

Teaching Science through Observing Plants Close to Students

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Abstract

The study describes about how to teach science lesson using various plants close to the students. The purpose of the study was to analyze the process and outcomes of learning science through observing plants that were around the students. The study was conducted in September to December 2013 in the fourth grade class of 3 public and private elementary schools in South Tangerang, Banten, Indonesia. The results of the study revealed that (1) the students seemed ready to learn through observing plants that were around them, (2) they were very enthusiastic and passion for learning, although still frequent search for confirmation to their teacher during process learning and observations, so that the teacher seemed difficult to facilitate their students, (3) the students seemed to be trying to implement all tasks and noted all results, (4) the learning outcomes that were measured after the end of the study showed that the students demonstrated average results for the ability doing science practicum in observing, and poorly results for ability in formulating conclusion, in addition (5) they showed have fairly attitude and interest, as well as fairly self confidence and perceptions to science and learn science. The conclusion is that teacher can use various things close to the students and prepare their own lesson plans and worksheets in order to develop student abilities and skills in science.

Keywords : *science lab, attitudes, interests, self confidence*

Introduction

Teaching students in elementary schools to get to know life and living be conducted through a active that is oriented on the observations of / experiment / lab work by the use of skill, the ability of the imagination, and creativity (Ayala, et al, 2006; Harlen, 1992; Millar, 2001, 2004; Paliwal, 2005). Observation / experiment / lab work is a vehicle to develop the understanding, skills, attitudes, and interests (Hofstein, 2004; Hofstein & Lunetta, 2004; Hofstein & Mamlok-Naama, 2007; Millar, dkk., 2002; Millar, 2004; Tiberghien, 2000). Through observation activities, students can learn actively. Student active learning through practical works aimed to students could have the abilities, skills, behaviors, and attitudes needed to deal with the challenges in the twentieth century. However, there are the usual problems encountered in the implementation of observation / experiment / lab work, among which are (1) the activities of more attention as a practical procedure, (2) assessment has not been carried out in accordance with the competencies to be practiced through the lab, (3) the implementation of the lack of attention the teachers and principals because of limited resources, time, space, facilities (Greco, et al., 2010; Hofstein, 2004; Hofstein & Lunetta, 2004; Yung, 2001).

In recognizing that there are living beings around students, students need to be facilitated to observe plants and animals. Observation activities do not need to use the tools or materials that are difficult to have, but can use a plant or animal life or is available around the students. Encourages students to recognize and learn parts of plants and their function is one of the material taught in the fourth grade in Indonesia. Teachers teach the material to encourage students to observe and conduct experiments, using a variety of plants that are around students. Plants that can be used can obtain from the student environment around home or school.

This paper describes the results of the study about preparation and implementation of teaching learning process and learning outcomes. The purpose of the study were to analyze and describe (1) preparation and implementation of lesson plans, (2) students activities during the teaching learning process, and(3) assessment of learning processes and outcomes.

Methods

This research has been conducted in three elementary schools, which consists of 1 public and 2 private schools, in South Tangerang City, Banten Province. The three elementary schools were categorized as good, moderate, and less good schools based on the score of UAN results (National Final Examination) at the level city. The study was conducted in the first semester of the academic year 2013/2014, from September to November 2013. Textbooks used were based upon the based competencies curriculum of 2006, while the Student Worksheet which contains practical tasks and activities developed by teachers through adapting practicum that listed in the textbooks. The information and data collected in this study consisted of the process and result of developing lesson plans and worksheets as well as conducting learning and assessment, and results of student learning outcomes. The instruments were used in this study included worksheets, activity recording format, tests, and questionnaires. Data and formation collected by using observation, worksheets, tests, and questionnaires. The source of data and information derived from students and teaching and learning activities. Descriptive analysis was used to analyze and describe the data and information that has been collected.

Result and Discussion

Student worksheets composed through the procedure as follows: (1) to develop student worksheets draft, (2) to review the draft, (3) to revise the draft based on teacher review, (4) to determine the activities that need to be conducted, and (5) to finalize worksheets. Components that listed on the student worksheets comprised of learning objectives, learning targets to be achieved, the tools and materials that were needed to support teaching learning activities, teaching learning scenario or procedure activities, tasks or questions which have students to do. Student worksheets could be produced in accordance with target of the study. Worksheets completed and distributed to student to be learnt before the learning process

.Table 1. Description of Lesson Plan about Identifying Characteristics and Types of Plant Parts

