CHAPTER I
INTRODUCTION

1.1 Research Background.

The 21st century is an era of globalization characterized by technological advances that facilitate access to information so that human survival is easier and more practical in all aspects of life. The development of the 21st century has experienced advances in science and technology that have changed the pattern of people's lives and increased competitiveness on a national and global scale.

The 21st century has resulted in rapid changes in various fields, one of which is This century is an era of globalization characterized by the learning process in the field of education. The 21st century is an era of globalization that makes every individual required to be able to compete and face challenges globally, so in this century education is encouraged to be able to produce individuals or students to have 21st century skills (Zaniyati & Rohmani, 2024). Competencies in the 21st century shape the world of education to be able to combine the ability of understanding, ability, attitude, and mastery of Information and Communication Technology (ICT) so that it can give birth to students or individuals who are able to face global challenges.

The 21st century is characterized by the use of information and communication technology which has changed various things and influenced all aspects of life including the learning process. Every school is required to be able to prepare students to enter the 21st century by directing learning process activities that can encourage 21st century skills (Kamila et al., 2024). The 21st century skills have 3 types of competencies namely (1) learning skills (creativity and innovation, critical thinking, and problem solving; communication and collaboration); (2) literacy The skills required include (1) literacy, which encompasses information literacy, media literacy, and information and communication technology (ICT) literacy. In addition, (2) life skills are also very important, including adaptability and flexibility, initiative and independence, social and intercultural skills, productivity and responsibility, as well as leadership and a sense of responsibility

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(Soledad & Ramirez, 2020). The 21st century learning aims to prepare future generations with skills relevant to the challenges and needs of this era, this statement according to (Dewi & Arifin, 2024). The ability to think, communicate, collaborate and work together, the ability to master Information and Communications Technology (ICT) and information literacy and the ability to live a 21st century life, so that by using skills that are relevant to 21st century skills.

Scientific literacy is one of the abilities considered important in the 21st century. Entering the 21st century, humans are required to solve challenges in all aspects of life using technology and information. The development of technology and information today requires students to acquire a variety of skills and abilities in order to adapt to the demands of this era (Mousavi, 2020). One of them is the ability of science literacy. Science literacy is the ability to link scientific problems with scientific ideas. Person who is aware of science, will have an attitude to enter into scientific discussions and discussions about technology which includes 3 competencies, namely: (1) Explaining phenomena scientifically, (2) Evaluating and designing scientific investigations, (3) Interpreting data and evidence scientifically (OECD, 2019). Science literacy is the scientific ability to identify, gain knowledge, explain phenomena, draw conclusions from facts, be aware of science and technology that shape the environment, knowledge, and culture. Science literacy also relates to a person's desire to engage in existing science issues (OECD, 2016).

Scientific Literacy is also the knowledge and understanding of scientific concepts and processes needed in the economic productivity of a country (Istyadji & Sauqina, 2023). The improvement of citizens' Science Literacy is not only an intrinsic demand in the innovation-driven development of the country, but also a foundation project for creating an innovative environment to cultivate innovative talents (Han et al., 2023). The importance of Scientific Literacy skills in the 21st century has brought about changes in science education that serves as a science driver in providing a more useful direction of science learning with the aim of preparing society in the 21st century (Marsuki et al., 2020). It can be explained that scientific literacy skills are very important to improve student competence in

meeting their needs to face challenges in the 21st century which are heavily influenced by the development of science and technology.

In reality, the scientific literacy of students in Indonesia is still categorized as low. This is evidenced by the results of (PISA) survey in 2018 (Sukmawati & Wahjusaputri, 2024). The 2018 PISA results show that Indonesia occupies the bottom 10 positions out of 79 participating countries. The international reading literacy score in PISA 2022 decreased by 18 points on average, while Indonesia's score decreased by 12 points, which is a decrease in the low category compared to other countries. For scientific literacy, Indonesia's ranking in PISA 2022 increased by 6 positions compared to the previous year, but Indonesia's score dropped by 13 points with the international average dropping by 12 points (Komang et al., 2024).

