Effectiveness of Developing Self-Discovery and Exploration (SDE) Integrated Low Level Organism Taxonomy Module to Improve Collaboration Skill

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Abstract. Collaborative skills are skills to actively participate in building positive relationships with others. These skills are important to have to demonstrate high productivity, full responsibility and respect for others to support skills in the 21st century. However, according to observations, the research results show that students of the Department of Biology, Faculty of Natural Sciences, State University of Medan still have low 21st century skills with a percentage of 61.22%. Therefore, this study aims to test the effectiveness of developing an integrated Self-Discovery and Exploration (SDE) Taxonomy of Organisms module to improve students' collaboration skills. This module is a modification of the Discovery Learning concept based on assignments from the Indonesian National Qualifications Framework. This study uses the Research and Development (R&D) method which specifically measures the effectiveness of the developed module. Data collection techniques through observation. The research instrument used a precision sheet for the achievement of students' collaboration skills. The results of the study were analyzed through t-test and the percentage of students' collaboration skills was calculated. The results showed that there was a significant difference between the learning outcomes of students' collaboration skills in the experimental class and the control class with a tcount of 73,724 and a ttable of 1,697 (tcount > ttable). The average value of the collaboration skills of the experimental class students is 74.36% and the control class is 4.28%. Thus, it can be concluded that the development of the integrated Self-Discovery and Exploration (SDE) module on the Taxonomy of Low-Level Organisms (SDE) has proven to be effective in improving students' collaboration skills.

Keywords: Collaboration Skills; Module; Self-Discovery and Exploration (SDE).

1. Introduction

Collaborative skills are a form of collaboration skills that are able to compensate for differences in views, knowledge, and mindsets that play a role in discussions to listen, give advice, and support each other in order to achieve common goals. Collaborative skills are closely related to

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social skills, where students can show an attitude of working together and respecting each other effectively to achieve one goal in learning. Students flexibly actively act as whole individuals who help and compromise in broad thinking and are able to work productively with others in a high sense of responsibility and contribution to work [24][26][8]. Important collaboration skills are needed in the 21st century to increase productivity, patterns of positive interaction with others, and knowledge that is important to be mastered by a global society. This has implications for the development of metacognition and factual knowledge needed in dealing with the world of work and producing various technologies that characterize the 21st century holistically [12][27][4].

One way that can be done to improve collaboration skills is to implement modules as teaching materials that can construct a learning environment that is full of learning contexts, study group support, assignments, and interaction processes within the framework [17]. The framework that can optimize these skills is a Self-Discovery and Exploration (SDE)-based framework which is a combination of the Discovery Learning model and assignments oriented to the Indonesian National Qualifications Framework (KKNI) [30][22]. Discovery Learning is a part of constructivism learning that can train students' independence in finding and constructing the knowledge and concepts being studied. The learning activities include problem identification, data collection, data processing, verification and conclusion drawing as a solution to problem solving [10][1][15]. Meanwhile, the implementation of the KKNI at the State University of Medan involves six kinds of assignments that must be completed by students when following the course unit. The mandatory tasks are Routine Tasks, Critical Journal Reviews, Critical Book Reports, Mini Research, Projects, and Idea Engineering [19][16][5].

However, according to a specific review of the Low-Level Organism Taxonomy course at the Department of Biology, Faculty of Natural Sciences, State University of Medan, it is known that students still have low collaboration skills, which is 61.22%. The student admitted that there is a need for the development of teaching materials in the Lower Level Taxonomy of Organisms course that can improve collaboration skills based on learning models that are oriented towards finding facts, concepts, and information as well as the assignment of the IQF. Therefore, this study aims to analyze the effectiveness of developing the Self-Discovery and Exploration (SDE) module to improve student collaboration skills. This research is expected to be an alternative solution to improve the quality of teaching materials in the Taxonomy of Low-Level Organisms courses that are capable of improving student collaboration skills as one of the skills needed in the 21st century.

