ASSESSING SCIENCE ABILITIES AND SKILLS: PRACTICAL WORKS OF PLANT ADAPTATION AND PROTECTION IN PRIMARY SCHOOL

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ABSTRACT: *The study describes how to conduct instruction and assess student perception and understanding of life science in primary school. Primary school students have to be involved in science instruction using the student active learning approach based on observations and experiments. Relevant assessment and evaluation have to be provided as well. The learning abilities and skills that result of this instruction are considered as the basis and provision for further science learning as well as being needed to deal with the challenges of the twenty first century. The purpose of the study was to analyze the teaching and learning process and assessment activities in relation to science abilities and skills in practical applications of plant adaptation and protection in primary school. The study was conducted from September to December 2013 in the fifth grade class of three public and private elementary schools in South Tangerang, Banten, Indonesia. Data of students' readiness for learning, practical activity work, content understanding, and perception of science abilities and skills in practical applications of plant adaptation and protection were collected using a test, an observation sheet, and a questionnaire. The results of the study revealed that: the students were ready to be involved in practical work; they showed great curiosity and enthusiasm in doing practical work; they were able to do practical work using materials from the surrounding environment with the guidance and direction of the teacher; they demonstrated a good ability, positive attitude and good perception of science and practical work. Furthermore, teachers seemed to require much more effort to prepare lessons; to organize and manage the class; and they were able to assess students' abilities and skills regarding practical work, except the details of students' activities during the practical work components. In conclusion the whole scenario of active learning and most assessment procedures of practical work in relation to adaptation and self-protection of plants have been properly carried out.*

Key words *: assessment, science ability, science skill, practicum science, primary school, plant adaption, plant protection*

1. INTRODUCTION

Science as a subject in schools has an important role and can affect a person in daily life and future life [1,2,3]. The purpose of science education is to facilitate students in understanding the natural sciences and life according to their needs, interests and capacities as well as developing an understanding of the knowledge acquisition method [4,5]. Practical work in science (observations, experiment, lab work) is conducted in class in order to develop those competencies [5,6,7,8,].

The main purpose for science teaching at primary school is to develop students' understanding about nature and life, especially of that in the students' environment. The students have to be involved in science instruction through the active learning approach based on practical science work oriented in using their skills, abilities, imagination, and creativity [4,5,9,10, 11]. Student behaviors as learning outcomes need to be assessed and evaluated using the relevant techniques and procedures.

However, practical work still copes with some issues, including those in terms of facilities, as well as the assessment procedures [6,12,13]. Regarding these issues, teachers have to provide considerable efforts and thus they are able to properly conduct learning activity and assessment procedures, which are relevant to learning objectives.

Concerning these issues, the study has been conducted based on the following research questions: (1) how to carry out learning- oriented practical work (observation) in relation to adaptation and self-protection in plants in primary school by using a variety of plants that are easily obtained and available around the students at home or at school, and (2) how to assess learning outcomes through practical science work. This paper describes the implementation and the results obtained through the study.

2. METHODS

This study was conducted in the first semester of the academic year 2013/2014, from September to November 2013, in three public and private elementary schools, in South Tangerang City, Banten Province, Indonesia. The practical work manual and student worksheets were developed by school teachers based upon student textbooks of the competencies-based curriculum 2006. Data and information consisted of the process of learning activities and assessment procedures of student learning outcomes. The data and information were collected by using worksheets, observation (activity recording format), tests, and questionnaires. The sources of data and information were students, teachers, and teaching and learning activities. Descriptive analysis was used to analyze and describe the data and information that has been collected.

3. RESULT AND DISCUSSION

The study focused on implementation of learning-oriented practical work and assessment of learning, obtained on the topics of adaptation and self-protection in plants. Competences, objectives, and indicators of the topic are recorded in Table 1. The students needed to be facilitated to learn through observation.

Table 1. Topics, Competences, Objectives, and Indicators of Practical Works

Topic and Competence	Objective	Indicator
Adaptation of Plants: Identify plant adjustment to a particular environment	Explain the adaptation of plants	1. Identify kinds of adaptation in plants. 2. Identify the purpose of adaptation in plants
Protection of Plant : Identify plant protection in order to maintain its life	Understand plant protection	Identify the ways plants protect themselves

Practical work assessment is an assessment of performance in terms of behaviors, skills, and knowledge demonstrated by students [14,15,16,17]. The components that were assessed consist of skills in planning, implementing, and reporting the results [18,19]. In this study, teachers assessed learning outcomes through practical science work and the aspects assessed are listed in Table 2 .