Empirical research also reinforces the fact that Indonesian students' science literacy is in the low category. Hasasiyah et al. (2020) on junior high school students showed that science literacy skills were at a low level in almost all aspects. For example, only 24% of students were able to understand research design elements, 21% were able to interpret basic statistical data, and 32% were able to solve questions based on scientific phenomena. Overall, the average students' science literacy skills were categorized as low case. Similar results were found by Tillah and Subekti (2025) who tested the science literacy of junior high school students in Surabaya. Of the 31 students studied, 93.5% were in the very low category and no students reached the medium, high, or very high categories. Science literacy scores on the indicators of explaining scientific phenomena were only 34.4%, evaluating scientific investigations 36.6%, and interpreting scientific data 33.3%

The findings from PISA and empirical research illustrate that the low science literacy of Indonesian students is a serious problem that can affect the overall quality of education. Low case achievement in science literacy indicates that students are not yet able to solve real-world problems effectively, as their critical thinking, analytical and problem-solving skills are not optimally developed (Andayani & Agustina, 2025). It also reflects low motivation to learn among students, which in turn can negatively impact emotional intelligence and slow down the improvement of science literacy itself (Hidayati et al., 2023). Low science

literacy indicates that Indonesian society in general is not ready to compete in a global context, especially in the 21st century era that demands mastery of science, technology and higher order thinking skills (Iskandar, 2024). Improving science literacy is an urgent need so that Indonesia's young generation is able to face the challenges of the times while playing an active role in global competition (Komisia et al., 2025).

One of the factors causing the low scientific literacy of students is the learning process that rarely presents scientific phenomena, mathematics but does not explain its application in everyday life, does not reveal misconceptions, the analogy model used is not appropriate, the demonstration model is narrow (Suparya et al., 2022). Therefore, a learning model is needed that can facilitate students in developing their scientific literacy skills. Students can increase their capacity to face the demands of the times by taking the right learning approach to strengthen relevant skills to face 21st century developments (Fitria et al., 2025). One of the learning models that can be used in science learning is the Inquiry model which aims to improve science literacy skills in students (Wang et al., 2015). Inquiry learning is very suitable for improving science literacy skills because through inquiry learning, students can do science activities directly. Inquiry is a learning approach that involves learners in finding and using various sources to increase understanding of specific material (Maniotes & Kuhlthau, 2014).

The inquiry model is divided into four levels: Confirmatory Inquiry, Structured Inquiry, Guided Inquiry, and Open Inquiry (Susanti et al., 2021). Guided Inquiry is a suitable model for improving science literacy skills because it provides opportunities for students to investigate and provide direct experience of science, while improving students' science and laboratory attitudes (Putri, 2019). Guided Inquiry is an active learning method, where students learn in groups and carry out learning activities simultaneously (Frisch et al., 2018). Based on research conducted by Kuswanto et al. (2021), it is stated that learning with the guided inquiry model has an influence on students' scientific literacy skills, this is evidenced by the results of the hypothesis test which shows a sig value of 0.02 less

than the alpha value of 0.05, which means that there is an effect of the guided inquiry learning model on students' science literacy skills on biodiversity material.

Another factor that can cause students' low scientific literacy skills is the lack of application of creative, innovative and interactive learning media, which has an impact on students' low learning motivation. If this continues, students' scientific literacy problems can hinder the achievement of science learning objectives. One of the steps that can be taken to overcome this is to apply innovative, interactive and creative learning media according to student needs. Through the use of media, students will be more motivated to learn, so that the learning process becomes more effective and efficient, and strengthens the relationship between teachers and students (Amaliyah, 2023). Well-designed learning technologies are highly effective in reducing science literacy gaps among different learning groups. These technologies create an engaging learning environment that motivates students (Ismaniati & Iskhamdhanah, 2023).

