CHAPTER I
INTRODUCTION

1.1 Background

Education is a fundamental and structured aspect of character building for students. When discussing education, we realize how important it is in today's digital age. To advance a nation, maximum education is needed to achieve this. Therefore, it can be said that improving the quality of education has a major impact on the progress of a nation (Makkawaru, 2019). In Law No. 20 of 2003 concerning the National Education System, it is stated that education is a conscious and planned effort to create an atmosphere and process of learning and teaching so that students actively develop their potential to have religious spiritual strength, self-control, personality, noble character, and the skills necessary for themselves, society, the nation, and the state (Budiarti et al., 2017).

According to (Zakso, 2022), currently, the education curriculum has adopted the merdeka curriculum, although it has not yet been implemented in all schools in Indonesia. Themerdeka curriculum focuses on the use of adequate technology, considering that we are now in a highly advanced digital era, namely the 5.0 industrial revolution era. This curriculum model emphasizes student-centered learning rather than teacher-centered learning. However, in practice, many educators have not yet fully implemented it. The learning process is carried out without utilizing teaching modules and student worksheets, so it often focuses on honing the students' own abilities.

The merdeka curriculum is an innovative education policy designed to provide flexibility to teachers and students in managing a more relevant, in-depth learning process that is centered on the needs of students. This curriculum emphasizes character building and 21st century competencies through contextual learning and a focus on solving real-world problems. To support its implementation, a learning model is needed that can increase student participation, encourage collaboration, and train critical thinking and problem-solving skills.

The learning model is part of the learning process that serves as the basis for implementing each stage of learning in order to achieve predetermined learning objectives (Hakim & Syofyan, 2017). Meanwhile, according to Karwati & Priansa (2014), a learning model is an element of the learning process that has an organized conceptual structure and is applied in educational activities to achieve effective and efficient learning objectives. Based on these two opinions, it can be said that a learning model is a learning strategy that has a systematic pattern of grouping learning experiences in the classroom to interact with each other in order to achieve the desired learning objectives. One learning model that is very much in line with the principles of the Merdeka Curriculum is Problem-Based Learning (PBL). Problem Based Learning places students as the main subjects in the learning process through problem-solving activities that are relevant to their lives. Several studies have also shown that the application of PBL in the Merdeka Curriculum can improve student activity and learning outcomes through meaningful and focused learning experiences (Mastuti, 2024).

Most students consider chemistry to be one of the most challenging subjects because its nature is largely abstract. In fact, the purpose of studying chemistry is for students to understand chemical concepts and their application in everyday life and technology (Febriani et al., 2024). One of the topics in chemistry is chemical bonding. Chemical bonding studies the formation of a bond between two or more atoms that form a compound in order to achieve stability. It is this level of abstraction that causes chemical bonding to be viewed as a difficult topic for students to understand (Silaban et al., 2020).

The use of teaching media during the learning process can make it easier for students to learn independently. One type of teaching material that we often encounter is teaching modules. E-modules are teaching modules that display information in electronic form on a hard drive or flash drive that can be read using electronic devices such as smartphones, computers, laptops, and so on (Azizah & Ardhana, 2023). The use of e-modules can support the display of educational videos, interactive games, PowerPoint presentations, flip books, and much more, making this learning medium an attractive option to implement (Widiantari et al., 2022). The use of e-modules also provides a practical solution without the need

for paper and can be accessed anytime and anywhere, so that learning is not only about sitting in class but can also be studied independently after school.

Research conducted by Simangunsong & Purba (2025) shows that the development of Canva-based molecular shape e-modules produces learning media that is highly valid and practical for students to use. The validation results show that the e-modules scored 91.8% in material feasibility and 90.8% in media feasibility, both of which are in the "very valid" category. Trials with students also yielded excellent results with a response rate of 90.1%, with students stating that Canva-based e-modules were more interesting, easy to understand, and helped them learn molecular shape material through attractive visual displays and simple navigation. These findings confirm that Canva is an effective platform for designing attractive, communicative, and user-friendly e-modules.

Research conducted by (Putri et al., 2023) shows that the development of Canva-based e-modules produces learning media that is highly suitable for use. Through the ADDIE model, the developed e-module received a "highly suitable" rating from subject matter experts with a score of 88.63%, media experts with a score of 88.3%, and language experts with a score of 100%. The results of trials with students also showed a very good response with a percentage of 86.21%, where students rated the Canva e-module as more interesting, easy to use, and helpful in understanding the material due to its visual and interactive display. These findings prove that Canva is an effective platform for designing attractive and user-friendly e-modules.

Research conducted by Izzati and Dwiningsih (2025) indicates that the development of e-modules on molecular structure integrated with digital visualization can enhance students' visual-spatial skills and learning outcomes. The study results show that 88.8% of students achieved high-level improvements in learning outcomes after using the e-module. Furthermore, student responses to the use of e-modules fell into the "very practical and effective" category. These findings confirm that e-modules supported by interactive visualizations are crucial in facilitating the understanding of abstract molecular geometry concepts.