No	Component	Description
1	Topic of observation	Characteristics and types of Plant Parts
2	Purpose of observation	Getting to know the characteristics and types of plant parts
3 a	Tools and materials needed	Characteristics and types of roots: Grass, Reeds (Weeds), Spinach, Frangipani, Jambu air (Rose water), Corn, Guava, Peanut, Kale (<i>Ipoemaea aquatic</i>), Soybean, Hibiscus, Mango, Jackfruit, Rice, Rambutan, Cassava, Betel. Characteristics and types of flowers: Frangipani, Bunga kembang dara, Pacar air (Henna) , Putri malu (<i>Mimosa pudica</i>), Celery, Aster, Crysant, Dahlia, Lily, Mango Flower, Sunflower, Rose, Jasmine, Bunga kembang sepatu (Hibiscus), Lotus
3 b		Types of stems: Putri malu (<i>Mimosa pudica</i>), Reeds (Weeds), Aster, Bamboo, Spinach, Corn, Guava, Kale (<i>Ipoemaea aquatic</i>), Bunga kembang sepatu (Hibiscus), Mango, Rice, Palm, Papaya, Grass, Celery, Cassava, Betel, Sugarcane Types of leaves: Putri malu (<i>Mimosa pudica</i>), Grass, Reeds (Weeds), Aster, Bamboo, Spinach, Corn, Guava, Kale (<i>Ipoemaea aquatic</i>), Bunga kembang sepatu (Hibiscus), Mango, Rice, Palm, Papaya, Celery, Cassava, Betel
4	Tasks	Recording Characteristics and types of root, stem, leaves, and flower. Make inference from your observation
5	Assessment	Readiness for observation, Performance and behavior during carrying out observation, Recording, Formulating inference/ conclusion, Understanding the characteristics of roots, stems, leaves and flowers in plants, Interest and Perceptions

Table 2. Description of Lesson Plan about Root and Stem Function

No	Component	Description
1	Topic of lab works	The Function of Plant Stem and Root
2	Purpose of observation	Explaining the function of the stem and root in plants
3 a	Tools and materials needed	Function of Stem: Spinach, Celery, Aster, Chrysanthemum, Lily, Rose, Pacar air (Henna) , Water, Knife / Cutter, Clear glass, Food dyes
3 b		Function of Root: Red bean sprouts, Knife /Cutter, Pot,
4	Tasks	Recording The changing of the color and the time needed until the color changes Make inference from your observation
5	Assessment	Readiness for observation, Performance and behavior during carrying out observation, Recording, Formulating inference/ conclusion, Understanding the characteristics of roots, stems, leaves and flowers in plants, Interest and Perceptions

After developing of student worksheet, Guidelines for Teachers was developed. This guidelines explained the steps that the teacher should do in the teaching learning activities, include assessment. The worksheet had to distributed to the students before the day of teaching learning activity so that students learnt and understood the objectives, procedures, and assessment, as well as participated in preparing materials. Students should be guided for identifying the types of roots, stems, leaves, and flowers of plants. In addition they should be guided for doing experiment in order to explain the function of root and stem. Thus, students had to guided for observation, doing experiment, recording results, and drawing conclusions. Students would also be guided and informed if there are procedures that harm. In addition, students were given the information that their readiness to learn, performances during observation, and behavior to be assessed during teaching learning activities.

Students had worksheets before the implementation of learning. Students' understanding of how conducting lab works (observations or experiment) was considered as an indicator of their readiness to do lab works. They were assigned to bring a variety of plants and the tools that were needed. Therefore, every student carried an assortment of plants, the number and types of plants that should be observed were too much. As a result of observation required more time. So that learning could be implemented according to the time available, it should be set out clearly the tasks of the students who brought the plants to be observed. However, the number and type of plants should represents sample for each type of roots, types of flowers, types of stem and leaf types. Students can share their experiences and observations on a variety of plants with the guidance of the teacher.

The students worked in groups, but each student could do their own observations. Students were free to identify the attributes that observed from the roots and flowers. Observations on the characteristics of the students seemed have highly variation. Students observed characteristics of root based on direction of growth (35%), texture of root (25%), and size of root (25%). However, the data showed that the most students (nearly 50%) reported the type of root (root fibers or taproot. Students seemed to be able to identify the characteristics of 1-4 kinds of roots. A total of nearly 50% of students reported one characteristic, and approximately 35% reported 2 kinds. When students were asked to identify the type of roots of plants observed, more than 90% of students could indicate the type of plants that have a taproot or fibrous root correctly.

