Indonesians. Implementing ideal assessments according to the Merdeka Curriculum is key to achieving national education goals that benefit society.

Evaluating students' knowledge through their problem-solving capabilities represents a crucial foundation for cultivating Higher Order Thinking Skills (HOTS) that will serve them throughout their academic journey and beyond. These advanced cognitive abilities have become the heartbeat of contemporary education, as they prepare students to navigate the complex challenges that await them in our interconnected global society (Bavli, 2023; Tyas, et al., 2021; Ragab et al., 2024). When we examine physics education specifically, problem-solving skills become powerful tools that enable students to recognize patterns, dissect complex situations, and discover innovative solutions to the challenges they

encounter. This approach transforms abstract physics concepts into tangible understanding through meaningful application in authentic, real-world scenarios. When assessments are thoughtfully designed with this purpose in mind, students develop the capacity to approach problems with both critical rigor and creative flexibility (Syafri et al., 2021; Bao, L., & Koenig, K., 2019; Novitra et al., 2021). Consequently, creating tests that emphasize problem-solving abilities does far more than enhance academic performance; it builds the intellectual resilience and adaptability students need to thrive in an uncertain future (Mansour, 2024). This responsibility challenges educators to become architects of learning experiences that cultivate problem-solving competencies with both effectiveness and genuine care for student development.

The ability to solve problems effectively serves as a vital bridge connecting classroom learning to the complex realities students will face throughout their lives. These essential skills train young minds to approach challenges with critical thinking, logical reasoning, and systematic methodology when confronting multifaceted problems. In the realm of physics education, problem-solving becomes a powerful connector that helps students see the relationships between theoretical understanding and practical application, deepening their conceptual grasp in profound ways (Shanta, 2022; Fries et al., 2021). Beyond academic benefits, these capabilities provide students with remarkable flexibility to adapt and thrive amid constant change and technological advancement. This is why weaving problem-solving approaches throughout the curriculum becomes absolutely essential for preparing graduates who possess both competence and confidence to make meaningful contributions to their communities and society at large. The development of assessment tools that incorporate cultural contexts and problem-solving frameworks holds tremendous promise for making learning more relevant and meaningful, while preparing students to become well-rounded individuals ready to tackle real-world challenges with wisdom and creativity (Nilimaa, 2023; Cholilah et al., 2023; Purnawanto, 2022).

Educational research has consistently illuminated the fundamental importance of problem-solving skills, particularly within physics education where abstract concepts meet practical application. The groundbreaking work by Abdulfattah and Supahar (2019) highlighted the critical need for developing assessment instruments that truly capture students' problem-solving capabilities with validity and reliability. Their innovative research employed problem-based learning methodologies to create evaluation tools that measure not only factual knowledge but also students' systematic approaches to physics problem-solving. The encouraging results demonstrated that their carefully developed instruments possessed both validity and reliability, making them valuable resources for enhancing students' problem-solving competencies. This significant contribution demonstrates that investing in well-designed, problem-solving-focused assessments can meaningfully improve the quality of physics education in educational institutions.

Building upon this foundation, the research conducted by Tanjung et al. (2022) brings attention to the profound importance of developing problem-solving assessment tools that honor and integrate cultural contexts. Their findings reveal that students who engage with culturally-integrated assessment instruments demonstrate significantly enhanced problem-solving abilities. These discoveries align beautifully with the work of Zulfanir et al. (2024), whose research demonstrates how physics teaching materials grounded in science, environment, technology, and society (SETS) approaches can unlock students' creative potential and strengthen their problem-solving capabilities. When educational experiences connect learning to familiar local contexts, students find it much easier to grasp physics concepts and apply them meaningfully in their everyday experiences.

The research findings from Tanjung et al. (2024) reveal that numerous students continue to struggle with systematic physics problem-solving, highlighting the urgent need for more structured and supportive teaching approaches. Additionally, the work by Hutapea et al. (2020) draws attention to concerning gaps in students' problem-solving abilities, particularly with dynamics material, emphasizing that developing appropriate assessment instruments is

crucial for both measuring and improving these essential skills. Collectively, these research studies point toward a clear conclusion: developing educational tools and methodologies that prioritize problem-solving development is absolutely essential for elevating the quality of physics education throughout Indonesia.