Research conducted by Silaban (2021) shows that chemical bonding material is one of the basic concepts of chemistry that is abstract in nature, so it often becomes an obstacle for students in understanding the process of bonding and changes in electron configuration. Through research and development (R&D), Silaban designed a chemical bonding e-module equipped with pictures, illustrations, and structured explanations. The results of the trial showed that the use of this e-module can improve students' understanding compared to learning with conventional teaching materials. The results of this study provide a strong basis that the development of e-modules on chemistry materials, including molecular geometry/molecular shape materials, which are also abstract, is very necessary to help students visualize concepts that cannot be observed directly.

Research conducted by (Asmi et al., 2024), based on a needs analysis for the development of electronic chemistry teaching materials integrated with the Problem-Based Learning (PBL) model, as these students face difficulties in understanding abstract chemistry concepts and are limited by teaching materials that are still dominated by textbooks and conventional methods. Furthermore, the results of the needs analysis also indicate that students require electronic teaching materials capable of providing clearer visualizations and supporting active engagement in the learning process.

Previous research conducted by researchers on the application of the Problem-Based Learning (PBL) model in modules on molecular shapes shows that the use of PBL can improve students' conceptual understanding. Problem-based learning also encourages students to collaborate, discuss, and build concepts independently, thereby reducing misconceptions related to molecular shapes, bond angles, and factors that affect molecular geometry. However, this research has not yet integrated digital learning media such as interactive e-modules or videos visualizing molecular shapes (Triani, 2019).

Based on preliminary analysis at SMA Negeri 2 Medan, teachers still use a teacher-centered learning model. Teachers only use textbooks to explain chemical bonding topics. According to students, lecture-style learning methods are boring and reduce their interest in learning, especially since chemistry classes are held in the afternoon. To overcome this problem, learning media that can be used to

explain chemical bonds are e-modules using a group learning model. The problem-based learning (PBL) model is presented as a solution in learning to form small groups so that students can learn together in solving existing problems. Through this process, students are trained to think critically and also acquire skills in problem solving (Widahyu, 2021).

From the results of interviews conducted by researchers with a chemistry teacher at SMA Negeri 2 Medan, she said that the use of learning media in chemistry is still limited, especially digital-based media. In addition, students still find it difficult to understand chemical bonding material because of its abstract nature, especially when studying molecular geometry. Students assignment results tend to be low in chemical bonding material, especially when studying molecular shapes. The use of digital learning media to support the teaching and learning process is considered important in adding flexibility to teaching and learning activities. Thus, teaching and learning activities can be carried out without having to think about time and place.

Based on the above description, the researcher was interested in trying to explore the development of learning media with the title "Development of E-Module Based on Problem Based Learning (PBL) Model Using Canva on Chemical Bonding." The developed learning media could be one of the breakthroughs in media to improve student learning outcomes.

1.2 Problem Identification

The following are the problems identified in this study based on the background described above:

1. The learning model that is being implemented still does not emphasize student activity and involvement during the learning process.
2. Limited use of supporting learning media.
3. Teachers still dominate the learning process (teacher-centered).
4. There are no e-modules available that have been developed using Problem-Based Learning (PBL) using Canva.
5. Chemical bonding material is abstract and difficult to understand.

1.3 Scope

Based on the identification of problems described above, the scope of this study is as follows:

1. The learning process still uses a conventional model with a teacher-centered lecture method.
2. Limited variety of media used in chemistry learning.
3. Lack of student interest in conventional learning models.

1.4 Problem Limitation

To ensure that this study does not deviate from its objectives, it is necessary to define the scope of this study, namely:

1. The learning model used in this study is problem based learning.
2. The chemical bonding topic presented is molecular geometry.
3. This study was conducted to determine whether e-modules with a problem-based learning model on chemical bonding are effective as a learning medium.
4. This research was conducted on x grade students at State Senior High School 2 Medan in the 2025/2026 academic year.
5. The development model used is 4D (Define, Design, Develop, Disseminate).
6. This study is limited to a limited trial (examining the effectiveness of the e-module that has been developed).

1.5 Problem Formulation

The research questions in this study are:

1. How are the results of the initial needs analysis for e-module based on Problem Based Learning (PBL) using canva in chemical bonding?
2. How feasible of e-modules using the problem based learning model meet the standards set by BSNP?
3. How effective are e-modules with the problem-based learning model on student learning outcomes?
4. How do students respond to the chemistry e-modules that have been developed?

1.6 Research Objectives

This study is expected to provide the following benefits:

1. To determine the results of the initial needs analysis for e-module based on Problem Based Learning (PBL) using canva in chemical bonding
2. To create an e-module based on the Problem-Based Learning (PBL) model using Canva
3. To determine the feasibility of the e-module that has been developed with reference to BSNP validity of e-module teaching materials based on the problem-based learning model for the topic of chemical bonding.
4. To determine the effectiveness of the developed e-module based on pretest-posttest results.
5. To determine student responses to the PBL-based chemical bonding e-module using Canva that has been developed.

1.7 Benefits of Research

The benefits that can be obtained from this research are as follows:

1. For Students
   The research can improve student learning outcomes in chemistry lessons. Chemistry lessons can be accessed anytime and anywhere.
2. For Teachers
   The research can be an alternative for teachers in teaching students to be more interested in learning chemistry. It can improve teachers' understanding in creating an interactive and interesting classroom atmosphere.
3. For Researchers
   Researchers gained insight into the use of e-module learning media based on the problem-based learning model in improving the competence of prospective educators.
4. For further research
   Reference materials for improving exploration similar to different materials in accordance with the use of learning media.