

Observation of Equipment and Personal Protective Equipment in The Biology Laboratory

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Abstract. This observation aimed to understand the laboratory regulations, assess the availability of Personal Protective Equipment (PPE) in the laboratory, evaluate management practices, examine the completeness of laboratory equipment and materials, and observe the arrangement of laboratory space, equipment, and materials. This research was conducted in the basic biology laboratory at a university in East Kalimantan. The method employed in this research involved interviewing laboratory assistants and observing the laboratory conditions. The observations indicated that Laboratory A and B had complete personal protective equipment. However, there were some differences. For instance, the equipment and materials were complete in Laboratory A, whereas in Laboratory B, they were incomplete because the laboratory was newly built. Another difference was in the usage of the laboratories; Laboratory A was used for practical sessions, seminars, and classroom activities, while Laboratory B was solely utilized for practical exams. For future researchers, it is suggested that laboratories be explored for both practical sessions and classroom activities, rather than just classroom spaces.

Keywords: laboratory; observation; practice

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INTRODUCTION

The Minister of National Education Regulation of the Republic of Indonesia Number 24 Year 2007 mentions that science laboratories are places for conducting science learning activities through practical exercises using specific tools. One of the factors determining the success of the learning process is the availability of adequate facilities and infrastructure. According to Prastyawan (2016), facilities and infrastructure are integral parts of the learning process in educational institutions. Facilities and

infrastructure have functions and roles in achieving learning activities according to the curriculum at the educational unit level. The characteristics of the subjects greatly determine the need for supporting facilities and infrastructure

The laboratory is one of the facilities and infrastructures used in the teaching and learning process. Inside the laboratory, students can apply or utilize their theoretical knowledge in various technological situations according to their acquired skills (Nyangko et al., 2016). Laboratories play a crucial role in

the learning process by training students to be proficient in performing practical activities and technical skills in various subfields.

Laboratories are crucial supporting facilities strategically important in implementing the education system, especially in higher education institutions. Generally, their role and function include conducting educational activities, research, and community service (Kertiasih, 2016).

A laboratory is a place that provides equipment and other supporting infrastructure used for practical activities or research (Sari & Resmiaty, 2017). Laboratories should provide facilities such as space, equipment, and materials that support research. These facilities must be well-managed to facilitate researchers when using laboratory resources. A laboratory lacking good management may not function effectively despite having advanced equipment and professional staff (Sari & Resmiaty, 2017). Laboratory management is an essential part of laboratories as it determines the smoothness of every activity conducted in the laboratory.

According to (Wulandari, 2020), laboratory management is the effort to manage a laboratory. Several interconnected factors determine the effective management of a laboratory. Laboratory management is integral to daily laboratory activities and cannot be separated from them.

According to Astuti (2020), further explanation reveals that the purpose of laboratory management is to ensure that the planning for laboratory equipment and material needs is well-organized, all equipment and materials in the laboratory can be easily identified, all laboratory activities are easily controlled through good administration, to achieve optimization of laboratory usage, and it is hoped that this can enhance the production of beneficial works.

Practical work is one of the learning methods commonly used in science education, and it includes biology, physics, chemistry, and others. Literally, practical work originates from the word "practice," which means the actual implementation of what is taught in theory (Agustina et al., 2017). Meanwhile, according to the Official Dictionary of the Indonesian Language (*Kamus Besar Bahasa Indonesia*), practical work is defined as a part of teaching aimed at providing students with the opportunity to test and implement in real conditions what they have learned from theory and practical lessons (Agustina et al., 2017).

The presence of laboratories in biology education, according to Septinurmita et al., (2014) is crucial because it allows students to discover theories and prove theories acquired in class directly. This enables students to ensure that the theories they learn correspond to real-life situations, which they can experience firsthand in the laboratory.

According to Atnur (2015), laboratory practical work is one of the activities that apply scientific methods in biology education. Laboratory practical work falls under experimental learning methods that provide direct experience to students related to learning theories. Practical work is an essential part of the learning process. Every school is required to have a laboratory and conduct practical activities. Practical work has become one of the crucial components of science education, especially in biology.

In supporting research activities, laboratories must provide several pieces of information, such as facility information, laboratory availability status, and facility usage schedules. Based on the procedure for requesting permission to use laboratory facilities, approval from authorized parties is one of the requirements for researchers. Researchers must obtain approval for the

use of laboratory facilities from each laboratory's department chair and laboratory head.

