CHAPTER I
INTRODUCTION

1.1. Background

According to Law No. 20 of 2003 concerning the National Education System, it states that national education functions to develop abilities and form the character and dignity of the nation in order to educate the life of the nation. Furthermore, it emphasizes that national education aims to develop the potential of students to become human beings who have faith in God Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens.

The mandate of the National Education UU of 2003 above is masquerade so that education not only forms Indonesian human beings who are intellectually intelligent but also have personality or character, so that later a generation of the nation with noble character will be born.The world of education is currently considered only able to produce graduates with a high intellectual level. Many of the school graduates have high grades, are intelligent, brilliant and are able to solve various subject problems very quickly. Unfortunately, not a few of those who are intelligent actually do not have intelligent behavior and a brilliant attitude and lack a good personality mentality, as well as the academic values that they have achieved in school. Education is expected to be able to create human beings who have quality human resources and noble deeds (Saragih.J, 2012).

Education is a process of optimizing the development of abilities, intelligence, and, most importantly, shaping the personal character of students. Realizing a young generation with good character and personality is not easy; this is an important highlight that must be considered by all elements who play a role in education, and process itself requires cooperation between all components included in the scope of education, such as the government and teachers. The government prepares national regulations and policies on educational standards.curriculum, and teacher professional development to ensure the quality and equitable distribution of education. The government is responsible for providing adequate and decent school facilities to support the teaching and learning process. Meanwhile, teachers play an important role

in implementing the curriculum that has been developed by the government with the principle of diversification in accordance with the educational unit and the condition of students. Currently, the government continues to strive to provide a good education system can be seen in the government's efforts to adjust the curriculum according to the demands of the times, develop students' character and competencies through project-based learning, focus on essential materials, and greater school autonomy to adapt the curriculum to local needs and students (Silaban et al., 2020).

These changes also address the shortcomings of the previous curriculum and aim to improve the overall quality of education with the demands and developments of society and technology. The government launched a prototype curriculum through the Ministry of Education and Culture in 2021, which will then be refined into the Merdeka Curriculum in 2022. One of the specialties of this curriculum is character development through the Pancasila Student Profile Strengthening Project, which is abbreviated to P5. P5 is interdisciplinary learning to observe and think about environmental problems (Aprilia and Hindun, 2023).

With the existence of information and education technology in Indonesia, which has developed significantly, these needs can keep up with the times. Information and communication technology in the era of the industrial revolution 4.0 is developing rapidly, so education, which plays a major role in facing technological and information advances, must be able to improve the abilities and skills of human resources in order to be able to compete in this era of the industrial revolution 4.0. Education in the 21st century is a challenge. Learning skills in the 21st century can be seen in the learning process, where learning is no longer centered on the teacher but on the student. Therefore, in order for teachers to be inspired by the application of 21st century learning skills, teachers must have a foundation that allows them to truly stay ahead of the changing times (Maulidia et al., 2023).

Since the implementation of the independent curriculum, educators will also face the challenges of the 21st century in complex skills and qualifications capable of meeting educational challenges around the world. In chemistry lessons, there is a lot of analysis, complex understanding, so if the teacher uses the lecture method to convey chemistry material with a conventional model, learning becomes floating, because students will only imagine abstract forms and theories. Students become passive

because they do not feel the chemical theory conveyed by the teacher is useful in daily life. Therefore, teachers need to provide the right learning model to provide understanding to students, and students to think and explore the teaching material, so that students can understand the material easily, and learning becomes more active because it is takes place in two directions: between teachers and students.

fter conducting a study of various existing learning strategies, the researcher considers the Project-Based Learning Model (PjBL) to be recommended to improve the abilities that want to be fostered through education in the 21st century. Project-Based Learning (PjBL) is one of the 21st century learning models that is effective in developing the characteristics of students of the era, such as critical thinking, collaboration, creativity, and problem-solving, because this model involves students in complex problem-solving activities and produces realistic work products, which ultimately provide more meaningful and relevant learning to the real world.

