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Inquiry Learning in Biology Tadris Student Practicum Activities

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ABSTRACT

Unengaging learning activities have encouraged lecturers to create a more fun learning experience. The learning that students like can be identified by looking at the level of student activity and their motivation in participating therein. One learning model that emphasizes the ability to think independently is the inquiry learning model. This research was conducted to determine the use of the inquiry learning model in plant physiology practicum activities. This research is a type of CAR (Classroom Action Research) that applies an inquiry learning model in Plant Physiology practicum activities for third semester students of Biology Tadris IAIN Metro. This research was conducted in three cycles with the stages of problem identification, action/observation, and reflection. The data obtained is then analyzed descriptively qualitatively in each cycle before carrying out the next cycle stage. The value of the practicum report is taken after the practicum activity is carried out, the assessment of student activity is seen from attendance which is carried out routinely during practicum meetings, and independent tasks carried out by students, namely by making a summary of the material based on the topic of the practicum to be carried out. The use of inquiry learning models in practicum activities can increase the value of practicum reports, student activity, and independent assignments carried out by students in each cycle. This means that the use of the inquiry learning model is one of the effective choices for plant physiology practicum activities.

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INTRODUCTION

Biology courses emphasize active, independent and not boring learning for students. Learning that seems boring is the main task of the lecturer to create fun learning activities. The learning that students like can be observed by looking at student activity and motivation in participating in learning. Creating fun learning requires planning and learning strategies prepared by the supporting lecturer. Learning plans that need to be prepared, for example, are making teaching devices, media, teaching materials, and other equipment needed. One strategy that can be used by lecturers to carry out learning is by using a learning model (Fathurrohman, 2006).

Choosing a learning model that creates an active learning atmosphere for students needs to be considered in learning. Learning can be interpreted as a process of changing behavior in interacting with the environment (Kusherawati, et al., 2020). The purpose of learning is to provide direction for students to be able to solve environmental problems by providing a stimulus for thinking skills (Munandar, et al., 2019). The process of developing students' thinking skills can be done with learning activities that emphasize student independent activities, hone high thinking skills, and learn to find complex solutions to the problems at hand. Educators do not dominate the activities, but create a learning atmosphere and provide motivation and guidance to develop their respective potentials and creativity. The behavior of educators will be positively correlated with achievement if they are able to allocate and use time in learning (Fathurrohman, 2006).

One of the learning models that emphasizes the ability to think independently is the inquiry learning model (Ningsyih, at al., 2016). The success of learning Biology is influenced by five factors, namely: curriculum, resources, learning environment, teaching effectiveness, and assessment strategies. Learning activities using an inquiry approach are more active because there are a number of mental processes carried out by students, inquiry learning is more complex, demands a lot of thinking activity and not infrequently requires physical activity such as questioning and answering, discussing, conducting experiments, simulating, conducting simple research, solving problems. problems, and so on (Yulianti, et al., 2012).

The implementation of the inquiry learning model can improve students' abilities in learning biology. Inquiry learning in biology courses trains students in conducting research activities, provides active interaction between students, and trains students to find and understand the concepts of the material being studied (Ramdani, et al., 2020). The inquiry method is a learning method that seeks to instill the basics of scientific thinking in students, so that in this learning process students learn more on their own to develop creativity in solving problems (Ningsyih, et al., 2016). Inquiry-based learning can stimulate students' desire to understand concepts, motivate them to continue their work until they find answers to a problem, and provide students with real and active experiences (Walil et al., 2020). The role of the lecturer in learning with the inquiry method is as a guide and facilitator. Inquiry learning is very suitable to use the basics of scientific thinking, which is applied through practical activities (Sundari, et al., 2017).

Practical activities are learning activities for a student before the student conducts final research. In practicum activities, students are trained how to become a scientist, so when doing final research, the student will have difficulty. One of the courses that apply practicum in learning is Plant Physiology (Damopolii, et al., 2015). The Plant Physiology Practicum is directed at inquiry practicums that can help students gain a deeper understanding (Widiana, et al., 2020). The inquiry learning model in practicum activities trains students to carry out the stages of acquiring knowledge such as how scientists work, namely by identifying problems, making tentative assumptions (hypotheses), conducting experiments, analyzing data, making conclusions and communicating results (Suartini, 2010). The application of the inquiry learning model in practicum activities can help students learn scientifically, be more able to process information in learning, and can train critical thinking (Ristina, et al., 2020). Based on the theoretical studies that have been carried out, this research aims to determine the use of the inquiry learning model in the practical activities of Tadris Biology students at the Metro State Islamic Institute.