This research aims to discover the differences between the two laboratories at the Faculty of Teacher Training and Education and the Faculty of Mathematics and Natural Sciences. The objectives taken from the guidance from the University of Birmingham are to find out the rules in the laboratory, see the availability of Personal Protective Equipment (PPE) in the laboratory, know the management, see the completeness of laboratory equipment and materials according to the minimum standards set in National Education Minister Regulation No. 24 of 2007, see the arrangement of the room, equipment and laboratory materials, know the implementation of practicum according to the standard National Education Minister Regulation No. 24 of 2007 such as the laboratory can accommodate ± 20 people.

METHOD

This research was a survey study conducted using interview and observation methods. According to Islam (2019), personal interviews involve the researcher directly engaging in fieldwork. Researchers conducted interviews directly using interview guides prepared beforehand and in accordance with the standards outlined in the guidance from the University of Birmingham and National Education Minister Regulation No. 24 of the Year 2007. The advantage of personal interview techniques was greater researcher control. However, the disadvantages included the possibility of a low response rate, expensive interviewer bias, and the requirement for a significant amount of time.

According to Arikunto (2006:124), observation involved collecting data or information that had to be conducted by

making direct observational efforts in the place being investigated. As for the advantages and disadvantages of the observation learning method,

Purnomo (in Kurniawan, 2011:10) stated the following: Advantages of the Observation Method: The observation method was highly beneficial for satisfying students' curiosity, thus making the learning process more meaningful. It presented objects in a real and unmanipulated manner, was easy to implement, challenged students, increased their activity levels, motivated students to learn, and allowed for scientific qualities and curiosity among students. Disadvantages of the Observation Method: it requires a long preparation time, entails greater costs and effort in its implementation, and the observed objects could become overly complex, obscuring the learning objectives.

This research was conducted in two locations, including the Biology Education Study Program, Faculty of Teacher Training and Education, and the Biology Study Program, Faculty of Mathematics and Natural Sciences, at one of the universities in Kalimantan. The subjects of this research were one of the Teaching Assistants in the Biology Laboratory of the Teacher Training and Education Faculty and one staff member in the Biology Laboratory of the Faculty of Mathematics and Natural Sciences. During the observation, the researcher observed and recorded the condition and the availability of equipment, materials, and personal protective equipment in both laboratories being observed. Below is the list of equipment to be used during observation and interviews based on the standard guidance from the University of Birmingham and National Education Minister Regulation No. 24 the Year 2007.

Table 1. Faculty Biology Laboratory Equipment Checklist A

Access/Signs		Information	
Regulations	Yes	No	
Biological hazard signs available			
The lab is locked when not in use			
Only responsible people and certain people can enter the laboratory			
Environment and Improvement			
Regulations	Yes	No	Information
Have special requirements before entering the laboratory area			
Adequate lighting			
Comfortable temperature			
Adequate ventilation			
The laboratory hallway looks neat			
The floor is clean and in good condition			
Availability of sinks in the laboratory			
Availability of antiseptic fluid			
The bench is clean, in good condition, and safe			
Cleanliness and PPE			
Regulations	Yes	No	Information
Availability of a sink in the laboratory area			
Availability of a soap on the sink			
Availability of trash bins in the laboratory area			
The lab coat used is put on properly and correctly			
Availability of gloves			
Equipments			
Regulations	Yes	No	Information
Security cabinets are tested before being used for storage			
Equipment is stored and maintained properly			
Lab Procedures			
Regulations	Yes	No	Information
Availability of Refrigerator or Freezer			
Safe storage of biological agents			
Safe storage of chemicals			
Chemicals are separated and labeled			
Work Arrangements			
Regulations	Yes	No	Information
The number of people at one time is appropriate			
Adequate space and facilities			

RESULTS AND DISCUSSION

This research aimed to investigate the availability of equipment and personal protective gear in the university laboratories in Kalimantan, with the code-names Laboratory Faculty A and Laboratory Faculty B. Regarding the first indicator concerning the layout of the biology laboratory space at Faculty A,

the interview results indicated that the laboratory space conditions, in terms of biology laboratory criteria, could be considered to fully meet the laboratory criteria. Meanwhile, based on the observation results, it was found that the condition of the biology laboratory space was in accordance with the criteria of (National Education Minister Regulation