Table 2 Focus of Learning Assessment

Dimensions and Indicators	Instrument
Readiness: Understand concepts and procedures	
Explain the concepts and objectives. Explain the tools and materials as well as procedure of practical work	Test
Conduct practical work	
Carry out practical work - properly, actively, systematically and precisely, using time effectively, with good cooperation, independence, discipline and responsibility Cleanliness and tidiness	Check list
Write a report : - appropriate format - data and information from observations - conclusions in accordance with objectives and observation	Document analysis
Understanding content and practical work	
- explain the purposes, equipment, materials, procedures, and observations, - describe concepts related to practical work topics	Test
Attitude, interest and perception - high curiosity, positive attitude, work based on evidence, skepticism of the results, accept ambiguous results, be cooperative, confidence, high interest	Quest-ionnaire

Implementation of Practical Work.

Generally, during the practical classes, the students were ready to engage in practical work and learn about plant adaptation and protection using materials that were obtained from their surrounding environment. They showed great curiosity, were very excited and enthusiastic in accomplishing all procedures written in the practical work manual and in recording the report, although they were less sure and hesitant about what was to be done and written thus they always asked each other or asked the teacher.

They were able to do practical work using materials with the guidance and direction of the teacher and using materials from their surrounding environment. However, the students had many kinds of plants, thus they could not observe all plants in more detail. It seemed that they did not have sufficient time to accomplish all of the practical work. The teachers seemed to require much effort to prepare lessons; organize, guide and direct the students; as well as manage the classroom. Thus, the students actively worked in a more manageable and less noisy class.

Conducting Practical Work Assessment

Teachers assessed students' readiness to engage in practical work, based on an understanding of the procedures. The results are listed in Table 3. Teachers have been able to assess the readiness of students to perform practical work, their understanding of the content, recording and reporting of observations/practical work, and students' attitudes and perceptions towards science and practical work.

Table 3. Readiness Test Results

Topic: Plant Adaptation	Score and Note
Describe the equipment and materials correctly	0.60 (Fair)
Describe procedure correctly	0.85 (Very Good)
Mean	0.72 (Good)
Plant Protection	
Describe the equipment and materials correctly	0.82 (Good)
Describe procedure correctly	0.64 (Fair)
Mean	0.73 (Good)

Teachers have been able to assess the readiness of students to perform practical work, their understanding of the content, recording and reporting of observations/practical work, and students' attitudes and perceptions towards science and practical work.

The practical work was accomplished by utilizing a variety of plants that were easily obtained and available from around the students at home or school. Basically, students were considered to be able to demonstrate good enough ability in performing the work and recording the observation. However, they still needed to be taught how to work using time effectively and independently and to be concerned about cleanliness and tidiness in their work.

Teachers were not able to assess students' activity in detail during the practical work sessions since they always tried to guide and direct the students in order to have better observations. Students' performances in terms of practical science lessons with regard to working properly, systematically, precisely, cooperatively, and with discipline and responsibility, still need to be examined in further study.

After the instruction, the teachers assessed students' understanding. The assessment results are listed in Table 4. The students still need more time to study regarding

equipment, materials and procedures of Practical Work on the topic of protection in plants.

Table 4. Students' Understanding

Practical Work/ Observation	Score and Note
Plant Adaptation : Describe the equipment/ materials/procedures	0.72 (Good)
Observation characteristics of stems of kale	0.94 (Very Good)
Observation characteristics of leaves of cactus	0.90 (Very Good)
Mean	0.86 (Very Good)
Plant Protection	
Describe equipment/ materials/procedures	0.47 (Poorly)
Observation of characteristics of *pear*	0.83 (Good)
Observation of characteristics of snake fruit plant	0.92 (Very Good)
Observation of characteristics of cabbage	0.83 (Good)
Mean	0.76 (Good)

The teachers assessed students' attitudes, interest, confidence and perception. The results of assessment are listed on Table 5.

Table 5. Students' Attitudes, Interest, Perceptions

Aspects	Score and Note
Attitudes	1.78 (Positive)
Interest	1.59 (Fairly)
Confidence (using 2 scales)	1.48 (Fairly)
Curiosity	3.37 (Agree)
Work based on evidence	3.18 (Agree)
Being able to accept uncertainty	2.68 (Fairly)
Can work cooperatively	3.22 (Agree)
Be positive about failure (using 4 scales)	2.65 (Fairly)

4. CONCLUSION

The results of the study revealed that the students were ready to be involved in practical work. They demonstrated great curiosity and enthusiasm in performing practical work. They have been able to accomplish practical work using materials with the guidance and direction of the teacher and using materials from their surrounding environment. Students demonstrated good abilities, positive attitudes, and good perception toward science and practical work. Furthermore, teachers seemed to require much effort to prepare lessons; organize and manage the class and they were able to assess students' abilities and skills in relation to practical work, except detailing students' activities during the practical work sessions. In conclusion, learning activities relating to adaptation and self-protection of plants could be conducted as planned and most of the assessment procedures could be carried out.

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