MATERIAL AND METHODS

This research is a type of CAR (Classroom Action Research) by applying the inquiry learning model to plant physiology practicum activities. The number of samples used were 31 students from 63 third semester students for the 2019/2020 Academic Year of the IAIN Metro Biology Study Program. The research was conducted at the Biology Laboratory of the Biology Tadris Study Program, IAIN Metro. This research is focused on knowing the increase in the value of practicum reports, student activity, and the value of independent assignments. Classroom action research is carried out through the stages of planning, implementation/observation, and reflection which are carried out cyclically. The number of cycles corresponds to the number of meetings, namely three meetings (Figure 1).

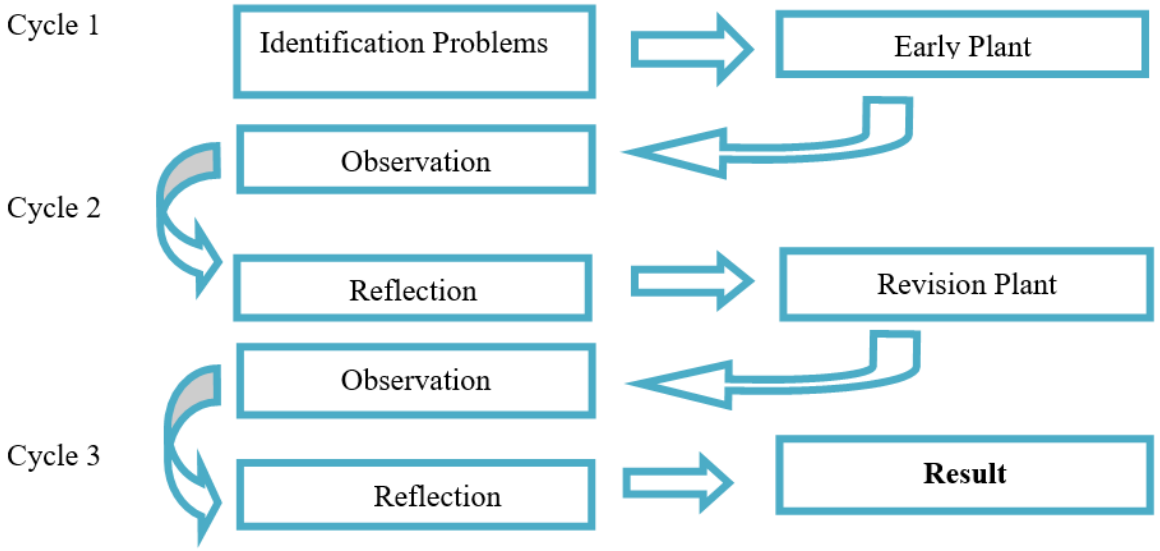

Figure 1. Stages of Classroom Action Research (Arikunto, 2006)

The implementation of CAR in the Plant Physiology practicum is carried out in cycle I stages with the topic of Photosynthesis. Cycle II was carried out on the topic of Respiration. Cycle III was carried out on the topic of Growth Hormone. Cycles I, II and III were carried out with different topics in the same class to measure the success of the Inquiry Learning Model in the Plant Physiology Course. Plant Physiology courses are designed in 3 credits which are held in 3 meetings with a duration of 50 minutes each. The implementation of the action uses an inquiry learning model with learning steps using syntax as presented in Table 1.

Table 1. Syntax of the Inquiry Learning Model

Stages	Student Activities
Formulating of the problem	Students determine problems related to the practical topic that will be carried out.
Submitting a hypothesis	Students make hypotheses from existing theories to solve problems that have been formulated.
Collecting data	Students carry out practicum activities with procedures that are already in the practicum guide based on the topics carried out.
Testing hypotheses	Students analyze the data that has been obtained to test the hypotheses that have been made previously through making a temporary report on the results of the practicum.
Formulating conclusion	Students make a discussion based on the results of the practicum obtained in the form of a report to determine the conclusion.

Sumber: (Fatmawati, *et al.*, 2019)

In the first cycle, it begins with planning including making learning tools in the form of Lecture Program Units (SAP), compiling LKM, observation sheets, and assessment instruments. At the first meeting, the lecturer gave emphasis and direction on the course of the practicum learning process. The implementation of the practicum is supported by Student Worksheets (LKM) which have been adapted to the inquiry learning model used.