To better understand the lived reality of physics education, the researcher engaged in meaningful conversations with a physics teacher at SMA Negeri 7 Medan, seeking to identify key variables for study while uncovering potential challenges within the physics learning environment. These insightful discussions revealed that current assessment instruments primarily focus on measuring students' conceptual understanding of physics material, without incorporating contextual assessments that connect to real-world applications. This limitation results in students having fewer opportunities to practice applying their physics knowledge in complex, authentic situations that mirror real life. The conversations also brought to light that teachers have not yet fully embraced technology's potential in their instructional practices. Much of the teaching continues to follow traditional patterns, emphasizing lecture-based delivery and written assignments rather than interactive engagement. This limited use of technological resources, such as interactive learning applications or digital media, contributes to reduced student interaction and engagement in the learning process (Tuma, 2021; Haleem et al., 2022; Pinto & Leite, 2020). When students remain passive rather than actively engaged, their motivation to participate meaningfully in learning diminishes, which ultimately impacts both their understanding and their ability to solve problems effectively. These important discoveries highlight several key variables that warrant careful consideration in this study: first, how effectively assessment instruments measure both student understanding and problem-solving capabilities, and second, the extent to which technology is meaningfully integrated into learning experiences. These challenges clearly indicate the necessity of developing assessment instruments that are both contextual and relevant, alongside providing teachers with the training they need to successfully integrate technology into their instructional practices (Keyza & Sirait, 2024). This research aims to offer practical solutions for improving physics education quality

at SMA Negeri 7 Medan while better preparing students to meet real-world challenges with confidence and competence.

These educational challenges align closely with preliminary research findings that highlight the concerning issue of limited problem-solving abilities among Indonesian students, particularly in physics education. The important work by Khoirun Nisa et al. (2024) brought attention to how students' limited problem-solving capabilities often stem from inadequate access to valid and relevant assessment instruments. Furthermore, research by Tanjung et al. (2022) demonstrated that students frequently encounter difficulties when attempting to solve complex physics problems, especially in situations requiring them to apply theoretical concepts within authentic, real-world contexts.

The research conducted by Widyaningtyas et al. (2024) powerfully demonstrates that culture-based learning approaches can significantly enhance students' creative thinking and problem-solving abilities. However, the reality in many classrooms reveals that educators continue to rely on conventional teaching methods that fail to connect subject matter with students' local cultural contexts. This disconnect causes students to feel less engaged with their learning and unable to see meaningful connections between their studies and their daily lives. This makes it critically important to develop assessment tools that evaluate not only knowledge acquisition but also problem-solving skills within culturally relevant and meaningful contexts.

The integration of technology into assessment practices, particularly for knowledge evaluation, presents both opportunities and challenges that deserve careful consideration (Keyza & Sirait, 2024). While research has shown that applications like Quizizz can effectively enhance students' problem-solving capabilities, many educators remain hesitant to incorporate these technological tools into their teaching practices (Kristiani & Usodo, 2022; Setiyani, 2020; Lestari et al., 2024). The work by Carolina et al. (2022) provides encouraging evidence that interactive media such as Quizizz can genuinely improve students' problem-solving abilities. However, at SMA Negeri 7 Medan, obstacles persist regarding technology accessibility and adequate teacher training for effective

application use. This situation illustrates that while technology holds tremendous potential for transforming learning experiences, successful implementation requires comprehensive support and dedicated attention to overcome existing barriers.

The collective findings from previous research clearly demonstrate that students' limited problem-solving abilities in physics represent a well-documented concern that has captured the attention of numerous educational researchers. The work by Abdulfattah and Supahar (2019) emphasized that insufficient access to valid assessment instruments for measuring students' problem-solving capabilities contributes significantly to these skill deficiencies. Additionally, research by Tanjung et al. (2022) revealed that students often struggle with complex physics problems, particularly when confronted with situations demanding the application of concepts in authentic, real-world contexts. The research by Zulfanier et al. (2024) further demonstrates that when learning experiences fail to connect academic material with real-world applications, students experience decreased motivation and struggle to relate their educational experiences to their everyday lives. These comprehensive findings clearly indicate the urgent need for more integrated and contextually meaningful approaches to physics education.

Addressing these educational challenges requires developing superior assessment instruments that resonate with students' cultural backgrounds and experiences. The culture-based learning approach advocated by Widyaningtyas et al. (2024) offers a promising pathway for increasing student engagement while helping them establish meaningful connections between academic content and their daily experiences. Assessment instruments designed around contextual problem-solving should be carefully crafted to evaluate students' abilities to analyze, identify, and resolve physics problems that reflect authentic, real-world situations. This approach ensures that students are evaluated not only on their conceptual understanding but also on their capacity to apply knowledge within broader, more meaningful contexts. Additionally, the research by Carolina et al. (2022) demonstrates that incorporating interactive media like Quizizz can significantly enhance students' problem-solving capabilities. When technology is

thoughtfully integrated into learning experiences, students can develop problem-solving skills within engaging, interactive environments that make learning both effective and enjoyable.