Project-based learning, if applied appropriately, will have a real effect on creativity and activeness, as well as provide a varied learning experience, which will then have a positive impact on student learning outcomes (Jalil and Shobrun, 2023). Based on the results of observations in schools, it was found that teachers did not adjust learning to the needs of students in using interesting learning media during teaching and learning activities in the classroom, especially the problem of using ICT-based learning media. Of the 30 teachers in the school, only 3 teachers (10%) often operate the use of ICT-based media in the classroom; the rest of the teachers do not correctly choose the learning media that can be used, so that students' activeness in the learning process is very lacking. This situation causes Students to becoming less active and even not about participating in learning activities in the classroom, such as not responding to material, being slow in completing assignments, can even leading to the desire to cheat on a friend's work (Jasahuldia et al., 2022).

The chemistry learning process carried out by teachers still does not use the right learning media. The learning media used must be interesting and easy for students to understand. The media used must also be adjusted to the content of the material and the characteristics of the students. The lack of enthusiasm of students in the classroom can usually be caused by material consisting of mathematical concepts, calculations that are difficult for students to understand, such as in reaction rate material.

The effect of the reaction rate is abstract, but changes in the results of the reaction rate can be observed through practicum. One of the media that can be used to make it easier for students to understand the reaction rate is learning resources. Many students still learn from just one book, It prevents them from to in person. After conducting an analysis, it was found that learning resources that can be accessed independently by students, such as modules, are needed. In addition, there are several factors that can make it difficult for students to learn with books from school; students also think that learning reaction rate is difficult, abstract to recognize in daily life. Therefore, the selection of the right teaching materials, such as learning media, and the selection of the right learning model are very useful in making it easier for students to understand reaction rate material at school (Sudarmo, 2021).

In the learning process in schools, E-modules are one of the media that support the success of the electronic-based learning process. E-modules are teaching materials that are designed in a structured manner by the curriculum and accessed with electronic devices (Silaban, et al., 2021). The application of e-modules as a learning medium is something that can be used to convey learning messages electronically to students. Where the media must really help students to achieve learning goals, provide stimulation to pay attention to learning, increase interest in learning, strengthen participants' thoughts and feelings towards the meter they receive through the understanding of the material presented (Rahmadhan.S et al,2021). The use of E-modules not only brings convenience, sophistication, and savings, but can also increase students' understanding of learning materials.

Based on the results of interviews with chemistry teachers at SMAN 2 Percut Sei Tuan, it is known that teachers have never used e-modules for classroom learning, especially in reaction rate materials. In teaching, the reaction rate is very limited to the limitations of tools and materials in the laboratory, so it usually only uses simple materials but is not integrated with local wisdom. Chemistry teachers at SMAN2 Percut Sei Tuan also realize that it is very necessary to e-module developed through an ethnopedagogical approach based on local wisdom because it is able to provide real experience to students so that abstract material can be learned directly so that children are able to find their own understanding correctly. Based on the results of the student needs analysis questionnaire with grade XI students who have studied reaction rates,

it was found that 85.5% of students were interested and agreed that learning should be developed in the form of project-based e-modules integrated with ethnopedagogy. They felt that with a project-based approach, they could explore their understanding independently.

Thus, the preparation of E-modules should be carried out in an attractive, effective, and innovative manner, and attention to the needs and characteristics of students. The use of local culture in science learning (including chemistry) is essential. Students' knowledge of chemical materials in the form of content and the cultural context that exists around them is the initial knowledge that is brought into learning Where this initial knowledge is very useful in helping students understand the chemical material to be studied. The integration of local culture into learning will be able to increase students' love for the (cultural) potential of their region and the desire to continue to preserve it (Surdana, 2014).

Today's education is required to not only focus on students' cognitive achievement, but to integrate local cultural values as part of the learning process. According to research conducted by Imas et al., in 2022 in Semarang, the development of bioporic e-booklet learning media focused on the development of teaching materials and learning media on the topic of reaction rate by observing the decomposition of organic waste and student responses to the developed E-booklet were 86.83% with the category of "very good" but it has not been explained whether the learning outcomes will increase if the teaching materials are developed based on the local wisdom of students because Teaching materials developed with local wisdom are not only innovative, but also relevant to students' daily lives.

