

Implementation of Student Sheet Activities Through the Usage of Mantangan (*Merremia peltata* (L.) Merr.) Extract as Organic Fertilizer to Increase Student Concept Understanding on Plant Physiology

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Abstract—Plant physiology is one of the subjects studying the metabolic processes in plants. Almost every subject in this course is generally difficult for students to understand because it is abstract, so we need the right way to overcome it, one of the ways to do learning that demands student activity, which can be done through the guidance of student activity sheets. This research was conducted with the aim of reviewing the implementation of student activity sheets through the use of formulations extract of mantangan (*Merremia peltata* (L.) Merr.) as organic fertilizer to improve understanding of concept on plant physiology courses. The analysis was carried out descriptively by analyzing the students' understanding of material concepts according to the subject matter specified, namely the subject matter of soil and plant nutrients, as well as plant growth and development. Data collection was obtained through pretest and post-test instruments by looking at the results of students' understanding of concepts which were assessed based on the rubric of understanding concepts. The results showed that the implementation of student activity sheets through the use of formulations extract mantangan as organic fertilizer can improve students' understanding of concepts in plant physiology courses, specifically the subject of soil and plant nutrients, as well as plant growth and development of 26.9%.

Keywords: *student activity sheet, plant physiology, the understanding of concept*

I. INTRODUCTION

Plant physiology is a subject that must be programmed by students in the fifth semester on Biology Education Study Program of Faculty Teacher Training and Education, Mulawarman University. The courses have a credit score of three semester credit units (credits), including one of the subjects which the student is difficult to understand because of air abstract nature, although in the lecture are often accompanied by doing practical work. Students should no longer experience difficulties, because theories obtained through face-to-face activities can be proven through practical activities. The reality on the ground shows different things, where in the lecture process in the student class it is still difficult to understand the concepts of plant physiology. The trouble allegedly caused understanding of the concept of students are still not optimal, so the right way is needed to improve the understanding of the concept of students in the course of plant physiology. Abstract material requires proof

to concretize the abstract material. One way that can be done to overcome student difficulties is to make learning effective in the classroom by involving students directly according to the subject matter.

The subject in plant physiology lecture is not just a series of topics, but one that must be understood the students, so that may be an application right in life. If student learn best through their experience, by doing, using the senses, the environment, good environment in the form of objects, places, events around them, and a variety of other things that happened in real life, then active involvement directly with the objects in the surrounding environment can encourage students' mental activities to think, analyze, conclude, and find understanding of new concepts and integrate them with concepts they already knew before [1]. Students can easily participate or get involved if they are familiar with the object of the lecture material. One way to make it easier to recognize the object of lecture material is to use these objects as media and learning resources that are in accordance with student life experiences, with the help of guidelines that can guide students to carry out activities, one of which is by applying Student Activity Sheets.

Student Activity Sheet is a learning tool that is used as a guide or guide for students in carrying out lectures. Student Activity Sheets is not only used in practical activities in the laboratory, but also in the learning process that takes place in the classroom. Student Activity Sheets can be made by the lecturer based on the subject that is suitable with the aim of making the Student Activity Sheets. Meina stated that Student Activity Sheets have a specific format that is relevant to the substance of the material and is supported by appropriate use [2]. Also added that the use of Student Activity Sheets can increase student activity by 71, 79, 86, 89%, starting from cycle I to cycle IV. In the course of plant physiology, Student Activity Sheets is needed to guide students to understand difficult concepts, including the processes that take place within a plant. With the guidance of Student Activity Sheets students can carry out activities directly to prove the existence of the process and to make it easier for students to understand abstract concepts on the subjects studied in the course of plant physiology.

Some subjects in the course of plant physiology that are not too difficult to study include the subject of soil and plant

nutrition, and the subject of plant growth and development. However, in the lecture process students still experience difficulties in learning these subjects. Thus researchers are encouraging to develop Student Activity Sheets specifically for these topics. The developed Student Activity Sheets was modified by applying the extract of mantangan as an organic fertilizer in cultivated plants. This is intended so that students can be directly involved in activities that are in accordance with the subject of the plant physiology course, so that through direct activities using mantangan extract, they can easily understand abstract concepts that are concrete through the guidance of Student Activity Sheets.

II. METHOD

This research was a quasi-experimental type of research conducted with the aim to examine the implementation of Student Activity Sheets through the use of the formulation of mantangan extract as organic fertilizer to improve students' understanding of concepts in plant physiology courses.

A. Time and Place of Research

The research was conducted during July - September 2019. The research was conducted at Biology Education Program, Faculty of Teacher Training and Education, Mulawarman University, Samarinda, East Kalimantan, Indonesia.

