



## Urgency Analysis of Development of Self-Discovery and Exploration (SDE) Integrated Low Level Organism Taxonomy Module to Improve 21<sup>st</sup> Century Skills

### Analisis Urgensi Pengembangan Modul Taksonomi Organisme Tingkat Rendah Terintegrasi untuk Penemuan dan Eksplorasi Diri (SDE) guna Meningkatkan Keterampilan Abad ke-21

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#### Abstrak

Keterampilan Abad ke-21 merupakan keterampilan yang sangat penting dimiliki oleh generasi muda agar dapat bersaing dan berhasil menghadapi tantangan di era global. Salah satu upaya untuk dapat meningkatkan Keterampilan Abad ke-21 ialah dengan mengintegrasikan model *Discovery Learning* dan penugasan KKNi ke dalam konsep modul pembelajaran interaktif yang dikreasikan secara inovatif dalam bentuk *Self-Discovery and Exploration* (SDE). Oleh karena itu, penelitian ini bertujuan untuk menggali potensi kebutuhan pengembangan modul berbasis SDE pada mata kuliah Taksonomi Organisme Tingkat Rendah untuk meningkatkan Keterampilan Abad ke-21 mahasiswa. Penelitian ini termasuk deskriptif kualitatif dengan menggambarkan potensi pengembangan modul secara sistematis. Teknik pengumpulan data menggunakan kuesioner dan wawancara. Data temuan dianalisis secara deskriptif kualitatif dengan pendekatan Miles and Huberman. Hasil penelitian menunjukkan bahwa dosen pengampu mengaku setuju dan mendukung pengembangan modul SDE untuk meningkatkan kualitas bahan ajar pada mata kuliah Taksonomi Organisme Tingkat Rendah, sebanyak 60,40% mahasiswa Jurusan Biologi Fakultas Matematika dan Ilmu Pengetahuan Alam Universitas Negeri Medan mengaku perlu meningkatkan Keterampilan Abad ke-21 dan sebanyak 94% mahasiswa jurusan tersebut setuju untuk menggunakan modul Taksonomi Organisme Tingkat Rendah berbasis SDE. Berdasarkan hal tersebut dapat disimpulkan bahwa pengembangan modul Taksonomi Organisme Tingkat Rendah terintegrasi SDE merupakan hal penting dilakukan untuk meningkatkan Keterampilan Abad ke-21 mahasiswa.

**Kata kunci:** Modul; Taksonomi Organisme Tingkat Rendah; *Self-Discovery and Exploration* (SDE)

#### Abstract

21st-century skills are very important skills possessed by the younger generation in order to compete and successfully face challenges in the global era. One of the efforts to improve 21<sup>st</sup> Century Skills is to integrate the *Discovery Learning* model and the assignment of the IQF into the concept of an innovatively created interactive learning module in the form of *Self-Discovery and Exploration* (SDE). Therefore, this study aims to explore the potential need for developing SDE-based modules in the Taxonomy of Low-Level Organisms courses to improve students' 21st-century skills. This research includes Research and Development (R&D) research using the ADDIE model. The essence of this research specifically focuses on the Analysis stage in the ADDIE model series. Data collection techniques using questionnaires and interviews. The findings were analyzed descriptively qualitatively with the Miles and Huberman approach. The results showed that the lecturers admitted to agreeing and supporting the development of the SDE module to improve the quality of teaching materials in the Lower Level Organism Taxonomy course, as many as 60.40% of students from the Department of Biology, Faculty of Mathematics and Natural Sciences, State University of Medan admitted that they needed to improve their twentieth century skills. 21 and as many as 94% of students in the major agreed to use the SDE-based Taxonomy of Low-Level Organisms module. Based on this, it can be concluded that the development of the SDE integrated Low Level Organism Taxonomy module is an important thing to do to improve students' 21<sup>st</sup> Century Skills.