Planning in cycle II in addition to preparing learning tools, the lecturer first gives direction to students to read the material to be discussed first. The implementation of learning in cycle II has been according to plan. Students have begun to be able to adapt to the applied learning model and have begun to increase their independence in solving problems.

In Cycle III, the Lecture Program Unit has been designed, the shortcomings in the previous cycle have been anticipated. Implementation of Inquiry Learning in cycle III has been according to plan. Students have started to get used to the learning model that is applied and the habit of independence in solving problems, the cycle III lectures can run more smoothly. Lecturers enjoy their duties as facilitators more. Students no longer need to be motivated to ask questions or participate in lectures. Students can make presentations and discussions with a little guidance from the lecturer. In this third cycle, the available time allocation can be utilized optimally. Learning outcomes also increase and student independence develops. Reflection activities include analyzing, understanding and making improvements based on observations and field notes. Reflection is useful for knowing the level of success and failure. Reflection results are obtained from observations in each cycle. The results obtained are used as a reference for planning to the next cycle. The research data obtained from the assessment of activities in the Plant Physiology Course are as follows:

A. Practical Report

The value of the practicum report is taken after the practicum activity is carried out, the practicum report is the result of a student study of the data obtained from the practicum which is then analyzed in theory to prove the hypothesis that has been made. The report is made based on the systematics of writing a practicum report (Table 2).

Tabel 2. Rubrik Penilaian Laporan Praktikum

No	Report Components	Rating Description		
		1	2	3
1.	Formulation of the problem	Sentences are not in the form of questions and are not in accordance with the practical topic.	Sentences in the form of questions, written operationally but not in accordance with the practical topic.	Sentences in the form of questions, written operationally according to the practical topic.
2.	Hypothesis	Not in accordance with the formulation of the problem.	Answering the problem formulation but not in accordance with the theory and written in operational sentences.	Answer the problem formulation, according to the theory and written in operational sentences.
3.	Practicum Time and Place	Not written	Written one and organized	Completely written and organized
4.	Basic theory	Not in accordance with the objectives of the practicum and incomplete (less than 5 literatures)	In accordance with the purpose of the practicum but incomplete (less than 5 literatures)	In accordance with the objectives of the practicum, complete (at least 5 literatures), and correct.
5.	Tools and materials	Written one	Completely written and not well organized	Completely written and well organized
6.	Work procedures	Written incomplete and does not use active sentences.	Written in full, using active sentences, but not in the form of a flow chart.	Completely written, using active sentences, and presented in the form of a flow chart.
7.	Practicum Results data	Complete data, easy to read, not presented in tabular form, not based on practicum results, and untidy.	Complete data, easy to read, presented in tables, based on practicum results, and untidy.	Complete data, easy to read, presented in tables, based on practicum results, and neat.
8.	Data Analysis and Discussion	Not in accordance with the data obtained, the discussion does not relate to the related theory, is written in an organized manner.	In accordance with the data obtained, the discussion does not relate to the related theory, and is written in an organized manner.	Analyzed based on the data obtained, the discussion relates to related theories and is complete and organized.
9.	Conclusion	Not in accordance with the problem formulation and not written in bullet points	In accordance with the formulation of the problem and discussion, it is not written in bullet points.	In accordance with the formulation of the problem and discussion, written in bullet points, clear, concise, and concise
10.	References	Incomplete (less than 5 sources), does not follow scientific writing procedures.	Complete (at least 5 sources), does not follow scientific writing procedures.	Complete (at least 5 sources), following scientific writing procedures.

B. Student Activity

The assessment of student activity can be seen from attendance which is carried out regularly when practicum meetings are held. The value obtained is calculated based on the number of student attendance in 3 cycles, then divided by the number of meetings, namely 3 meetings, and multiplied by 100.

C. Indemendent Task

Independent tasks carried out by students are by making a summary of the material based on the topic of the practicum that will be carried

out. A summary of the material is made with the conditions given. The provisions given are systematically in the form of the title or topic of the material, student identity. The summary of the material is handwritten on folio paper with a maximum of 2 pages or 1 sheet of paper. The assessment is carried out by looking at the suitability of the systematics and the suitability of the material written according to the practical topic.

RESULTS AND DISCUSSION

A. Practicum Report Value Using the Inquiry Learning Model

Based on the assessment of student practicum reports for each cycle, the results obtained are as shown in Figure 2.

