

Analysis of Practicum System in The Science Laboratories at FKIP Mulawarman University Toward Perception and Outcome

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Abstract. A laboratory is a facility schools must own to support the teaching and learning process in schools or tertiary institutions. This research aims to analyze the perceptions and the outcomes obtained by the students from practicum activities at the Science Laboratory at FKIP UNMUL, namely the biology laboratory, chemistry laboratory and physics laboratory. This research employed a qualitative method in which the data were collected via interviews with laboratory assistants and questionnaires to Physics Education students in Batch 2022. The data analysis technique used in this research was quantitative descriptive analysis which described the data collected. Based on the research findings, it can be concluded that the practicum system in the three laboratories is nearly identical, including the preparation, the practicum, and the evaluation after the practicum. However, the perceptions of the students and the results obtained from the practicum are different, meaning that the students tend to understand the practicum only in a certain laboratory.

Keywords: Perception; Practicum System; Science Laboratory

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INTRODUCTION

Gunawan (2019) explained in his journal that the word "Laboratory" derives from the Latin for "workplace". The evolution of the word laboratory has not altered its original definition, which is a place for conducting scientific research (Gunawan, 2019; Harefa et al., 2021; Nurhadi, 2018). Chapter 1 Article 1 of Ministry of State Apparatus Utilization and Bureaucratic Reform Regulation No. 3 of 2010 defines a laboratory as a permanent or mobile academic support unit at educational institutions in the form of a closed or open room that is systematically managed for testing, calibration, and production on a limited scale by using equipment and materials

based on certain scientific methods to support education, research, and community service (Gustini & Wulandari, 2020).

Laboratories are used in educational institutions to strengthen students' conceptual comprehension and improve their practicum skills. In addition, students' abilities to conduct scientific experiments can be enhanced through laboratory work. In accordance with this, the laboratory implements scientific theories requiring knowledge and skill. Hence, the laboratory uses the practicum approach as a learning environment (Agustina, 2018; Emda, 2017; Maknun, 2016; Nisa et al., 2021).

Every educational institution is encouraged to have a laboratory, as laboratories contribute to the success of education in both schools and universities (Minister of National Education Regulation No. 24 of 2007). Laboratories in every educational institution are anticipated to facilitate observation and experiment success. This is in accordance with the Minister of National Education Regulation No. 24 of 2007 concerning Infrastructure Standards, which states that a laboratory is one of the facilities required and must be owned by each educational unit to support the success of observation and experiment activities (Muldayanti & Kurniawan, 2021).

Laboratory management is the administration of a laboratory. Whether a laboratory can be administered effectively depends on several interrelated factors (Indrawan et al., 2019). Sophisticated laboratory apparatus and professional personnel do not guarantee that the laboratory will be used properly. Therefore, laboratory management must be incorporated into daily laboratory operations. A clear job description, effective facility utilization, efficiency, discipline, and excellent laboratory administration are also required (Indrawan et al., 2019).

Effective and efficient laboratory management variables are essential to conduct proper laboratory activities. According to Iswanto and Mulyono (2021), the elements that support ideal laboratory management are the availability of sufficient laboratory apparatus, qualified human resources, and a clear arrangement of activities. Indriyanti (2021) lists many characteristics that laboratory management have, namely: (1) being a place for a sequence of actions or cooperative efforts in achieving specific purposes, (2) being a place for cooperative efforts implies that there are shared planning activities, (3) it denotes the occurrence of collaborative relationships and the use of resources,

including as people, money, facilities, and infrastructure, as a process of actions to achieve goals, and (4) the success of a laboratory is determined by management strategies that include planning, structuring, administration/inventory, maintenance, supervision and security.

The purpose of practicum is to refine students' cognitive, affective, and psychomotor domains, with the psychomotor domain receiving the most emphasis. During the practicum, students interact not only with their peers and practicum assistants, but also with the instructional materials. After completing the practicum, students are expected to achieve the intended learning objectives. Despite the fact that a management system and procedure has been provided as a guide and reference for practicum implementation, the practicum is frequently hindered by several factors ranging from facilities and infrastructure to management factors and people involved in the implementation (Sadjati, 2013).

An evaluation must be conducted after the practicum. This aims to: (1) determine whether the activity's predetermined objectives have been accomplished, (2) provide objectivity in the observation of the results' conduct, (3) determine the capability and feasibility, and (4) provide feedback on the completed activities.

Regarding the evaluation of post-practicum implementation, the perceptions of practicum participants, namely the students, are crucial and useful since they are directly involved in the activities (Sadjati, 2013). Therefore, it is necessary to evaluate the implementation of the practicum through research evaluation activities. In this research, students' perceptions of practicum implementation will be discussed through the use questionnaire given to the students, which will then be analyzed for use in research-based evaluation (Sadjati, 2013).