No. 24 Year 2007, 2007) as many facilities were available in the laboratory. These included one preparation room, one storage room, one laboratory assistant room, several types of storage cabinets with different functions, one lab coat cabinet, one demonstration table, six student tables, two whiteboards, and a sink for students and teaching assistants to wash hands and clean items after use. Regarding the condition of the biology laboratory space at Faculty B, based on the interview results, it was found that when viewed from the criteria of what a physics laboratory should be, it could be said that it inadequately met the criteria of what a laboratory should be. The observation results revealed that the condition of the biology laboratory space did not yet meet the criteria because the laboratory could be considered relatively new. Therefore, activities in this laboratory were primarily used for oral examinations for students, and generally, the examinations conducted did not involve specific equipment but only individual oral examinations. In the laboratory at Faculty B, there were actually various types of laboratories with different functions and types of practical work in each room. This was unlike the laboratory at Faculty A, where all biology practical activities were conducted in one place. However, in the laboratory at Faculty B, there were eight types of laboratories, each serving its specific function. This supported Sudaryanto's statement regarding the roles and functions of laboratories, which were threefold: (1) as a learning resource, meaning laboratories were used to solve problems related to cognitive, affective, and psychomotor domains or to conduct experiments; (2) as an educational method, which included observation and experimentation methods, and (3) as a research facility, where various research activities were conducted, thus fostering a scientific attitude in students. Laboratory B had several facilities,

including one storage room with neatly arranged shelves, a demonstration table, a head lab table, one staff lab head table, twelve student tables arranged in a zig-zag pattern, two sinks, and a whiteboard.

In the second indicator, the first part explored the equipment and personal protective gear used in Biology teaching activities in faculties A and B in Kalimantan. Based on the data, it was found that there was availability of equipment and personal protective gear for Biology teaching, but this varied according to the type of faculty based on laboratory ownership. The research results indicated that the faculties provided various biology laboratory equipment. Faculty A had the highest percentage of equipment availability (PLE) for laboratory equipment, followed by faculty B.

Furthermore, the second part of the second indicator aimed to determine whether students and teaching assistants utilized the available equipment and personal protective gear in the teaching and learning process. The research results indicated that the equipment and personal protective gear were sufficiently utilized for teaching and learning. This could be inferred from the percentage of availability and utilization. The utilization capacity also differed between faculty A and B, with faculty A having the highest utilization capacity, followed by faculty B. In line with the study by Edigan et al., (2019), Personal Protective Equipment (PPE) is a set of protective gear workers use to protect their bodies from workplace hazards.

Based on the interviews conducted with laboratory staff from faculties A and B in Kalimantan regarding the indicator of equipment completeness and suitability, it was mentioned in the study (Sari et al., 2022) that the smoothness of practical activities in the laboratory depends on the arrangement, availability, labeling, and storage of equipment and materials. The interview results showed

that the completeness and suitability of biology laboratory equipment were quite adequate according to the laboratory equipment checklist we had prepared. Additionally, based on the observation results, it was found that in faculty A, many equipment and materials were quite complete, especially in the category of basic measuring instruments and materials. Regarding the observation results at Faculty B, it was found that the completeness and suitability of biology laboratory equipment could not be considered complete because the laboratory of Faculty B was still relatively new, so there were still many equipment and materials needed to be available in the laboratory. Meanwhile, based on the observation results, it was found that many equipment and materials were incomplete in the laboratory of Faculty B.

CONCLUSION

From the observations that were conducted, differences between Laboratory A and Laboratory B could be seen. Both laboratories already had complete Personal Protective Equipment (PPE). The management in both laboratories was good, such as having lab assistants, laboratory heads, and teaching assistants. Cleanliness in both laboratories was maintained using the same system. After conducting experiments, students had to clean the equipment, materials, and laboratory space. The equipment and materials in Laboratory A were complete, while Laboratory B's were still scarce because this laboratory had just been built in 2019. In Laboratory A, it was used for practicals, seminars, and practical exams. Laboratory B was used solely for practical exams because the laboratory was newly built, thus lacking equipment. The capacities of the two laboratories were different; Laboratory A was used for practical sessions, accommodating approximately 36 people, while

Laboratory B was only used for practical exams and could accommodate approximately 24 people.

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