**PRACTICAL WORK ASSESSMENT AT BIOLOGY EDUCATION PROGRAM IN UNIVERSITAS TERBUKA**

Amalia Sapriati1, Tri Wahyuningsih2, Mestika Sekarwinahyu3, Nurhasanah4

lia@ecampus.ut.ac.id, tri@ecampus.ut.ac.id

1,2.3.4Universitas Terbuka (Indonesia)

**Abstract**

This paper describes practical work assessment of Biology 1 Course at Biology Education Program of Faculty of Education in Universitas Terbuka. This article was written based on the study that was conducted with the aim to identify the topics and the objectives of practical work of the course, describe abilities/skills aspects to develop and to assess in the practical work, and analyze student’s perception toward implementation of the practical work. The study was conducted in 2016 from July to October 2016. Data and information were collected using questionnaires, observations during lab work, document analysis, and tests. The assessment applied on the aspects of student practical process and practical work reports. Practical process was assessed during activity by an instructor or a teaching lab assistant. The assessments were conducted for aspects of skills and behavior of (1) students readiness, (2) students skills in using the tools conducting experiment and doing observation, (4) data/information recording and communicating, and (5) work safety, accuracy, cleanliness and neatness. The product of practical work, the practical work report was assessed by two qualified lecturers. In addition, students stated that they were ready to carry out practical work because they have read the guidance, felt that they understood the materials and instruction the work with, had got good guidance from the instructor, assessed that the place of practicum fulfills the need, considered that the condition of room was good enough, stated that was easy to carry out practical work, reported that they were actively participate in discussion, viewed that they actively worked and participated in activities, got motivated from the instructor to achieve their success, liked their activities, had a perception that they will succeed in learning, felt that the practicum performed in accordance with their work so far, reported that the report made based on the results and discussion, felt that score obtained was in accordance with the prediction. Students conducted practical works activities in a small group of 5-7 students. Practical work tasks were listed on the practicum modules. The type of activities consisted of hands-on labs and observation in order to confirm and illustrate the theories of biology.

*Keywords: practical-work, assessment, biology*

# INTRODUCTION

Practical work is commonly used that refers to atype of science teaching and learning activity in which students are working either individually or in small groups using real or virtual objects and materials, and the virtual ones could be obtained from a DVD, a computer simulation, or a text-based account [1]. Practical work is an important part in science education [2], [3], [4], [5]. Practical skills of science which will be of use in further education and life are developed and practiced through practical work activities. Therefore, development of practical skills is one objective of practical work. The types of skills that are developed consist of a knowledge base of concepts, procedural understanding, process skills (such as the ability to follow instructions and procedures and to conduct observation). In addition, data analyzing and interpreting, and taking and recording information and data, measuring with accuracy and precision were identified as essential practical science skills [6].

Science practical work is an important part of curriculum in order to show confirmation and illustration of theory, and develop students’ knowledge and skills [7]. Katchevich, Holfstein, Malok-Naaman (2013) have identified skills on the science practical work for performing theoretical verification and for inquiry activities (Table 1) [8].

Table 1. Science Practical Work Skills

|  |  |  |  |
| --- | --- | --- | --- |
| No | Science Practical Work Skills | Verify Theory | Inquiry Activity |
| 1 | Conducting work according to instruction  | √ | √ |
| 2 | Asking question |  | √ |
| 3 | Formulate research questions |  | √ |
| 4 | Make a hypothesis |  | √ |
| 5 | Designing an experiment |  | √ |
| 6 | Conduct experiments in their own design |  | √ |
| 7 | Organize results | √ | √ |
| 8 | Analyze the results | √ | √ |
| 9 | Make a conclusion | √ | √ |
| 10 | Create a summary of practical work procedures | √ | √ |

Robert & Reading (2015) explained about (1) what to teach skills in practical work (substantive ideas and ideas about evidence, and (2) how to teach skills in practical work (practical activities and non-practical activities) (Figure 1) [9].