The research findings from Tanjung et al. (2024) provide compelling evidence that utilizing relevant and contextually appropriate assessment instruments can substantially improve students' problem-solving capabilities. Through the adoption of applications like Quizizz, students can practice problem-solving skills within interactive and engaging environments that boost their motivation and active participation in learning. Furthermore, developing instructional materials that connect physics concepts to local contexts helps students achieve deeper understanding while relating their learning to their everyday experiences. This comprehensive, holistic approach holds great promise for helping students at SMA Negeri 7 Medan achieve significant improvements in their problem-solving abilities, which will ultimately create positive ripple effects throughout their overall physics learning outcomes.

Drawing from the comprehensive background presented above, the author recognizes the compelling need to develop problem-solving assessments that seamlessly integrate cultural contexts with technological innovation in physics education. Through the thoughtful adoption of the Quizizz application, students will have opportunities to practice problem-solving skills within interactive and enjoyable learning environments, thereby increasing their motivation and meaningful engagement in the educational process (Setiyani et al., 2024; Zainuddin et al., 2020). Additionally, creating assessment instruments that reflect and honor local contexts will help students develop deeper understanding of temperature and heat concepts while establishing clear connections to their everyday experiences. Therefore, this research study entitled "The Development Of Problem Solving Test With Cultural Context Using The Quizizz Application On Temperature And Heat Material At Sma Negeri 7 Medan" seeks to establish a more effective and contextually meaningful learning approach that will enhance students' problem-solving capabilities and improve their overall educational outcomes.

1.2. Identification of Problem

The identification of problem include:

1. The low ability of class XI students in solving problems in physics material at SMA Negeri 7 Medan.
2. Learning methods that are still conventional, such as written assignments, result in a lack of student involvement in the learning process.
3. The subject matter is not connected to the local cultural context, so students have difficulty understanding the relevance of physics concepts in everyday life.
4. Lack of use of technology in the learning process hinders student interaction and motivation.

1.3. Scope of the Problem

The scope of the problem in this research are as follows:

1. This research was conducted at SMA Negeri 7 Medan by developing a problem-solving-based test instrument that integrates cultural contexts for grade XIII students with temperature and heat material.
2. The aspects studied include students' problem-solving skills and the feasibility of the developed test instrument.
3. The limited time for teachers in developing and compiling HOTS test instruments that are relevant to the cultural context and applying technology to measure problem-solving skills in temperature and heat material is a challenge in itself.
4. Students at SMA Negeri 7 Medan are still not accustomed and trained in working on problem-solving skills-based test instruments that integrate cultural contexts by applying technology.
5. Students still consider problem-solving skills-based test instruments with cultural contexts to be quite difficult types of test instruments, and their ability to complete test instruments is often only based on their quantitative values.

1.4. Limitation of the Problem Problem Formulation

To maintain the focus of the research, several problem limitations need to be established. The problem limitations in this study are as follows:

1. This study is limited to students of SMA Negeri 7 Medan by taking class XII – M.T. Haryono as the research subject.
2. The focus of this study will only discuss the development of problem-solving-based test instruments with a cultural context using the Quizizz application.
3. The skills applied in this study are limited to the thinking process of the stages of problem solving according to the Polya problem-solving framework.
4. The physics learning material that will be the main subject of this study is a test instrument based on problem-solving skills on the material of Temperature and Heat.

1.5. Problem Formulation

The formulation of the problem in this study are as follows:

1. How is the process of developing a problem-solving test instrument with a cultural context on temperature and heat material at SMA Negeri 7 Medan?
2. How is the feasibility of a problem-solving physics test instrument with a cultural context developed for temperature and heat material?
3. How do students respond to a problem-solving skill-based test instrument on temperature and heat material?

1.6. Research Objectives

Based on the formulation of the problems that have been prepared, the objectives of this research are formulated as follows:

1. Knowing the process of developing problem-solving-based test instruments with a cultural context on temperature and heat materials at SMA Negeri 7 Medan.
2. Knowing the feasibility of problem-solving-based physics test instruments with a cultural context developed for temperature and heat materials.

3. Knowing students' responses to problem-solving-based test instruments on temperature and heat materials.

1.7. Benefits of Research

This research is expected to provide significant benefits to various parties.

The benefits of this research are as follows:

1. This research is expected to contribute to other researchers in developing problem-solving-based physics test instruments that are relevant to temperature and heat materials and cultural contexts.
2. As a reference for teachers in developing problem-solving-based test instruments on temperature and heat materials using the Quizizz application.
3. As input and consideration for schools in determining educational policies that support the development of students' problem-solving abilities.
4. This research is expected to add references in the development of contextual and relevant HOTS-based test instruments.
5. This research is expected to provide valuable experience for researchers in compiling and developing test items as prospective educators in the future.