In addition, various studies show that contextual learning can increase students' motivation and understanding. Research by I Gusti, I Wayan and Ida bagus in 2024 stated that the application of teaching materials based on local culture is able to increase student involvement in science learning because students feel close to the examples used. This fact shows that ethnopedagogy, an educational approach that integrates local wisdom into learning, has the potential to strengthen conceptual understanding while preserving regional culture (Gusti et al.,2024).

Another study, also conducted by Sugara & Sugito in 2020, explained that learning with ethnopedagogy is an educational approach that plays an important role

in instilling cultural values while strengthening learning. They emphasized that ethnopedagogy opens up great opportunities to be applied in schools because it is able to bridge the gap between the national curriculum and the context of students' daily lives. This suggests that teaching materials developed are integrated with the local culture will be more relevant to students, thereby improving their engagement and learning outcomes (Sugara and Sugito, 2022).

The Muzakkir's research in 2021, he stated that ethnopedagogy-based learning is not just the integration of culture in learning, but a one of the strategies to revive the values of local wisdom that have begun to be degraded by globalization. Ethnopedagogy is also seen as one of the solutions so that students do not feel alienated from their own environment. Thus, the development of teaching materials based on local wisdom can be an effective means to strengthen cultural identity while enriching the learning experience of science or ethnoscience and as a source of innovation and skills that can be empowered (Muzakkir, 2021).

The research, *Analysis of Ethnoscience Integrated Chemistry E-Modules On Reaction Rate Material To Strengthen Chemical Literacy Of High School Students*, by Rina Nugraheni & Heru Pratomo (2025) found that 93.3% of students stated that the analysis of student needs is high for ethnoscience-based chemistry modules for reaction rate material because the module can help students' understanding, introduce ethnoscience, and make the materials more interesting and not boring, it is hoped that it will make it easier for students to the material being taught, but the publication has not explained whether the teaching materials are directly that the impact on students in the reaction rate material, but the results of this research can be a reference for future researchers to ensure that the development of ethnopedagogy-based teaching materials will later receive support from users, namely students and teachers (Nugraheni.R & Pratomo.H, 2024).

Piper betle is a plant species that grows abundantly in the mountainous regions of the Bukit Barisan, which extend across the provinces of North Sumatra and Aceh. Within the cultural practice of betel chewing as a form of local wisdom, betel leaves are combined with lime and areca nut and subsequently chewed, producing a red-colored extract that is traditionally believed to enhance stamina and maintain oral and dental health (Simbolon et al., 2024). This local practice is closely related to the

concept of reaction rate in chemistry. The reaction occurs due to interactions between reactant particles, namely betel leaves, areca nut, and lime, which collide during the chewing process to form a product in the form of a red extract.

In the Tanah Karo region of North Sumatra, the practice of chewing betel leaves, lime, tobacco, and areca nut is commonly known as "marsukkil" and is predominantly carried out by middle-aged women. Additionally, the Karo community performs this tradition during customary ceremonies, such as wedding rituals and guest welcoming ceremonies. Typically, the host provides the marsukkil set to guests as a symbolic gesture to initiate conversation and strengthen social bonds (Dora & Azahra, 2024).

Furthermore, areca nut utilization is also an integral part of traditional rituals in various regions of Indonesia. In Papua, for instance, the betel chewing tradition is also widely practiced; however, the part consumed is often the betel flower rather than the leaf. This local wisdom can also be associated with chemical concepts, particularly acid, base, and salt solutions. Betel leaves are known to function as natural indicators, exhibiting color changes from green to red under alkaline conditions. This color change may occur through multiple pathways depending on the pH variations of betel extract in alkaline environments (Silaban et al., 2024). Previous studies have demonstrated that local wisdom-based learning can improve student learning outcomes, foster appreciation for local culture, and promote conservation-oriented character values (Safitri et al., 2018). In addition, local wisdom-based modules have been shown to enhance logical reasoning abilities, creative thinking skills, and scientific literacy (Hartini et al., 2017).