B. Research Objects and Subjects

The object in this study was the Student Activity Sheet of plant physiology courses. The research subjects are all fifth semester students of Biology Education Program in the academic year of 2018/2019 who programmed plant physiology courses.

C. Factors Studied

Students, namely the ability of students to work on problem solving activities related to the concept of plant physiology through the implementation of Student Activity Sheets on the subject of soil and plant nutrition, as well as plant growth and development. The learning process were the use of time in lecturing plant physiology, activities, and student cooperation in lecturing activities, as well as student responses after lecturing.

D. Data Collection

Sources of data in this study were students, documents, and learning processes. The types of data obtained in this study include: Student Activity Sheets, reports on the results of learning activities, observations of the implementation of learning through the implementation of Student Activity Sheets, and the results of student evaluations.

Data collection methods include observation, documentation, test assessment (product evaluation).

E. Indicator of Success

Indicators of success in this study were increased understanding of student concepts in plant physiology courses after implementing Student Activity Sheets on the subject of soil and plant nutrition, and plant growth and development.

F. Data Analysis

The results of data analysis was about effectiveness implementation of Student Activity Sheets obtained from the pretest and post-test by analyzing gain score by Hamidah [3], as follows equation 1.

$$g = \frac{S_{post} - S_{pre}}{S_{max} - S_{pre}} \tag{1}$$

Symbol g represents the value gain score obtained, with acquisition rate gain score categorized into three categories: high ($g > 0.7$), moderate ($0.3 \leq g \leq 0.7$) and low ($g < 0.3$). Learning is said to be effective if the gain score is at a moderate or high level. If the result of the gain score is at a moderate or high level, it means that the implementation of Student Activity Sheets has a positive influence on students' understanding of concepts in plant physiology courses.

Student responses related to the implementation of learning through the implementation of Student Activity Sheets were analyzed by calculating the average score given by the observer with the criteria: $< 59 =$ very poor; $60 - 69 =$ not good; $70 - 79 =$ good enough; $80-89 =$ good; $90 - 100 =$ very good. The percentage to determine the implementation of the RPP uses the equation 2.

$$P = \frac{1 - (A - B)}{(A + B)} \cdot 100\% \tag{2}$$

where R is percentage of RPP implementation, A is higher score than observer, and B is lower score than observer

III. RESULTS AND DISCUSSION

The implementation of Student Activity Sheets (Student Activity Sheets) through the use of mantangan extract as organic fertilizer to improve students' understanding of plant physiology courses is carried out based on selected subjects namely soil and plant nutrition, as well as growth and development plant. The Student Activity Sheets that was developed based on the chosen subject matter was applied to the lecture process as many as 6 meetings, so that learning was carried out 100% for the chosen subject. The recapitulation of the results of learning is shown in Table 1.

Student responses related to the implementation of learning by implementing Student Activity Sheets through the use of mantangan extract to improve understanding of concepts in the course of plant physiology showed a positive response, as listed in Table 2.

Profile Understanding of Student Concepts

Measurement of students' understanding of concepts is done before (pretest) and after learning (post-test). The collected data is then analyzed using descriptive statistics to find out the average increase in concept understanding in each respondent. The results of the complete analysis are listed in Table 3 .

TABLE I. RECAPITULATION OF LEARNING IMPLEMENTATION OF STUDENT ACTIVITY SHEETS

Syntax Implementation	Observer 1	Observer 2	Average	Category
Meeting 1-6	84.3	79.2	81.75	Well

TABLE II. STUDENT RESPONSES TO PLANT PHYSIOLOGY LECTURES THROUGH STUDENT ACTIVITY SHEETS IMPLEMENTATION

No.	Indicator	Frequency	
		Yes	No
1.	Interesting?	26	0
2.	Feeling happy?	26	0
3.	Increase learning motivation?	26	0
4.	Improve investigation / observation skills?	24	2
5.	Improve learning outcomes / mastery of concepts?	25	1
6.	Improve collaboration skills?	26	0
7.	Has advantages compared to other strategies?	26	0

TABLE III. AVERAGE SCORE OF UNDERSTANDING THE CONCEPT BEFORE (PRETEST) AND AFTER LEARNING (POST-TEST)

