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The Implementation of a Research-Based Learning Model to Motivate Students in Understanding Fungal Kingdom Concepts

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Abstract

Biology learning is often considered difficult by students, especially on Fungal Kingdom concepts which involves abstract and complex concepts. This causes low student learning motivation. The study aimed to observe the application of a research-based learning model or Research-Based Learning (RBL) with a practicum method to motivate students in learning Fungal Kingdom concepts in class X. This study used a qualitative descriptive approach, with instruments in the form of observation sheets and written tests. The subjects of the study were students in grades X1, X2, and X3 at one of the public high school in Serang in the 2024/2025 Academic Year. Learning takes place following the RBL steps which include problem identification, hypothesis formulation, practicum implementation, discussion, data analysis, and evaluation. The results showed that 74.28% of students achieved scores above the minimum competion criteria with a class average of 82.78. This shows that the application of the RBL model with a practicum method can motivate students in learning Fungal Kingdom concepts. Students become more actively involved, enthusiastic in making observations, and show better understanding

Keywords: Research-Based Learning, Practical Method, Student Motivation

INTRODUCTION

Biology learning is often considered difficult by students because it requires a deep understanding of abstract and complex scientific concepts. One of the conceptss that is considered difficult is Fungal Kingdom, which includes the characteristics, structure, and classification of Fungal Kingdom. Observations show that many tenth grade students have no desire to learn the concepts. This is very important because learning motivation greatly influences student learning outcomes (Kurnia *et al*., 2024). Learning motivation can be defined as an internal drive that encourages students to achieve educational goals with enthusiasm, persistence and consistency (Rahman, 2021). Without adequate motivation, students tend to be passive, less involved in the learning process, and find it difficult to achieve optimal understanding (Suharni, 2021).

Using more interactive learning methods and encouraging students to participate actively is one way to increase their learning motivation (Raztiani & Permana, 2019). One method that can be used to achieve this goal is the research-based learning (RBL) model, which encourages students to act as researchers, explore and discover concepts independently. The RBL model allows students not only to gain knowledge but also to participate in finding solutions to problems (Mahardini *et al*., 2018). It is hoped that combining RBL with

practicum methods will provide a deeper and more concrete learning experience for students. Practicums give students the opportunity to observe, experiment, and explore biological phenomena such as Fungal Kingdom directly, which will help them connect theory with real life (Rabiudin, 2023).

If RBL is used in conjunction with practicum, there are several important steps that encourage students to learn actively. Identifying the problem is the first step. Students are given questions or problems related to mushrooms to investigate. Then they create a hypothesis and plan the research. Students then do practicum, collect and analyze data, and then talk about their findings (Mahardini *et al*., 2018). Students gain the ability to connect abstract concepts to real-world experiences during practicums, which enhances their understanding and increases their desire to learn.

Previous studies show that students' encouragement and understanding in science learning can be improved through practicums. Research by Kurniawan *et al*. (2021) found that students involved in practicum activities showed increased learning motivation compared to students who only received theoretical learning. Another study by Lestari (2020) also showed that research-based learning can increase students active involvement in the learning process. However, there have not been many studies that specifically examine the effect of the combination of RBL and practicum methods on students learning motivation, especially in learning Fungal Kingdom concepts at the high school level. The novelty of this study lies in the application of a research-based learning model combined with practicum on the topic of Fungal Kingdom, which is expected to have a significant impact on students learning motivation.

Based on this background, this study aims to observe the application of research-based learning models with practical methods to motivate students in learning Fungal Kingdom concepts in grade X. Through this study, it is expected that effective learning strategies can be found to motivate students in learning biology, especially in conceptss that are considered difficult such as Fungal Kingdom.

METHOD

This study aimed to examine the application of research-based learning in motivating 10th grade students in learning the Fungal Kingdom concepts. The subjects of the study were students of grades X1, X2, and X3 at one of the public high school in Serang, Indonesia in the 2024/2025 Academic Year. This study used a qualitative descriptive approach with observation techniques equipped with observation sheets as the main instrument. In addition,

written tests are used to evaluate students cognitive understanding of the concepts that has been studied.