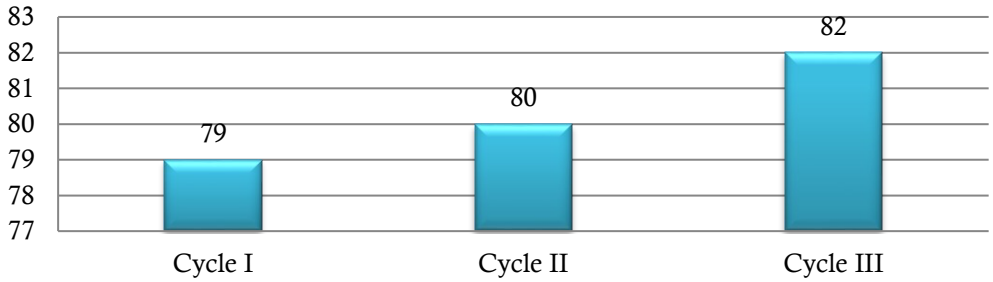

Figure 2. Graph of the Average Result of Student Practicum Report Assessment

Based on the graph in Figure 2, the average value of the practicum reports made by students in each cycle is obtained. In the first cycle the average student report score was 79, in the second cycle the average practicum report score was 80, while in the third cycle the practicum report score reached 82. Based on the score in each cycle, there was an increase in student practicum report gains.

The increase in the value obtained in each cycle is caused by the existence of independent activities carried out by students based on the syntax of the inquiry learning model in practicum activities. In general, autonomy in adolescence or college students includes three aspects, namely emotional autonomy, behavioral autonomy, and value autonomy. Emotional autonomy is the degree to which students are able to reduce their emotional dependence on others, so that they are able to face their problems even though no one else is nearby to provide emotional support. Autonomy plays an important role and has a positive impact on students. Independent students are able to try to solve their own problems so that they are not in a hurry to ask for help from others, are not swayed by the rush of information received, both orally and in writing, are able to use which values are important and which are correct. In addition, independent students are able to compete with others, they can immediately make decisions for the actions they will take and do not wait for others to decide for them (Yulianti, et al., 2012).

Students have a sense of responsibility according to what must be done. Inquiry learning that trains students to design and carry out each activity causes students to tend to be productive in achieving their grades. Student grades have also increased because of the enthusiastic learning factor where students are trained to observe phenomena according to practicum topics that can stimulate students' thinking (Ningsyih, et al, 2016). This is supported by research results showing an inquiry learning model in practicum activities, effectiveness in increasing students' ability to solve problems and an increase in student activity (Suartini, 2010, Rakhmawati, et al, 2019).

Practicum activities carried out with the inquiry learning model also train students to learn to determine hypotheses, so that students become accustomed to determining temporary answers to a problem. The results of other studies also show that the use of inquiry learning models in practicum activities can significantly improve critical thinking skills and science process skills (Sarlivanti, et al, 2014). The increase in these skills makes students more skilled in determining hypotheses as guidelines in making practicum reports.

The inquiry learning model also trains students in collecting data. Data collection process carried out by students resulted in them

being more thorough and responsible for being able to obtain answers from the problem formulations that had been made previously. Students will be trained in classifying and predicting data as the primary source for problem solving in order to attain good processing skills (Agustina and Anggraini, 2018). Students will also be able to distinguish similarities and differences in each data obtained based on the purpose of the practicum. The inquiry learning model in practicum activities can also foster scientific attitudes, including honesty in presenting practicum results, accepting differences of opinion based on new information, being meticulous when preparing practicum equipment, being disciplined and responsible when solving problems (Sundari, et al, 2017).

Testing hypotheses in the learning step using an inquiry model by means of communication is also a factor in increasing student scores. Students are trained to seek and understand theoretical information from various reading sources to find solutions to problems that occur. Students are responsible for reading references that are used as sources to test hypotheses. Practicum activities using the inquiry learning model also train students to determine conclusions. Students can conclude the results of practicum activities using appropriate and accurate information or ideas that they can account for (Walil, et al., 2020).

B. Student Activity Using the Inquiry Learning Model

The results of activity average value obtained by students are shown in Figure 3.