The MIPA Education study program at Faculty of Teacher Training and

Education of Mulawarman University integrates the learning activities in the classroom and laboratory, particularly for the physics, chemistry, and biology study programs. First-semester physics students will complete a practicum in the three laboratories of the aforementioned study program, with each laboratory employing a distinct method for carrying out the practicum. Based on the preceding context, the research was conducted to determine the effectiveness of the system implemented in each laboratory and the perceptions of 2022 physics education students regarding the existing practicum. According to Darmaji et al. (2019), perception can be defined as a student's ability to interpret what is observed during practicum. Through this research, it is anticipated to ascertain the perceptions of 2022 physics students on the conducted practicum.

METHOD

This research was a quantitative study that collected data via interviews and the distribution of questionnaires. This study aims to determine the perceptions and outcomes of physics students Batch 2022 during their practicum in the science laboratory located in the Faculty of Teacher Training and Education (FKIP) UNMUL area, specifically the biology laboratory, chemistry laboratory, and physics laboratory. Interviews were conducted with biology laboratories, chemistry laboratories, and physics laboratories that manage the practicum. Students in Batch 2022 were provided with questionnaires as they conducted practicum activities in the three laboratories. The questionnaire consisted of the questions that the researchers used to obtain the necessary information from respondents, such as information about the practicum system starting from the preparation before practicum, the process of conducting practicum, and the activity after practicum, as well as information about the student's perceptions and

outcomes of the practicum. The distributed questionnaire was an open questionnaire in which respondents could provide answers to queries according to their own volition (Afriansyah, 2016).

Data analysis was conducted to determine the perceptions and outcomes of the students by counting the number of the distributed questionnaires whose responses were categorized according to the assessment criteria in the observation table.

RESULTS AND DISCUSSION

A system is a collection of elements collaborating to accomplish a particular objective (Jogianto in Hutahaean (2014)). This system describes a real event and object, such as locations, objects, and people. According to Robins, perception is how individuals organize and interpret their sensory impressions to make sense of their surroundings. To determine the perceptions and outcomes of practicum conducted by the students in biology laboratories, chemistry laboratories, and physics laboratories, it is necessary to understand the practicum system starting from the preparation to the practicum evaluation. The indicators of this research are the students' opinions regarding the implementation of the laboratory practicum, the role of the practicum assistant during practicum activities, and their comprehension of the conducted practicum.

The interviews with laboratory assistants showed that the three science laboratories in the area of the Faculty of Teacher Training and Education (FKIP) Mulawarman University, namely the biology laboratories, physics laboratories, and chemistry laboratories, have a system consisting of rules and procedures starting from the practicum preparation, practicum activities, and practicum evaluation. The role of practicum assistants in the three laboratories is to assist students during practicum. Each

laboratory assistant receives training in advance on the experiment title that will be conducted during the semester. Students are given a practicum briefing to learn the norms and SOP (standard operating procedure) for conducting practicum in the laboratory before engaging in them. These three laboratories provide practicum manuals that include the experiment's title.

Students must test each experiment title before engaging in practicum activities. In the biology laboratory, this examination is a pre-test administered once before the practicum on all experimental titles. Once those practicums are conducted, the post-test is administered. As in chemistry and physics laboratories, this test is referred to as a response and is issued before the practicum based on the title of the experiment that will be conducted that week.

The three laboratories in the Faculty of Teacher Training and Education (FKIP) Mulawarman University have nearly the same practicum mechanism: students must first pass the test to participate in practicum activities, namely the pre-test in the biology laboratory and the response in the physics and chemistry laboratories, with a score of at least 70. In addition, students are required to complete preliminary assignments, which in the biology laboratory consist of a semi-complete report, a flowchart, and the provision of materials for practicum activities. In the chemistry laboratory, this preliminary assignment consists of a semi-complete report, whereas the physics laboratory requires a temporary report. In addition, if the preliminary task has been completed, students conduct practicum activities to collect the data necessary to complete the preliminary task, such as semi-completed or temporary reports, with the assistance of practicum assistants.

The physics students in Batch 2022 in the biology laboratory are divided into

six groups, with two practicum assistants supervising each group. In every meeting, all groups conduct the same experiment. In the chemistry laboratory, the physics students in Batch 2022 are divided into four large groups, with each large group further subdivided into two small groups of no more than four students. For each experiment title, four practicum assistants are responsible for each class. In the physics laboratory, the physics students in Batch 2022 are divided into five groups, with one practicum assistant supervising each group. The group will change the practicum assistant when the experiment's title changes. Each group conducts a unique experiment at every meeting.