|  |  |  |
| --- | --- | --- |
|  |  | How To Teach Skills |
|  | Practical Activities | Other Activities |
| What To Teach Skills | Substantive Ideas  | ObservationClassificationIllustrative Practical WorkDiscoveryInquiry | DiscussionDidactic LearningActive LearningPresentationUse Models |
| Ideas About Evidence | Investigation (Lab/Field)Illustrative Practical WorkBasic Skills Practical Work | DiscussionDidactic LearningActive LearningPresentationUse ModelsUse Secondhand DataEvaluating Investigation |

Figure 1 What and How to Teach Science Skills [9]

Teaching learning process of practical work needs to ensure that students gain both practical skills experience and the confidence in a lab situation [1]. The program of teaching learning has to design and the time has to spend in doing practical work on developing the skills, then it is essential that such skills are formally summative assessed. Therefore needed to identify which skills in science are more important and worthy of assessment than the others. Science practical skills can be directly (through the manipulation of real objects, to demonstrate skills) or indirectly (data and/or reports of the practical work.) assessed [10]. Students considered that practical work will develop their understanding of scientific concepts, science skills, curiosity, and ability to work carefully and systematically [7]. Framework of the process of design and evaluation of a practical task which proposed by Abrahams and Millar revealed that .the analytical framework offered a means of assessing the learning demand of practical tasks, and identifying those that require specific support for students’ thinking and learning in order to be effective. Practical work was generally effective in providing students activity with physical objects, however much less effective in that to use the scientific ideas for actions and reflect upon the collected data [2].

Learning assessment is very important in students’ learning experiences [11] and is an important part of an aligned curriculum to support student learning [12][13]. Student’s abilities that are assessed in science practical work consist of readiness, manipulating and using the tools/materials, conducting experiment, creating improvisation, observing with accurate, recording data/information, reporting the result, cleanliness, neatness and work safety [7]. Assessment is conducted before and during, as well as after practical work (Practicum Report) by instructors or lab assistances or lecturer. Practical work assessment should be carried out on both the practical work skills and practical lab reports [14]. Assessment of students on practical learning is carried out on the understanding of work procedures and safety, practicum readiness, practicum ability (practice skills / process performance), observational outcomes, attitudes and behavior, and results or practicum products (including practicum reports). [15].

This paper describes practical work assessment of Biology 1 Course at Biology Education Program of Faculty of Education in Universitas Terbuka. This article was written based on the study that was conducted with the aim to *identify* the topics and the objectives of practical work of the course, describe abilities/skills aspects to develop and to assess in the practical work, and analyze student’s perception toward implementation of the practical work.

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# METHODOLOGY

The study was conducted based on descriptive research on implementation of practical work assessment of Biology 1 Course at Biology Education Program of Faculty of Education in Open University. Data and information were collected in 2016 from July to October, used questionnaires, observation, document analysis sheets, test, and review of practical work report from 5 UT-regional offices (UPBJJ-UT), namely in Bengkulu, Purwokerto, Semarang, Surabaya, and Kupang. The number of respondents was 44 students, consisting of 17 students from Bengkulu, 8 students from Purwokerto, 9 students from Semarang, 3 students from Surabaya, 7 students from Kupang.

Data and information consisted of student perceptions of readiness and performance, observations during practical work, analysis of instruction and practical work report, and tests of understanding toward practical work procedures. The data and information collected were analyzed descriptively qualitative and quantitative. Qualitative descriptive analysis was done by content analysis (determining purpose, determining coding category, coding, and interpretation). Quantitative analysis was performed by calculating averages and standard deviations.

# RESULTS AND DISCUSSION

### Description the Topics and Objectives of Biology Practical Work

The subjects discussed in Biology Practicum 1 are Plant Anatomy, Plant Physiology, Morphology, Animal Anatomy, Animal Physiology, Genetics, Ecology, and Environment. Topics, description of topics, and learning objectives on practical work are listed in the Table 1).