2. Method

This research is descriptive which systematically describes the phenomenon and provides solutions to the problem solving of the phenomenon [28]. The study population was all students of the Department of Biology, Faculty of Natural Sciences, State University of Medan which consisted of 268 students. The research sample consisted of 67 students who were divided into experimental and control classes.

The data collection technique used observation of student collaboration skills learning outcomes. The research instrument used an observation sheet for the acquisition of student collaboration skills during learning with the indicators measured as follows.

Table 1. Collaborative Skills Indicators Measured in Research

Indicators		Measured Aspect
Effective	1.	Effectiveness in working together
Open Minded	2.	The attitude of accepting other people's opinions
Responsibility	3.	Collaborative responsibility
Appreciation	4.	Respect for others

(Sources: [20][23][21])

Data analysis was carried out in two ways, namely t-test and accuracy of student collaboration skills. The t-test aims to determine whether there is a significant difference in the collaboration skills of the experimental and control class students. The t-test analysis was calculated with the help of SPSS 2022. Meanwhile, the accuracy of the achievement of student collaboration skills was carried out by calculating the average percentage of student skill acquisition. Furthermore, the percentage results are interpreted according to the following criteria.

Table 2. Interpretation of Student Collaboration Skills Percentage

Percentage (%)	Category
76-100	Very high
51-75	High
26-50	Low
0-25	Very low

(Source: [11])

3. Results And Discussion

Before calculating the t-test, first, normality and homogeneity tests were carried out on the student collaboration skills scores as a condition for conducting the t-test. The results of the normality test can be seen in Table 3.

Table 3. Normality Test of Collaboration Skill Scores Based on Collaboration Skills Indicators

Classes	Kolmogorov-Smirnov	Shapiro Wilk	Information
Experiment	0,340	0,257	Normal
Control	0,473	0,370	Normal

Based on Table 4.39. above it can be understood that the acquisition of the Normality test of Collaboration Skill scores based on indicators of collaboration skills in the experimental and control classes> 0.05. According to Putra, et al (2019) if the result is > 0.05, then the data used is normally distributed. Based on this, the students' collaboration skills scores were normally distributed [18].

The results of the homogeneity test of the Collaboration Skill value obtained the Sig value. (P-Value) of 0.870 which indicates the value is> 0.05. According to Ghozali (2020) if the result is > 0.05, then the data used is homogeneous [6]. This means that the acquisition of Collaboration Skill scores is homogeneous. Furthermore, according to the calculation of the t-test between the average score of the Experimental and control Collaboration Skills, the tcount value is 73,724 and ttable is 1,697 with Sig. (2-Tailed) of 0.000 which indicates the value of tcount> ttable and the value of Sig. the <0.05. According to Suyono (2018) if the results of tcount > t table and Sig. (2-tailed) SPSS≤0.05, indicating there is a significant difference between the two variables

being compared [25]. This indicates that there is a significant difference between the average control and experimental class Collaboration Skill scores. The results of the accuracy of student collaboration skills can be seen in Table 4.

Table 4. Average Percentage of Achievement of Student Collaboration Skills

Classes	Percentage of Achievement Creativity Skill	Category
Experiment	74,36%	High
Control	4,28%	Very Low

Based on Table 4. above, the results show that the average Collaboration Skill of experimental class students who are taught using the developed module is in the high category. Meanwhile, the average collaboration skills of control class students who were taught using the textbooks available in the Lower Level Organism Taxonomy course were in the very low category.

In this study, it was found that the application of Discovery Learning combined with the exploration of the IQF assignment which was integrated in the concept of Self-Discovery and Exploration could significantly improve students' collaboration skills. This is obtained because Discovery Learning is a constructivist learning model that can emphasize an active learning style followed by specific instructions that must be done collaboratively. This is as proposed by Bruner that the practice of independent instructional learning in a collaborative environment is more effective in increasing mastery of material in groups. The same thing was also emphasized by Huang (2020) & Tang, et al (2020) that Discovery Learning is effectively able to improve students' collaboration skills because students are invited to find, process, and investigate a fact of learning information by actively contributing, being flexible. in compromising and appreciating the arguments given, so as to generalize a concept of discovery in learning [9][26]. Furthermore, Andrews & Forsyth (2020) also reported that collaboration-based assignments given in learning were able to have a positive impact on the level of social awareness of students [3]. Xie, et al (2018) explained that structured tasks moderated in group discussions can train patterns of social interaction that involve the collaborative role of students [29].