The students should consult regarding the practicum's results or data after completing practicum activities for each experimental title in each laboratory. The students consult the photographs of objects observed during the practicum in the biology laboratory. In the chemistry laboratory, the students consult observation results. In the physics laboratory, they consult observation tables and calculation data. After the practicum assistant approves their consultation, the students report a practicum activity. All completed practicum reports will be submitted to the practicum assistant of each laboratory and revised until the practicum assistant of each laboratory approves the report.

The practicum learning method is a problem-solving process centered on students who can cultivate and develop scientific attitudes and scientific thinking skills (Kurniawati et al., 2015). Based on the responses to the perception questionnaire from the three science laboratories in the Faculty of Teacher Training and Education (FKIP) Mulawarman University, Table 1 displays the students' perspectives on the practicum system in each laboratory.

Table 1 The Result of The Questionnaires About The Students' Perceptions of Practicum System

No	Laboratory	Interval	Category	Number of questionnaires
1.	Biology Laboratory	$x > 6$	Good	30
		$x < 6$	Less good	0
2.	Chemistry Laboratory	$x > 6$	Good	29
		$x < 6$	Less good	1
3.	Physics Laboratory	$x > 6$	Good	17
		$x < 6$	Less good	13

Table 1 shows that all thirty questionnaires indicate that the practicum system in the biology laboratory is good. Twenty-nine out of thirty questionnaires distributed in the chemistry laboratory suggested that the practicum system is good, while one questionnaire out of 30 stated it is less good. In the physics laboratory, 17 of 30 distributed questionnaires indicated that the practicum system in the laboratory is good, while the remaining questionnaires suggested it is less good.

The result of the student's responses to the questionnaire related to the practicum assistants in each laboratory is displayed in Table 2.

Table 2 Result of The Questionnaire Related to The Practicum Assistants During Practicum

Laboratory	Interval	Questionnaire
Biology laboratory	$x > 6$	30
	$x < 6$	0
Chemistry laboratory	$x > 6$	28
	$x < 6$	2
Physics laboratory	$x > 6$	19
	$x < 6$	11

Notes:

$x > 6$: assistants are very helpful in assisting students to comprehend practicum

$x < 6$: assistants are less helpful in assisting students to comprehend practicum

Table 2 regarding assistants in the biology laboratory reveals that 30 out of 30 questionnaires indicate that the assistants are very helpful in assisting students in comprehending practicum activities.

According to 28 out of 30 questionnaires, the assistant is viewed as very helpful. Similarly, 23 out of 30 questionnaires indicate that the assistant is very helpful in assisting students in comprehending practicum activities. Table 3 displays the percentage of comprehension related to practicum experiment activities conducted in each laboratory.

Table 3 The Result of The Questionnaire About Comprehension Percentage Regarding The Practicum Conducted

No	Laboratory	Questionnaire
1.	Biology laboratory	29
2.	Chemistry laboratory	28
3.	Physics laboratory	19

Notes:

Percentage interval $\geq 65\%$

Table 3 shows that the biology laboratory has the highest number of questionnaires in relation to the percentage of comprehension of practicum activities conducted, with 29 out of 30 questionnaires distributed and a comprehension percentage value of $\geq 65\%$. In the chemistry laboratory, 28 out of 30 distributed questionnaires indicate a comprehension percentage value of $\geq 65\%$. The physics laboratory has the lowest number of questionnaires with 19 out of 30 distributed and a comprehension percentage value of $\geq 65\%$.

It can be seen from the three tables that the biology laboratory always

occupies first place, followed by the chemistry laboratory and the physics laboratory. This is observed further based on the distributed questionnaires, which concluded that the data in the three tables are influenced by practicum assistants who guide and assist practicum activities in each laboratory. According to Inayah and Astuti (2017), several factors influence the outcomes of practicum activities, including the parties engaged in the practicum implementation.

CONCLUSION

This research interviewed the science laboratories' laboratory assistants in the FKIP UNMUL and distributed questionnaires to the Physics Education students in Batch 2022. The data was collected and analyzed based on the interviews about the laboratory system and the questionnaire regarding the students' perceptions during practicum in the biology laboratory, chemistry laboratory, and physics laboratory. It can be concluded that the practicum system in the three laboratories is nearly identical, and the students' perceptions of the practicum system in each laboratory are good. The students' perceptions and outcomes of practicum activities are influenced by practicum assistants who guide and assist the students during the practicum.

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