Previous research has shown that integrating local wisdom into chemistry teaching materials can provide more contextual and meaningful learning for students. The development of a Problem-Based Learning (PBL)-based chemistry e-textbook that incorporates Toba Batak local wisdom through the Dekke Naniura context proves that chemical concepts can be directly connected to students' culture and environment. Therefore, the development of a local wisdom-based chemistry e-module is also relevant for application to reaction rate material as an effort to improve conceptual understanding, learning engagement, and student appreciation of local culture (Silaban et al.,2025).

Other studies have specifically focused on the development of local wisdom-based modules in stoichiometry learning (Silaban et al., 2025). Therefore, the researcher conducted research on the development of a chemistry module based on local wisdom for reaction rate materials which the researcher believes that with ethnopedagogy it can make it easier for students to learn and understand the reaction rate material properly and correctly.

Based on the description above, the researcher submitted a research proposal entitled "Development of E-modules of Teaching Materials Based on Project Based Learning (PjBL) Integrated with Ethnopedagogy of Reaction Rate Topics.

1.2. Problem Identification

Judging from the background of the above problems, it can be identified that the problems.The existing ones are as follows:

1. The lack of compatibility between media and learning strategies in schools can improve the character and skills of 21st century students in schools.
2. The lack of use of ICT in making interesting learning media so that doctrinal chemistry learning is difficult to understand and abstract to learn.
3. The lack of learning resources for reaction rate materials that are integrated with PjBl and integrated ethnopedagogy that help students in building their understanding independently but still being guided.
4. The learning resources used so far do not include learning methods that are in accordance with the characteristics of the chemistry material they are studying.
5. The need for effective and innovative learning resources, as well as paying attention to the needs and characteristics of students in interactive E-modules.

1.3. Scope of Research

Based on the identification of the problems that have been described, the scope of this research is to develop an ethnopedagogy-based E-module "Betel Eating Culture North Sumatra integrated with Project Based Learning (PjBL) on reaction rate chemistry materials.

1.4. Problem Limitations

Given the breadth of the scope of the problem in identifying the above problems,this study is only limited to the following:

1. The e-module is developed based on Project Based Learning (PjBL) in the topic of reaction rate chemistry and is intended for secondary school grade XI.
2. The material to be studied in E-Module is the topic of reaction rate chemistry with the subtitle factors that affect reaction rate.
3. Local wisdom related to the E-module is a tradition originating from North Sumatra.
4. This study was limited to a limited trial (asking students and teachers to respond).

1.5. Problem Formulation

To provide directions that can be used as a reference in research, the formulation of research masala is made as follows:

1. What are the needs of the media and learning strategies available today, especially in reaction rate material?
2. How to design a reaction rate e-module based on PjBL integrated culture eating betel seeds, in order to meet the standards, set by BSNP ?
3. What is the feasibility of the e-module that has been prepared referring to the BSNP validity of E-module teaching materials based on Project-Based Learning strategies that are integrated with the ethnopedagogy of reaction rate topics?
4. How do chemistry teachers and students respond to the PjBL-based reaction rate e-module integrated with the culture of eating betel that has been prepared?

1.6. Research Purpose

In accordance with the formulation of the above problem, the objectives of this research are:

1. Knowing the current media needs and learning strategies available on chemistry topics, especially in reaction rate materials.
2. Knowing the design of e-module teaching materials based on project based learning intergrated with ethnopedagogy on reaction rate,in order to meet the standards, set by BSNP.
3. Knowing the feasibility of e-module teaching materials based on project based learning intergrated with ethnopedagogy on reaction rate that has been prepared refers to the BSNP validity.

4. Knowing the response of chemistry teachers and students to the e-module teaching materials based on project based learning intergrated with ethnopedagogy on reaction rate, has been prepared.

1.7. Research Benefits

This research is expected to provide the following benefits:

1. For schools: as a new reference for schools to implement appropriate and interactive teaching materials for students in school learning.
2. For chemistry teachers: As a reference for chemistry teachers to design learning media (teaching materials) that are interesting, innovative, and utilize current ICT in chemistry learning.
3. For students: Able to direct, guide and provide additional references for students in learning reaction rate material by giving a real impression so that they can understand and build their knowledge independently but still be guided.
4. For further researchers: As an overview and reference to conduct research and development with the same subject matter to improve the quality of the learning process, especially chemistry learning.