Basically, the learning that is applied is active, where students are not considered as empty containers to be filled. However, students can explore their skills through the lessons presented. This is in line with McComas (2014) which states that Discovery Learning as initiated by Jerome Bruner does not view students as empty containers filled passively. However, students are considered as learning subjects who can actively participate in interacting socially and their environment to develop their potential [32]. The same thing is also emphasized by Bau, et al (2017) that learning Discovery Learning brings many benefits for the development of collaboration skills of students including the attention of students more focused on learning together, the resulting discovery ideas are more varied to be completed, there is a positive response to each other. find solutions to problem solving and students can give each other constructive feedback [33].

The assignments given in learning also support the development of students' collaboration skills. This is because assignments based on the Indonesian national qualification framework given help students master the material by collaborating with each other. This is reinforced by Liu, et al (2020) that additional tasks in learning can be a preference for improving student learning outcomes. This is because students are trained to optimize each other's skills in a flexible, effective, and consistent interaction pattern [34]. In line with this, Zhang, et al (2022) also reported that meaningful learning combined in discovery learning-based assignments can

associate understanding in building information through assignment instructions completed in groups. Learners can also access new information to produce better retention together. Ideas that are difficult to solve can also be solved well and reduce misconceptions in learning. This is what triggers the emergence of a great motivation for students to think openly and be flexible in giving appreciation for each contribution made [35].

Discovery Learning can improve collaboration skills because in its application each student has the opportunity to build their own knowledge through dialogue in groups. Each student communicates with each other to share the information that has been found. The experimental class is also trained to solve problems contained in the KKNI-based assignments that are given collaboratively, so that each individual has a sense of responsibility to achieve shared learning goals. This is in line with Makoolati, et al (2021) that there is a principle to interact with each other in the application of Discovery Learning. Each student has a role and a task that must be completed. Every idea and thought that he got was then disclosed to other friends [13]. Thus, each student is required to show respect to be able to work together in concluding every idea expressed. Gorgulla, et al (2022) also emphasized that Discovery Learning combined with the assignment principle emphasizes the activeness of students in learning (student-centered learning). Students collaboratively interact with each other in identifying problems, providing solutions to problems presented through hypothesis design, collecting data through experiments, processing finding data, and verifying and generalizing the data found [7].

Meanwhile, control class students tend to have low collaboration skills because students are passive in accepting learning. Students only receive material from the lecturer and are followed by a question and answer session at the end of the lesson. In practice, the learning process does not show any pattern of interaction between students. Conditions like this can weaken the attitude of social care in learning because students do not work together to achieve learning goals. The same thing was also explained by Müller & Mildenberger (2021) and Aliramezani, et al (2022) that conventional learning only focuses students on receiving learning in one direction, so that students lack the opportunity to develop their knowledge collaboratively [14][2]. Yousuf, et al (2022) also reported that in the application of conventional learning there is no interaction pattern between students, because every concept, material, and information taught only comes from the teacher or lecturer. Students are less able to explore their potential in depth through interrelation in their groups [30].

4. Conclusion

The Integrated Low Level Organism Taxonomy Module Self-Discovery and Exploration (SDE) is proven to be effective in improving students' collaboration skills with tcount of 73,724 and ttable of 1,697 on Sig. (2-Tailed) of 0.000 which indicates there is a significant difference between the learning outcomes of students' collaboration skills in the experimental and control classes. The accuracy of the achievement of collaboration skills of experimental class students is 74.36% in the high category and the control class students are 4.28% in the very low category.

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