**Keywords:** Module; Taxonomy of Low-Level Organisms; *Self-Discovery and Exploration* (SDE)

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## INTRODUCTION

21<sup>st</sup> century skills are an era of knowledge, information technology, globalization, and a rapidly developing economy. This era is marked by unpredictable disruptions in various fields. This disruption takes place quickly and is difficult to control, so we need a generation that is capable of taking advantage of various opportunities that arise as a condition to successfully adapt to global challenges and be ready to compete in the flow of knowledge and literacy (Redhana, 2019; Mardhiyah, 2021). The 21<sup>st</sup> century requires a young generation who is strong in managing and utilizing information, communicating things clearly and effectively, and having high ethics that can contribute to the social world. Therefore, UNESCO recommends that education should lead to four main pillars, namely: 1) learning to know, namely the curiosity of students on an ongoing basis, 2) learning to do, namely an attitude that can compile methods and knowledge, 3) learning to do. be, namely the attitude of self-introduction in fundamental knowledge and can adapt to the environment, 4) learning to live together, namely the attitude that shows cooperative behavior in various contexts of circumstances over a long period of time (Bhattacharjee & Deb, 2016; Oviawe, et al. , 2017).

The National Education Association & US-Based Partnership for 21<sup>st</sup> Century Skills identifies the skills needed in the 21<sup>st</sup> century to develop Human Resources with high character and competitiveness. These skills are known as 4Cs which consist of Critical Thinking Skills, Collaboration Skills, Creativity Skills, and Communication Skills (Zubaidah, 2016; Septiani & Susanti, 2021). Critical Thinking Skill is a critical thinking skill related to the activities of analysis, reconstruction, evaluation, and rational and logical decision making. Collaboration skills are skills to work together that lead to respect in social relationships to achieve common goals effectively. Creativity Skill is a creativity skill that is related to constructing new things that are original, developing solutions for every problem and generating new ideas that are varied and unique. Meanwhile, Communication Skill is a communication skill that is correlated with communicative and effective disclosure of ideas and information, both spoken and written (Van Laar, et al., 2017; Dishon & Gilead, 2021). These skills have implications for improving the quality of Human Resources who are successful in facing global challenges full of progress in various fields.

One of the efforts that can be made to improve the The 21<sup>st</sup> century skills of students is to improve the quality of teaching materials by integrating them into learning models that contain The 21<sup>st</sup> century skills values (Roito, et al., 2019; Pratiwi, et al., 2019). The learning model is Discovery Learning which is oriented to the principle of constructivism which directs students to construct their understanding independently (Rustama, 2020). Discovery Learning has advantages including being able to organize their own understanding critically and systematically, being able to activate a learner-centered learning process, and training the

development of students' critical analysis, communication, analogy, representation, and generalization power (Ellizar, et al., 2018; Zuo, et al., 2021). Specifically, the module is an interactive teaching material that can be integrated with the syntax of a learning model that is coupled with learning objectives and learning materials systematically to train students' learning independence (Al Azka, 2019). Furthermore, teaching materials used in higher education should lead to the Indonesian National Qualifications Framework (KKNI) which is a qualification framework to equalize and integrate learning outcomes in higher education. The concept of IQF is important to be integrated in a course teaching material because it functions to facilitate the education of students who have work experience and learning outcomes in a structured manner (Permendikbud No. 73 of 2013).

According to observations on the subject of Taxonomy of Low-Level Organisms at the Department of Biology, Faculty of Mathematics and Natural Sciences, State University of Medan, information was obtained that the teaching materials in the course were still in the form of ordinary textbooks written conventionally and theoretically by the lecturer. These teaching materials have not been able to train 21<sup>st</sup> Century Skills and student independence in learning because they have not been integrated with the values of learning activities that can support 21<sup>st</sup> Century Skills and the assignment of the IQF. Therefore, this study aims to analyze the importance of developing an integrated interactive learning module for Self-Discovery and Exploration which is a combination of the concept of Discovery Learning and the assignment of the IQF. This research is expected to be able to improve the quality of teaching materials on Taxonomy of Low Level Organisms according to the potential needs to improve students' 21<sup>st</sup> Century Skills.

## **METHODE**

This type of research is descriptive qualitative, which describes problems about the urgency of developing modules systematically and providing solutions to problems. The research was conducted at the Department of Biology in 2021, Faculty of Mathematics and Natural Sciences, State University of Medan in October-December 2021. The study population consisted of 9 classes with a total of 268 students. The research sample consisted of 100 students who were randomly selected from several different classes.