Learning is carried out for 3 lesson hours with structured steps. In the initial activity (1 lesson hour), the teacher starts with greetings, prayer and presence. To connect students' initial knowledge with the concepts to be studied, the teacher conducts apperception by asking about the characteristics of mushrooms. In addition, the teacher explains the steps of the research-based learning (RBL) model and learning objectives. After that, the teacher asks students to find problems and create hypotheses that will be studied.

To identify problems, students were divided into four groups and asked to answer questions related to Fungal Kingdom such as characteristics, body structure, and classification of Fungal Kingdom. After that, each group creates a hypothesis that will be tested during practical activities. Students are expected to study biological concepts critically and independently at this stage.

In the practicum implementation stage (1 lesson hour), students try various types of mushrooms, including enoki mushrooms, oyster mushrooms and mushrooms on bread. Observations were made using a microscope to study the structure of fungal hyphae and spores on bread; Macroscopic observations were carried out using a magnifying glass to see the body structure of enoki mushrooms and oyster mushrooms. To enable further analysis, the data collected for each group was recorded thoroughly.

Students proceed to the discussion and data analysis stage after the experiment is completed (1 lesson hour). Each group discusses the results of their observations, analyzes the data, and compares their findings with previously learned theories. This discussion not only helps students develop analytical skills but also facilitates collaboration between groups. After discussing, students draw conclusions from the research results and evaluate whether the hypotheses they formulated are proven or not. The teacher also provides an evaluation of the learning process by involving students in class discussions. In addition, a written test is held to measure students understanding of the Fungal Kingdom concepts comprehensively.

The research instruments used include observation sheets to monitor student engagement during activities and written tests to measure students cognitive understanding. Data were analyzed descriptively qualitatively to see the effect of research-based learning on student motivation and learning outcomes.

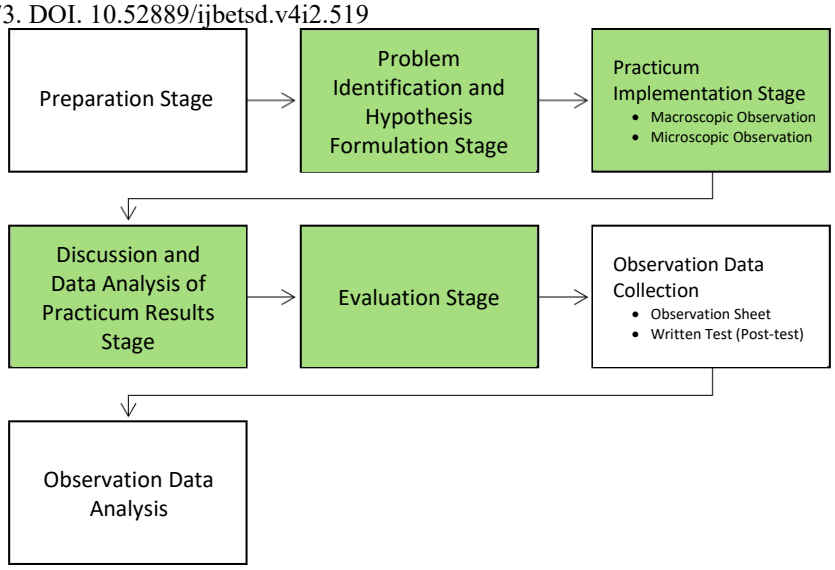

Figure 1. Research Stages and Research Based Learning Stages (Haryati & Firmadani, 2018)