Table 1 Topics and Learning Objectives on practical work

| **No** | **Topics** | **Description of Topics** | **Objective** |
| --- | --- | --- | --- |
| 1 | Organ nutritive system of plant (leaves, stems, roots) | Leaf compound, The shape of the rod, the direction and the branching, Modification of roots, stems, leaves | Conducting observation and summarizing the results |
| 2 | Organ reproductive system of plants (fruit, flowers, seeds) | Flower symmetry, flower formula, & flower chart, Morphology & fruit types | Conducting observation and summarizing the results |
| 3 | Processes in plants (osmosis, plasmolysis, photosynthesis, respiration) | Effect of various concentrations of sugar solution on osmosis process, Plasmolysis, Measure plant and animal respiration | Conducting observation and investigation and summing up the results |
| 4 | Organ systems of living things | Mammalian respiratory organ systems and urogenital system  | Conduct observation & investigation & summarize the results |
| 5 | Transport systems and movements of living things | Number of erythrocytes & leukocytes, Nature of blood flow in blood vessels, rabbit muscle system | Conduct observation and investigation and conclude the results |
| 6 | Respiratory system and temperature effect on breathing | Respiratory before and after activities  | Conduct observation and conclude observation results  |
| 7 | Mendel's law | Mendel's law | Conduct simulation an summarize the results  |
| 8 | Population and environmental pollution | Effect of disinfectant solution | Conducting observation and investigation and summarizing the results |
| 9 | Food needs and environmental influences on health | Survey of community sanitation conditions | Conduct observation and summarize the results |

Objectives of science practical work is, among others, (1) to teach practical knowledge and science concepts, (2) to develop the skills and techniques of scientific procedures, (3) to improve scientific literacy, (4) increase social skills, and (5) to support implementation of knowledge in daily life [16] [17][18]. The achievement of learning of biology, among others, is the skills to communicate in writing, skills in collaboration, the abilities to write critical analysis scientifically, knowledge of biology as processes and facts, knowledge of the organization in biology; analytical skills to analyze quantitative data [19].

### Abilities, Skills, and Student Assessments in Practical Work

The study showed that assessment of readiness to carry out the practicum is to provide a matter of pre-test about the purpose of lab work, description or explanation equipment and materials used in the lab, and work procedures or work practices steps. Assessing of the skills and abilities carried out by using an observation sheet and document analyses form. Assessment of student performance during practicum is assessed by laboratory assistants or practicum instructors who also provide technical assistance to students during practical work.

Furthermore, assessment is carried out on aspects of students' abilities/skills during the practicum and the aspects considered to consist of (a) Readiness of students to carry out practicum, (b) Skills and thoroughness of students in manipulating and using equipment / materials, (c) Ability in experimental improvisation (if required), (d) Systematic or experimental skills, (e) Accuracy of students in conducting observations and experiments, (f) Accuracy of observed data (the data is proofed by the instructor and included in the practicum report), (g) Cleanliness, neatness and work security.

In this case, score for student performance in practical process used scale between 0 (very bad) to 4 (very good). In addition, assessment aspects of student practical report are (a) Recording of observations (40-60% from total score), (b) Discussion (20-30% from total score), (c) Formulating conclusion appropriate to the objectives and observation (20-15% from total score), and (d) description/explanation of answers to given questions (20-15% from total score). The skills and abilities of practical work assess during preparation before conducting practical work, during practical work itself, and after practical work through practical work report.

Student assessment on practical work is the assessment of performance in order to demonstrate skills (to plan, implement, and deliver practical results) and student knowledge[5][20][21]. Thus, aspects to be assessed consist of physical skills (example measuring, observing, experimental design, (b) thinking skills and logic (example formulate conclusions, choose method), and (c ) knowledge of science concepts and materials. Components are assessed include the skills to plan, implement, and deliver practical results [5] [21].

Assessment may be carried out for practical learning outcomes in the process during practice and / or practicum products (e.g. observations and reports or both). In more detail the assessment can be performed on (1) the understanding of work procedures and safety, (2) the readiness of the students to perform the practicum, (3) the work process during the lab, (4) the work result of observation, (5) behaviour, and (6) ) practical work reports, as a product of activity [15]. According to experts, almost all practicum activities (95%) need to assess the results of work processes (observations) and reports. [15]

### Student’s Perception toward Implementation of Practical Work

The results of the study revealed that the students were ready to carry out practical work because they have read the guidance. They felt that they understood the materials and instruction the work with, had got good guidance from the instructor.