Data collection techniques using interviews and questionnaires. Interviews were addressed to lecturers in charge of the Lower Level Organism Taxonomy course, while questionnaires were given to students. The instruments used are interview sheets and questionnaire sheets with indicators leading to extracting information about the urgency of developing the integrated Self-Discovery and Exploration Taxonomy of Low-Level Organisms module. The indicators measured through interviews and questionnaires can be seen in Table 1.

**Table 1.** Indicators Measured in Research

No.	Interview	Questionnaire
1.	Types of teaching materials available in the course	21st-century skills students have
2.	Content and techniques for presenting material in teaching materials	Teaching materials to practice independent learning courses
3.	Integration of Discovery Learning in the development of teaching materials	Content of 21st-century skills in course teaching materials
4.	Integration of the assignment concept of the Indonesian National Qualifications Framework (KKNI) into teaching materials	Integration of 21st-century skills adaptive learning models in teaching materials
5.	Use of other literature sources that support the course	Self-exploration in the assignment of the Indonesian National Qualifications Framework (KKNI)
6.	Constraints in the use of teaching materials	Motivation to learn through the application of the adaptive learning model and the assignment of KKNI

The research data were analyzed by calculating the percentage of respondents' answers. The answers were analyzed through the Miles and Huberman approach, which consisted of four research steps, namely data collection, data reduction, data display, and conclusion data. At the data collection stage, data was collected in the field through interviews and questionnaires, then followed by the data reduction stage, which is a step to reduce data by clearly describing the important points obtained from the research data. Furthermore, a data display is carried out to present the data in the form of descriptions and pictures. At the conclusion data stage, conclusions are drawn, and verification of the research data obtained (Sugiyono, 2018).

## RESULTS AND DISCUSSIONS

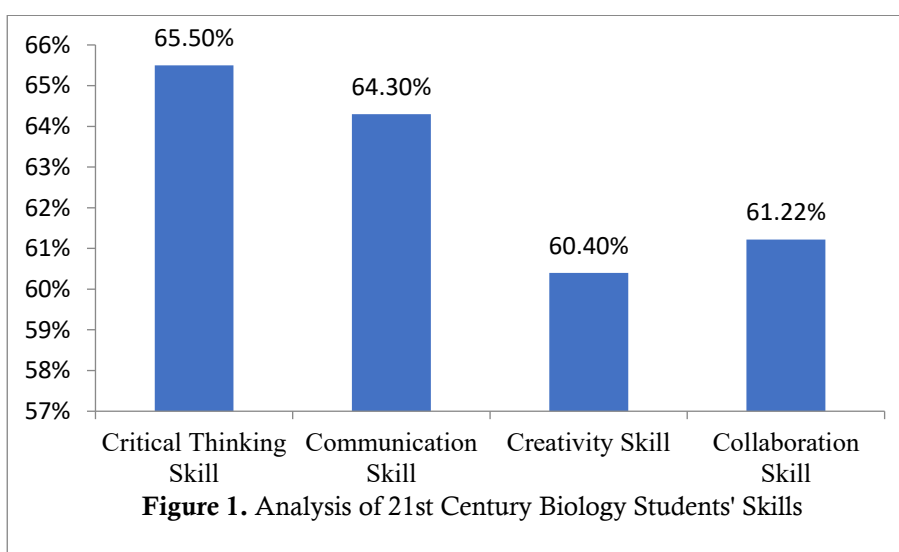
Based on interviews with lecturers in charge of the Lower Level Organism Taxonomy course, information was obtained that the available teaching materials were still in the form of conventional diktat books written by a team of course lecturers. The material content is presented theoretically, so it is less able to meet student understanding related to the material being studied. That is the reason the supporting lecturer recommends students to access other literature to add insight from the material being studied. Because they are written conventionally, these teaching materials are not integrated with the concept of any learning model that can train students' 21st-century skills. The teaching materials used also have not been able to optimally explore the potential of students through KKNI-based assignments. The obstacle to teaching materials, that appears according to the teaching lecturer, is the lack of integrity of teaching materials with more recent contemporary concepts, such as the concept of adaptive skills that are important for students today.