RESULTS AND DISCUSSION

Learning Fungal Kingdom concepts through a research-based learning (RBL) model with a practicum method is designed to motivate students to learn by actively involving them in every stage of learning, from problem identification to discussion of results. Through this active involvement, students not only receive the concepts actively, but also experience the scientific process directly. This can certainly increase their interest and curiosity. Previously, biology learning was only in the form of literature searches or theoretical explanations about Fungal Kingdom, such as the structure of the fungal body, classification of Fungal Kingdom, and the role of Fungal Kingdom in the ecosystem. This approach makes students understanding abstract without concrete experience of the biological processes that actually occur. In contrast to using the RBL approach accompanied by practicums, students are given the opportunity to directly observe and study the biological processes that occur, so that they not only increase their understanding, but also encourage higher learning motivation in studying Fungal Kingdom concepts.

At the beginning of the lesson, when the teacher delivered apperception, almost all students were seen listening to the teacher's explanation attentively. However, there were 2 to 4 students who did not seem to pay much attention. Students who did not pay attention to the teacher's explanation sat in the back seats. Students seemed enthusiastic when the teacher explained the purpose of the practicum. This was indicated by the quiet atmosphere in the classroom and students paying attention to the front when the teacher was explaining the introduction to the concepts on the characteristics and classification of Fungal Kingdom. There were several students who asked about the characteristics of Fungal Kingdom and the

differences between Fungal Kingdom and plants. In addition, there were 4 to 5 students who actively answered when the teacher gave a provocative question.

In the problem and question formulation stage, the teacher facilitates discussions in each group to help students formulate problems or research questions. Each group records research questions related to the morphological characteristics and classification of Fungal Kingdom, for example, “What are the morphological characteristics that distinguish between Zygomycota, Ascomycota, and Basidiomycota Fungal Kingdom?” At this stage, all students are actively involved in group discussions to identify problems by asking various questions and ideas related to the topic of characteristics and classification of Fungal Kingdom. Although some group members are still passive in the discussion, the majority of students contribute to formulating hypotheses. The average questions asked are “What is the body structure of enoki mushrooms, oyster mushrooms, and bread mold?” and “Which divisions are enoki mushrooms, oyster mushrooms, and bread mold included?”. Based on the questions that have been made by each group, it can be seen that all groups have succeeded in formulating hypotheses that are in accordance with the problems that have been identified, and show a good understanding of the scientific method.

At the data collection stage, each group conducted a mushroom observation practicum using a microscope. They observed and identified the morphological characteristics of mushroom specimens such as Rhizopus and Saccharomyces. Students also filled out observation sheets to record their observations. At this stage, students enthusiasm was seen in conducting direct observations of mushrooms and recording their observations carefully. This is supported by Ridwan (2019), who stated that learning that directly involves students in the process can motivate students because they feel closer to the scientific process. In addition, students actively asked the teacher about the specimens being observed such as their body structure, division groups, and general characteristics of mushrooms. When observing the structure of oyster mushrooms and enoki mushrooms, students made microscopic observations using a magnifying glass. Meanwhile, when observing the structure of bread mold, students made microscopic observations using a microscope. So students had to make a wet preparation first. Most students were able to use a microscope correctly, but there were still some who needed help from friends or teachers. On average, students found it difficult when making wet preparations and making observations through a microscope. The students preparations appeared to be too large in section or too many specimens were taken, making it difficult to observe. In addition, the moldy condition of the microscope lens made the object less visible. Although there were several obstacles that had to be faced, each group appeared

compact in working together to collect observation data by dividing the tasks evenly. During the observation,Students are also seen looking for various information on the internet and also books to complete their knowledge.

At the data analysis stage, each group discusses the results of the observations that have been made. At this stage, students are seen actively discussing, students are also seen exchanging opinions and exchanging information that they get to analyze the results they have obtained during the practicum. When analyzing observation data, students look for information related to the structure of the observed Fungal Kingdom and the classification of each species of Fungal Kingdom observed. Some students have been able to relate the results of their observations to the appropriate theory, but some students still need teacher assistance in relating the results of their observations to the appropriate theory. Most students have been able to analyze the structure and classification of the observed Fungal Kingdom correctly. After students discuss with their groups, then students exchange the information they have obtained with other groups. Some students have been able to convey the results of the discussion well, but some are still unclear in explaining the results to other groups.