Observations on the characteristics of students' interest showed that 50% of students pay attention to the existence of the pistil and stamens, almost 30% noticed a crown of flowers, almost 25% noticed a flower petal, and about 40% attention to the color of flowers. Students seemed to be able to identify the characteristics of as much as 1-3 wide. When students were asked to identify the types of flowers (flower perfect or imperfect flowers) of the plant were observed, approximately 65% of students could demonstrate that plants have flowers perfect or imperfect correctly.

In addition, students identified the type of stem and leaf type of plant. The students observed as many 4-9 plant. Students had to be able to identify whether the observed plant has woody stems or trunks wet and whether the plants have parallel leaves, resemble fingers form of leaves, curled leaves, or

pinnate leaves. Almost all students (over 90%) could determine the type of plant stems observed correctly. In addition, more than 80% of students could determine which kind of leaves observed correctly.

Furthermore, for the observation of the function of the stem and roots, students (nearly 50%) seemed to record the observations in detail. Color changes that were occurred in the stem, leaves flowers custom noted. In observing the function of the stem, all the students recorded the time of observation. However, students were less able to explain why it changes color. Furthermore students also could not use the observations to make conclusions. Nearly 30% of students could make a conclusion but the conclusion was not in line with the information contained in the observations. Conclusions based on the knowledge that had been obtained of previous learning. For observation of root function, students could not explain that the root is very necessary for plant life. Approximately 50% of students could be mentioned that the roots can grow well. The observation of the students indicated that students take measurements of growth (by measuring plant height were observed). However, these observations were less clearly, thus the students could not infer function for plant roots.

From the data obtained it appeared that students record observations sometimes was not based on observations by using all five senses owned, but is sometimes based on the knowledge that has been acquired previously. Suppose that at the time had to observe the roots, written observations were kind of roots that have been studied previously, namely taproot root fibers, rather than write about root fibers form, branch roots, root length of fibers, direction of growth of roots and so on, which can be observed. Similarly, when observing flowers, most students wrote existence of male genitalia and female genitalia plant that is the pistil and stamens (although probably not the visible) rather than write about the completeness characteristics of flower parts. Tasks to be performed in addition to record student observations were made conclusions. Students seemed to be difficult to make conclusions. How to formulate conclusions based on observation (data / information) seems to be taught. The data showed that students who could make the conclusion less than 40%. Students could make decisions with the help of the teacher, so that the conclusions made reference to the results of the previous study was not referring to the observations obtained.

Assessment was conducted on the readiness for observation, performance and behavior during carrying out observation, observation records, formulation of inference or conclusion, understanding of the content, interests and perceptions. The analysis showed the results as listed in Table 3. Other measurements conducted on students' interests and perceptions toward learning science and practice. The results are listed in Table 4.

Table 3 Assessment of Readiness Learning and Learning Outcomes

No	Components	Score
1	Readiness for observation (before observation process)	
	Characteristics and types of Plant Parts	0.90
	The Fuction of Stem	0.70
2	The Fuction of Root	0.70
	Test (5 weeks after observation)	
	Stating the procedure :	
3	Function of Stem	0.60
	Characteristics and types of Plant Parts	0.80
	Function of Root	0.60
4	Explaining how to observation :	
	Function of Stem	0.40
	Characteristics and types of Plant Parts	0.80
5	Function of Root	0.80
	Formulating result of observation :	
	Function of Stem	0.40
6	Characteristics and types of Plant Parts (leaves)	0.50
	Characteristics and types of Plant Parts (stems)	0.95
	Characteristics and types of Plant Parts (leaves)	0.50
	Characteristics and types of Plant Parts (flowers)	0.40
	Formulating of inferences:	
7	Function of Stem	0.30
	Function of Root	0.70

Table 4 Interest and Perception toward Science and Observation

No	Component	Mean (Scale 1-4)	Std Dev
1	Attitudes	2.78	0.28
2	Interests	2.49	0.30
3	Self-Confidence	2.47	0.34
4	Perception: Work based evidence	3.03	0.87
5	Being skeptical of the results obtained	2.82	0.93
6	Accepting which are ambiguous	2.74	1.35
7	Be cooperative	2.92	1.02
8	Positive attitude towards failure	2.59	1.04
9	Scientific Attitudes	2.82	0.53

Conclusion

The results of the study revealed that the students (1) were ready to learn through observing plants that were around them, (2) were very enthusiastic and passion for learning, although still frequent try to find information to the teacher, (3) tried to implement all tasks and reported results, (4) demonstrated quite good ability to perform observation and to report the results, however they still showed less good ability to draw the inferences, in addition (5) showed have positive attitude, moderate interest, moderate self confidence and good perceptions toward science and learning science. The conclusion is that teacher can use various things close to the students and prepare their own lesson plans and worksheets in order to develop student abilities and skills in science.

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