The use of technology such as web-based learning is expected to have a positive impact on students. Web-based learning is a general term that describes a learning method that uses the Internet as its primary medium. Since the beginning of the 21st century, rapid developments in information technology have led to the emergence of various forms of distance education and online learning based on the Internet. This has also given rise to new terms such as online education and e-learning. The academic community, both domestically and internationally, collectively refers to this method of learning that utilizes the Internet as web-based learning (Ismail et al., 2024). Research conducted by Kuswanto et al. (2021) has shown that the guided inquiry model with the help of technology in learning can have a good effect on students in developing scientific literacy skills, so researchers will develop web-based learning media designed with a guided inquiry model in learning nutrition, because in previous studies nutrition material was rarely found, its hoped that the web-based learning media that will be developed can facilitate science literacy in junior high school students, especially in nutrition material.

In this study researchers chose nutrition material because Nutrition is one of the fundamental aspects that plays an important role in supporting physical

growth, cognitive development, and the formation of healthy behaviors in children and teenagers (Hartanti et al., 2024). A good understanding of nutrition not only helps students choose the right foods, but also contributes to the prevention of various health problems such as obesity, stunting, and micronutrient deficiencies, which ultimately have implications for quality of life and academic achievement (Alawiyah et al., 2024). For this reason, nutrition literacy is a competency that must be acquired early on so that children are able to apply healthy eating habits in a sustainable manner.

In reality, level of nutrition knowledge among students is still relatively low. Research conducted by Fatimah (2017) in Sleman shows that 56.92% of students are in the "poor" category of nutrition knowledge. Similar results were shown in a study by Yuningsih and Kurniasari (2021) in Semarang, which reported that 66.7% of students were in the "poor" nutrition knowledge category. This condition shows a gap between the importance of nutritional understanding and the reality in the field, which has the potential to cause students to be unable to apply healthy eating patterns, which in turn has an impact on their nutritional status.

Based on the background explanation and the data that has been presented, it appears that the level of student understanding of nutrition material and also scientific literacy skills is still fairly low so there are problems that need to be researched and followed up. To solve this problem, the author will conduct research that aims to develop media designed with a guided inquiry model that is expected to help students in scientific literacy skills, especially in nutrition material. Therefore, the title of this research is "Development of Web-Based Learning with Guided Inquiry Model on nutrition learning to facilitate Scientific Literacy in Junior High School Students".

1.2 Research Problem

Based on the background of the problems previously described, the problem formulation in this study can be formulated as follow: "How to Develop Web-based learning with guided inquiry on the topic of nutrition to Facilitate Junior High School Students' Scientific Literacy Skills?". The research attempt:

1. How is the step of developing Nutriolic guided inquiry to facilitate student scientific literacy as the media of teaching?

2. How does the validity of content, language, and design based on experts judgement to the 'Nutriolic' web inquiry facilitate junior high school students' science literacy on the topic of Nutrition?

3. How does validity of content, language, and design based on Teacher to the 'Nutriolic' web inquiry facilitate junior high school students' science literacy on the topic of Nutrition?

4. How do students respond to 'Nutriolic' to facilitate junior high school students' scientific literacy on the topic of Nutrition?

1.3 Operational Definition

In research, it is very possible for the same variable to have different operational understandings depending on the aims and objectives of the related research. Therefore, in order to avoid misunderstandings and equalize understanding rgarding several terms used in this research, below the author in this research, operational definition of each variable discussed in this research:

1.3.1 Step of Nutriolic Development

In this study, the Implementation of Nutriolic is defined as the application of a web-based learning medium using the guided inquiry model and focusing on nutrition content. The development in this study refers to the stages of the ADDIE model. ADDIE model is an instructional development framework consisting of five main stages: analysis, design, development, implementation, and evaluation. This model is used to design and develop learning media that are tailored to learning needs.

In this study implementation is defined as the use of Nutriolic in learning. Its use is limited to assessing its practical functions, namely ease of use and ease of use in the classroom, as well as its suitability for supporting students' science literacy, particularly regarding the content dimension of science. The purpose of this evaluation is to determine whether Nutriolic is a suitable tool for supporting web-based nutrition learning.