According to the results of the interview above, it can be indicated that there is a need to improve the quality of teaching materials for the Lower Level Organism Taxonomy course. The

improvement in the quality of teaching materials, according to the lecturer, is the need for teaching materials that can train students' independence in learning, the presentation of material content should be enriched by integrating it into an adaptive learning model that is able to hone 21<sup>st</sup> century skills possessed by students, and teaching materials need to be integrated with the concept of KKN assignment so that students can further develop their potential when studying subject matter. [Gusti and Syamsurizal \(2021\)](#) emphasized that the analysis of the shortage of teaching materials is an important basic thing to be addressed in order to improve the quality of the applied learning. [Bruza, et al \(2021\)](#) also explained that an investigation of the shortage of teaching materials is important so that the implementation of learning is more relevant to the skills that are important to be mastered by students. Based on this, every critical analysis from the lecturer in charge of the course is a material consideration that needs to be addressed so that learning can take place effectively in accordance with the expected learning outcomes.

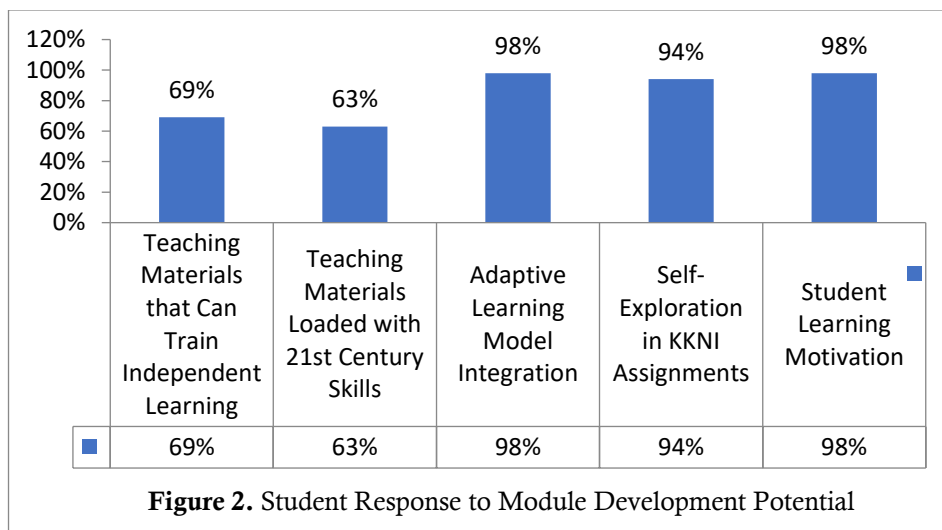
[Budur \(2020\)](#) revealed that teaching materials have implications for improving the quality and independence of student learning. This is because, by using quality teaching materials, it can help the learning process of students to be actively involved in a series of learning effectively. [Cloonan and Fingeret \(2020\)](#) emphasized that quality teaching materials have an important meaning for developing the potential of students because they get sources of information that can deepen the skills of the material being studied. [McDonald, et al \(2022\)](#) also report that high-quality, cutting-edge teaching materials are needed as a place to convey the characteristics of the content of learning messages in complex, structured and instructional activities. Based on this study, it can be understood that the lack of teaching materials in the Lower Level Organism Taxonomy course needs to be addressed so that students can explore their potential in accordance with the demands of 21<sup>st</sup> Century Skills.

Furthermore, according to the answers to the questionnaire from the students, the results of the analysis of the 21<sup>st</sup> century skills of students were obtained as shown in Figure 1.



Based on Graph 1. above, it can be understood that Biology students still have low 21<sup>st</sup> century skills, namely Critical Thinking Skills at 65.50%, Communication Skills at 64.30%, Creativity Skills at 60.40%, and Collaboration Skills of 61.22%. This indicates that the 21<sup>st</sup> century skills possessed by these students need to be improved.

Student responses to the analysis of the shortage of course teaching materials can be seen in Figure 2.