They considered that the place where practical work took placed had fulfilled the needs and, the condition of room was good enough. They stated that was easy to have schedule for doing their practical work. They reported that they were actively participate in discussion, as well as viewed that they actively worked and participated in activities. They received enough motivation from the instructor in order to achieve their success. They felt enjoy to do the activities and had a perception that they will succeed in learning. They also stated that the practical work performed in accordance with their work so far.

In addition they reported that the report made based on the results and discussion. Their practical work score obtained was in accordance with their prediction. Data analysis results in Table 2.

The results of observation revealed that the students conducted practical works activities in a small group of 4-7 students. Practical work tasks were listed on the practicum modules (practicum guidelines). The types of practical activities consisted of hands-on labs and observation that conduct in order to confirm and illustrate the theories of biology.

Table 2 Student’s Perception on Practical Work

|  |  |
| --- | --- |
| **Description** | **Practical Work of Biology 1** |
| **Mean** | **Std, Dev** |
| Practical readiness (1) | 3,58 | 0,50 |
| Understanding (2) | 3,47 | 0,50 |
| Instructor guidance (3) | 3,45 | 0,36 |
| Frequently asked questions (4) | 3,40 | 0,52 |
| Student Activity (5) | 3,60 | 0,48 |
| Motivation from the instructor (6) | 3,42 | 0,45 |
| Like to join the activities (7) | 3,69 | 0,32 |
| Successful perception (8) | 3,31 | 0,31 |
| Practice conducted according to work (9) | 3,30 | 0,42 |
| Reports are based on results and discussion (10) | 3,50 | 0,44 |
| Practical workshop is enough (11) | 2,23 | 1,07 |
| Sufficient tools and materials (12) | 2,69 | 0,51 |
| Good lab room conditions (13) | 3,48 | 0,46 |
| Ease of taking practicum (14) | 3,10 | 0,56 |
| Assessment results as expected (15) | 3,37 | 0,76 |
| (scale 1-4) |  |  |

The results of this study were similar to the results of studies in 2012, that is students conducted hands-on labs and practical works in order to confirm and illustrate theory of science and use and present their experiences for future teaching [7]. Moreover, that the results of the study revealed that facilities, materials, and instructor for practical work were available practical works activities [7]. Moreover, the result of this study. as well as, showed that students had a positive attitudes towards practical works and assumed that practical works process and writing report were easy, enjoyable and useful for them, and , they perceived that practical works could enhance their science knowledge, and improve their practical work skills. Thus, the activities though practical works setting is perceived as the attempt to develop students’ understanding of concepts, science skills, and attitudes and interest towards science [7].

# REMARCKS

The achievement of learning biology, among others, is knowledge of biology as processes and facts, knowledge of the organization in biology; analytical skills to analyze quantitative data [19]. Moreover, the learning objectives of science practical work is, among others, to develop the skills and techniques of scientific procedures, to improve scientific literacy, increase social skills, and to support implementation of knowledge in daily life [16] [17][18]. Abilities, Skills, and Student Assessments in practical work

The assessments were conducted for aspects of skills and behavior of (1) students readiness, (2) students skills in using the tools conducting experiment and doing observation, (4) data/information recording and communicating, and (5) work safety, accuracy, cleanliness and neatness. The product of practical work, the practical work report was assessed by two qualified lecturers. In addition, students stated that they were ready to carry out practical work because they have read the guidance, felt that they understood the materials and instruction the work with, had got good guidance from the instructor, assessed that the place of practicum fulfills the need, considered that the condition of room was good enough, stated that was easy to carry out practical work, reported that they were actively participate in discussion, viewed that they actively worked and participated in activities, got motivated from the instructor to achieve their success, liked their activities, had a perception that they will succeed in learning, felt that the practicum performed in accordance with their work so far, reported that the report made based on the results and discussion, felt that score obtained was in accordance with the prediction.

The students had a positive attitudes towards practical works and assumed that practical works process and writing report were easy, enjoyable and useful for them, and , they perceived that practical works could enhance their science knowledge, and improve their practical work skills. Thus, the activities though practical works setting is perceived as the attempt to develop students’ understanding of concepts, science skills, and attitudes and interest towards science [7]

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