1.3.2 Validity Expert Judgement

Expert judgment is the evaluation of the Nutriolic media by professionals with expertise in education and science using the LORI instrument. LORI instrument is an assessment tool designed to evaluate the quality of digital learning objects, assesses various important aspects of learning media, including interface design, content accuracy, pedagogical appropriateness, feedback, user engagement, and learning opportunities. All of these aspects were assessed in this evaluation. In this study The evaluation focuses on the quality of the media in terms of design, content accuracy, relevance to learning objectives, and its potential to support science literacy skills, particularly in explaining phenomena, interpreting data, and designing scientific investigations.

1.3.3 Validity Teacher Judgement

Teachers' assessment of Nutriolic media was conducted using the LORI (Learning Object Review Instrument), an evaluation tool that assesses the quality of digital learning objects from various aspects, such as content relevance, information presentation, interface design, and pedagogical suitability.

In this context, the focus of teacher assessment includes the relevance of the media to curriculum objectives, ease of use, support for student motivation and engagement in learning, and the extent to which the media helps students understand nutritional concepts and develop scientific thinking.

1.3.4 Student Response

Student responses refer to students' perceptions of their learning experiences using Nutriolic media. This assessment uses the LORI (Learning Object Review Instrument), which evaluates the quality of digital learning objects based on aspects such as ease of use, user engagement, content quality, and support for the learning process. In this context, student responses encompass cognitive, affective, and practical reactions, such as ease of use, level of engagement, understanding of the material, and their views on how

much this media helps in developing science literacy skills, particularly on the topic of nutrition.

1.4. Research Objectives

The objectives of this research are outlined and specified as follows:

1. Designing and developing 'Nutriolic' web-based learning to facilitate students' science literacy in learning nutrition.
2. To validate web-based learning media that can facilitate scientific literacy skills on the topic of nutrition based on the expert judgement.
3. To validate web-based learning media that can facilitate scientific literacy skills on the topic nutrition based on teacher judgement.
4. To gain students' responses to 'Nutriolic' to facilitate students' scientific literacy in Nutrition topics.

1.5 Research Benefit

The result of this study is expected to have benefits as follows:

1.5.1 Teachers

Teachers can use this media to support teaching the topic of nutrition. Although the topic of nutrition is not too difficult for students to understand, it is often a trivial concept, especially among junior high school students. The web-based Nutriolic can be used as an alternative to distance learning or asynchronous learning. Teachers can also use the Nutriolic app which provides inquiry-based questions to evaluate students' understanding of the material and facilitate their scientific literacy skills.

1.5.2 Students

The benefit of this research for students is that it allows them to learn science in a unique and interactive way. Students can interact with technology and get an interesting learning experience through questions that are packaged in inquiry questions in the Nutriolic application. With Nutriolic, students are expected to be able to learn nutrition concepts while developing their science literacy skills. In addition, Nutriolic is very practical because students can access this website anytime and anywhere as long as they are connected to

the internet. In addition, students can also facilitate their skills in using technology.

1.5.3 Researcher

This research can be used as a reference for developing Nutriolic as a learning media. Nutriolic design can be reviewed based on its advantages and disadvantages. In addition, it can also be evaluated to find out whether Nutriolic can help students develop their science literacy skills

1.6 Scope of Research

The scope of this study focuses on the development and validation of a web-based learning media called Nutriolic, which uses a guided inquiry approach to improve junior high school students' science literacy on the topic of nutrition. The development process was carried out by applying the ADDIE model, which includes the stages of analysis, design, development, implementation, and evaluation. The research instruments used in this study include the Learning Object Review Instrument (LORI) to assess the media's suitability, expert validation sheets, teacher evaluations, and student response questionnaires. The science literacy indicators examined in this study include the ability to explain scientific phenomena, design and evaluate scientific investigations, and interpret data and evidence scientifically. The research subjects were junior high school students in Bandung who had studied nutrition material in accordance with the science curriculum, with validation also conducted by subject matter experts, media experts, and science teachers.