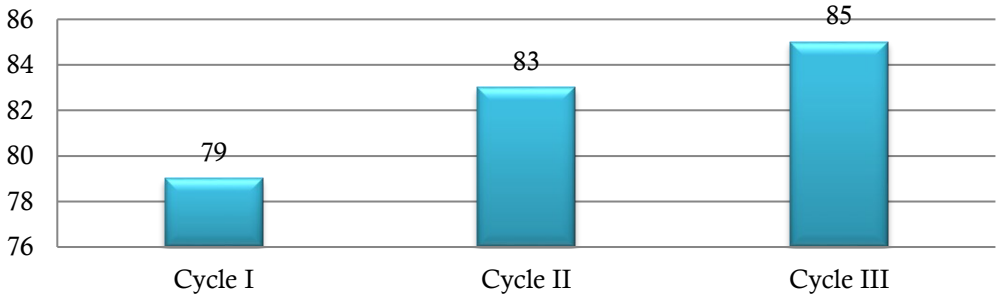

Figure 3. Graph of the Average Results of Student Activity Assessment

Based on the graph in Figure 3, the value of student activity for the first cycle is 79, while in the second cycle the average is 83, and for the third cycle the average value is 85. This value means that the level of student activity in practicum activities with a learning model inquiry is increasing in each cycle.

Learning by Inquiry has components that can encourage students to solve problems by searching the literature or teaching resources, asking lecturers when there are difficulties in solving problems, asking friends who are more understanding when having difficulties in doing assignments, appreciating differences of opinion between students. students, work well in groups, are active when participating in group activities in solving problems, respond to a given question or instruction, dare to explain the findings in front of the class, dare to express their own opinions, take notes on the material provided and write them completely and neatly, take lessons seriously in the classroom, as well as pay attention and listen to the instructions given in the classroom (Budiasa and Gading, 2020).

The active learning component resulted in an increase in research results. In the inquiry learning model, there is an exploration stage which invites students to investigate the relationship to a given problem and an application stage which invites students to solve problems, so that students will feel challenged to solve the problem. This explanation can be interpreted that student learning activities are activities that involve physical and non-physical aspects of students during optimal learning activities to create a conducive and interesting classroom atmosphere. The existence of these activities motivates students to always take part in plant physiology lessons. The increase can be seen from the average attendance value based

on attendance record which shows that in each cycle there is a significant increase in value.

C. Independent Tasks Using the Inquiry Learning Model

The average value of independent assignments obtained by students can be seen in Figure 4.

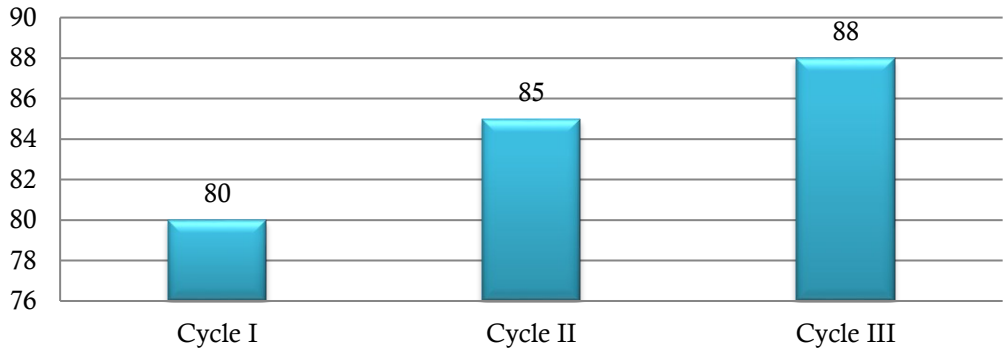

Figure 4. Graph of the Average Results of Independent Student Assignments

The graph in Figure 4 shows that the average value of independent student assignments in cycle I is 80, cycle II is 85, and in cycle III the value is 88. Based on the value of independent assignments obtained in each cycle, the use of inquiry models in practicum activities can increase the students' average grades.

Practicum activities can be more effective in helping students construct knowledge, develop logical skills and good problem solving skills. Guided inquiry through the experimental method generates more ideas and provides opportunities for students to conduct their own experiments so that they can better understand the studied materials and concepts (Kusherawati, et al., 2020). Students' interested, enthusiastic, and fun attitude responses are a form of motivation in achieving maximum learning outcomes (Ristina, et al., 2020). Practicum activities that use the inquiry learning model can also significantly improve student learning outcomes, resulting in better values obtained (Walil, et al., 2020).

CONCLUSION

The use of the inquiry learning model in the practical activities of Biology Tadris students at IAIN Metro can increase the value of practicum reports, student activities, and independent tasks carried out by students in each cycle. So that the use of the inquiry learning model is one of the effective choices that can be used in plant physiology practicum courses.

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