Respo-ndents	Pre-test	Post-test	Enhancement (%)	Information
1	39.1	81.7	42.6	Increase
2	74.9	83.7	8.8	Increase
3	53.7	80.9	27.2	Increase
4	47.6	80.1	32.5	Increase
5	52.7	82.7	30.0	Increase
6	45.9	81.6	35.7	Increase
7	82.7	85.7	3.0	Increase
8	25.2	77.7	52.5	Increase
9	42.1	81.3	39.2	Increase
10	77.5	84.9	7.4	Increase
11	62.7	82.7	20.0	Increase
12	74.9	86.1	11.2	Increase
13	55.2	79.7	24.5	Increase
14	76.6	85.9	9.3	Increase
15	62.7	82.7	20.0	Increase
16	48.1	80.7	32.6	Increase
17	50.9	79.7	28.8	Increase
18	16.1	75.1	59.0	Increase
19	70.1	83.7	13.6	Increase
20	38.2	79.1	40.9	Increase
21	52.7	79.8	27.1	Increase
22.	34.9	78.1	43.2	Increase
23.	67.3	81.5	14.2	Increase
24	69.1	81.1	12.0	Increase
25	40.3	77.6	37.3	Increase
26.	51.2	79.2	28.0	Increase
Average	54.32	81.27	26.95	
	Gain		26.9%	Increase

Table 1 shows the average results of the implementation of learning through the implementation of Student Activity Sheets on the subject of soil and plant nutrition, and plant growth and development of 81.75 with good categories. This means that lectures in class by utilizing Student Activity Sheets are well implemented in the process of lecturing plant physiology. The results of visual observation in the lecture process shows the enthusiasm of students in carrying out learning, so that the lecture process goes well. The use of Student Activity Sheets in the process of lecturing plant physiology, especially on the subject of soil and plant nutrition, and growth and development of plants, is carried out from the initial meeting until the end of the lecture process, so that learning with the Student Activity Sheets is carried out as a whole. This can motivate students to learn the concepts of plant physiology well. Mulyasa stated that motivation is one of the factors that determines learning

success, because students will learn seriously if they have high motivation [4].

Student responses to the implementation of Student Activity Sheets in learning plant physiology as listed in Table 2 shows that students generally respond well to learning using Student Activity Sheets applied in plant physiology lectures, even though there are still students stating that learning has not been able to enhance their investigation or observation so that it has not can also improve learning outcomes or understanding the concepts of plant physiology well. This can be explained that the ability to think of each person is different depending on the mindset and culture and the environment that shapes it. These differences remain inherent to students even though in the lecture process they receive the same learning. This is in line with Kamal which states that the community has a major role and influence on the intellectual development and personality of individual students [5]. The community is a laboratory and macro learning resources that are full of alternatives to enrich education. Also added by Yaqin that different ethnic backgrounds of students and different characteristics can lead to a difference that should be noted by the instructor [6].

The results of the data analysis show that lectures by applying Student Activity Sheets can improve students' understanding of concepts in the Plant Physiology course. This is reflected in the increase in understanding of student concepts as seen from the average scores of the pretest and post-test results. This can be explained that the lectures on Plant Physiology using the Student Activity Sheet (Student Activity Sheets) are able to motivate students to understand the concepts found in the Plant Physiology course, students can associate their acquired concepts directly through phenomena that are observed themselves with concepts in the book/teaching material, so as to increase their understanding of the intended concept. The synergy of lecture material with plants can be found in the environment around the campus, causing students not to have significant difficulties when doing the exercises listed in the Student Activity Sheets provided. In line with Haluk and Nagihan which states that Student Activity Sheets are learning tools that are more effective than traditional teaching methods and materials [7]. This shows that the use of Student Activity Sheets in lectures in the classroom can make the lecture process effective.

The use of Student Activity Sheets in the classroom gives students the freedom to apply the science process, explore freely to find and discover, and work with friends in solving problems related to learning Plant Physiology. Farida stated that Student Worksheets based on science process skills are a solution and alternatives that can be chosen to improve student learning outcomes [8]. In college, plants physiology generally examine the function and the natural processes that take place inside the body of plants when learned using Student Activity Sheets in the classroom, even easier for students to understand the concepts related material learning, thus increasing understanding of their concepts [9].

IV. CONCLUSION

Based on the results of research and discussion, it can be concluded that the implementation of Student Activity Sheets (Student Activity Sheets) through the use of

formulation extract mantangan extract as organic fertilizer can improve students' understanding of concepts in plant physiology courses by 26.9%, especially in subject matter Soil and Plant Nutrition, and Plant Growth and Development.

Suggestions that can be made based on the findings of this study are: (1) Student Activity Sheets can be implemented in face-to-face lectures in plant physiology courses and not only during practicum activities, (2) The use of Student Activity Sheets needs to be adjusted to the specifications of the subject to improve understanding of concepts students according to the chosen subject.

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