Based on Figure 2., it can be understood that as many as 69% of students agree that they need teaching materials that can train independence in learning. This can be indicated that students tend to be more able to explore their potential in learning by using modules. This is in accordance with [Sirate and Ramadhana \(2017\)](#) that the module is a teaching material needed by students to develop their personal skills while at the same time clarifying the presentation of information, so that students can participate in varied and independent learning. [Zefri, et al \(2022\)](#) also emphasized that the module is a teaching material that can increase independence in learning that is based on student-centered learning, the development of student creativity, and learning that is fun and challenging and promotes valuable, contextual, and meaningful learning experiences. [Ma, et al \(2021\)](#) also reported that the self-study package module includes a series of learning activities that are systematically designed to facilitate the learning process of students optimally. Based on this, it can be understood that the module is a solution that is needed by students to increase independence in learning while exploring their own potential in learning.

Students responding agree that 21<sup>st</sup> century skills-based teaching materials are needed 63%. The achievement of these skills can be done by integrating the adaptive learning model as the results of student responses by 98% agree to integrate the concept of an adaptive learning model that can develop 21<sup>st</sup> century skills in teaching materials. [Masgumelar and Mustafa \(2021\)](#) suggest that constructivism learning puts forward the construction of understanding material according to cognitive maturity by involving students in authentic and situational learning, so that it can help students to generalize and relate new information to the reflection of the

knowledge being studied. These efforts lead to discovery-based learning and meaningful learning which have an important essence for learning in the 21<sup>st</sup> century, namely being skilled at solving problems, explaining phenomena, having a critical view, and being skilled at reflecting knowledge into more comprehensive concepts. details according to scientific principles.

Peña-Ayala (2021) asserts that the characteristics of education in the 21<sup>st</sup> century emphasize meaningful learning and are based on a learning approach that is capable of developing domains of knowledge and skills. Therefore, everything related to learning facilities must be able to harmonize these points. Marcovitz and Janiszewski (2015) suggest that learning in the 21<sup>st</sup> century must be oriented to the principle of constructivism which trains students to discover and construct their own knowledge. The principle of constructivism-based 21<sup>st</sup> century learning leads to four main things, namely being centered on students actively developing their interests and potentials, respecting between talents in the principle of collaboration, having an impact on the real world (contextual), and being facilitated by the problem environment. Yulianto, et al (2021) also emphasized that the principles of learning in the 21<sup>st</sup> century need to be integrated into teaching materials in order to become a force to improve their potential. Based on these considerations, it can be understood that the response of students who need 21<sup>st</sup> Century Skills-based teaching materials is in line with the ideal demands of today's learning which requires the younger generation to have the skills to be ready to compete in global challenges.

Furthermore, as many as 94% of students agree that they need teaching materials that are directly connected to the KKNi-based course assignment system. Students agree that 98% feel more motivated in learning to use teaching materials that have a strong synchronization with active scientific discovery-based learning (Discovery Learning) and can explore deeper self-understanding and potential related to the material being studied. The same thing was also explained by Arwita et al (2020) that teaching materials oriented to the KKNi assignment can increase learning motivation because students are more facilitated to solve problems in complete lecture assignments supported by clear guidelines and formats in carrying out KKNi-based tasks. Furthermore, Gani et al (2020) also emphasized that the assignment of the KKNi serves to improve the information literacy of students needed to be ready to face challenges in the 21<sup>st</sup> century. Nugrahadi et al (2021) explain that the benefits of assigning the IQF in improving information literacy are related to developing thinking power and insight, increasing knowledge and performance abilities as well as a responsible managerial attitude. Thus, with these positive values, students are more helped to develop self-skills in learning.

## CONCLUSION

The development of a Low Level Organism Taxonomy Module to improve students' 21<sup>st</sup> Century Skills is an important thing to do. The results of interviews with supporting lecturers and responses to student questionnaires stated that it was necessary to improve the quality of teaching materials in the Lower Level Organism Taxonomy course. These efforts are carried out by developing teaching materials that can train students' learning independence in a structured and systematic manner, and these teaching materials need to be integrated with the concept of discovery-based constructivism learning (Discovery Learning) and KKNI assignments so that students can further explore their own potential to hone 21st-century skills.

This research only focuses on analyzing the potential development of the Low Level Organism Taxonomy Module to improve students' 21st-century skills. Therefore, it is recommended for other researchers to develop the module in question by establishing good development indicators and procedures. This is intended so that the urgency of developing the module can be realized in accordance with the expected learning objectives.

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