At the conclusion and evaluation stage, students discuss with their groups to create hypotheses based on the problem formulation that has been made previously. Most students are able to evaluate the hypothesis correctly, but some still have difficulty in connecting the data from their observations with the hypothesis. After that, students discuss with their groups to make conclusions from the results of the observations that have been made. Most students have been able to make conclusions according to the results of the observations that have been made. The hypotheses and conclusions that have been made are then presented in front of the class. Almost all students can convey the hypotheses and conclusions they get with confidence.

The results of the learning motivation evaluation showed that most students felt happy and more motivated with this learning method, as reflected in the average score of student engagement in discussions and practices. Their reasons varied, ranging from the fun of observing microorganisms to the joy of conducting their own experiments. However, there were some difficulties faced by students, such as the use of microscopes and making preparations that required more practice. These difficulties can be overcome through direct guidance from teachers and training in the use of tools before the main practicum begins.

In the aspect of evaluating students cognitive understanding, a written test was held to measure the extent to which students understood the Fungal Kingdom concepts after doing

the practicum. The number of students based on the minimum competion criteria score of 73 can be seen in Table 1, along with the Table 2 pf average student scores.

Table 1. Number of Students Based on minimum competion criteria Score 73

Class	X.1	X.2	X.3	Total
Number of Students	46	47	47	140
Number of Students Below minimum competion criteria Score	10	10	16	36
Number of Students Above minimum competion criteria Score	36	37	31	104

Table 2. Average Student Scores

Class	X.1	X.2	X.3	Overall Average
Class Average Score	85.19	84.09	79.07	82.78

Based on the tables, 104 students, or 74.28%, achieved scores above the minimum competion criteria score of 73, with an overall class average of 82.78. The highest score achieved by a student was 100, while the lowest score was 40. These results indicate that research-based learning is not only able to motivate students but also helps students cognitive understanding of the concepts. This finding is in line with Supit & Winardi (2024) which shows that RBL can improve students critical thinking and analytical skills in linking practicum results with theoretical concepts in Biology lessons.

The positive thing observed in the implementation of RBL is the increase in student independence in planning and implementing experiments. Students show initiative to seek additional information, process data, and compile good observation reports. In addition, collaboration between groups looks solid, with students sharing tasks during observations and discussions. This condition shows that RBL can be a method that can be used to develop students social and communication skills.

RBL practicum brings a number of problems and obstacles. Some of them are students who do not have the technical skills to use a microscope and students who cannot connect observation results with the theory they have studied. Technical limitations can be an obstacle to implementing research-based learning in schools, as stated by Herawati (2019). Apart from that, some students still lack confidence in speaking and showing their group results. To deal with difficulties, teachers can increase students' self-confidence by asking thought-provoking questions or giving praise to students who participate actively.

Overall, the application of RBL as a practicum method in learning Fungal Kingdom is proven to be able to motivate and help students' understanding of Fungal Kingdom concepts. Practical activities give students the opportunity to learn actively and directly, which helps them master scientific skills in addition to understanding theory. This learning not only helps

students to understand the concepts more deeply, but also encourages them to develop critical and analytical thinking skills. Adjustments and reinforcements made during learning using the RBL model can be an effective learning strategy in science education in schools.

CONCLUSION

Based on the results of the study, it can be concluded that the research-based learning model or RBL with the practicum method can motivate students in learning the concepts about the Fungal Kingdom, because students are directly involved in learning activities. The results of the written test conducted after the practicum showed that 74.28% of students achieved scores above the minimum competion criteria 73, with an average class score of 82.78. The highest score achieved by students was 100, while the lowest score was 40. These results indicate that research-based learning is not only able to motivate students, but also strengthen their cognitive understanding of the concepts being taught.

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