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The Effectiveness Of Using The Science Laboratory In Teaching Basic Science Concepts To Pgsd Students At The Faculty Of Teacher Training And Education Universitas Muhammadiyah Enrekang

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Abstract

This research aims to determine the effectiveness of using the Science Laboratory in teaching basic science concepts to second-semester PGSD students at the Faculty of Teacher Training and Education, Universitas Muhammadiyah Enrekang. This study is an ex post facto research that utilizes a descriptive quantitative approach. It was conducted at the Primary School Teacher Education Program, Faculty of Teacher Training and Education, Universitas Muhammadiyah Enrekang, during the odd semester of the academic year 2023/2024. The sample consisted of 50 students from the PGSD Semester IA and IB FKIP Universitas Muhammadiyah Enrekang in the academic year 2023/2024. The research instruments used in this study were observation sheets, questionnaires, and documentation in the form of photographs. The results of the study indicate that the effectiveness level of using the Science Laboratory in teaching Basic Science Concepts to PGSD Semester I students at FKIP UNIMEN shows an average score of 75% with the category of Quite Good. The percentage value that is still considered quite good is influenced by several factors such as the shortage of laboratory assistants as managers of laboratory facilities and infrastructure, as well as the limited availability of supporting tools and materials, causing students to encounter difficulties in conducting experiments in the science laboratory. Based on these results, improvements in laboratory management and the provision of practical tools and materials are necessary to maximize the experimental process more effectively.

Keywords: Effectiveness, Science Laboratory, Basic Science Concepts

1. Intriduction

The education issue is considered fundamental in human life; therefore, enhancing the quality of education is crucial. Improving the quality of education is a form of enhancing the human resources' quality to achieve the nation of Indonesia's national goals. One of the supports for the quality of education is the learning process carried out by teachers and students in schools. Every student hopes to achieve good learning outcomes from their efforts.

In the elementary science basic concepts course, lecturers teach students not only about the process of transferring materials but also present several course materials using laboratory practical methods. The learning process with this method is considered very effective, as students can understand the concepts by directly engaging in the observation and experimentation process.

The presence of laboratories significantly supports students in achieving learning outcomes. However, laboratories must also meet good minimum infrastructure standards. From interviews with the Head of the Science Laboratory at Muhammadiyah University Enrekang, it is stated that the facilities and infrastructure in the UNIMEN Science Lab are complete and meet the minimum standards outlined in Minister of National Education Regulation No. 24 of 2007. However, in practice, the use of laboratories in science education faces several challenges.

The laboratory is a facility that supports the smoothness of the learning process. Through the laboratory, students can develop technological skills using the equipment available inside. With the presence of the laboratory, students can more easily find the learning resources they need. The presence of laboratories in schools not only supports the learning process but also helps achieve various educational goals, including those related to cognitive, affective, and psychomotor aspects [1]. Through laboratory practical activities, students can improve their learning process skills, problem-solving skills, as well as their interest and attitude towards learning.

The laboratory is an essential requirement in learning as it provides direct experience to students, which is crucial in supporting the learning process. Laboratory activities are not only aimed at reinforcing theory but also provide opportunities for students to discover knowledge independently [2]. Through laboratory activities, students can more easily understand the material and build knowledge through direct experience or their own experiments. The level of student engagement in practical activities is directly related to the level of understanding and process skills achieved by students [3]. This indicates that laboratory activities enable students to build their own knowledge of facts, concepts, and theories in science subjects and enhance their experiences so they can be retained in their memory for longer periods.

Based on the initial observations of PGSD UNIMEN students in the Elementary Science Basic Concepts course using the Science Laboratory, the laboratory has been utilized for learning and practical activities, and overall, the available equipment and materials are sufficient and adequate. However, there are several challenges in the use of the Science Laboratory, such as the limited number of personnel (laboratory assistants) who can operate the laboratory equipment and the lack of recruitment of personnel from students to participate in the practical process [6]. Suboptimal laboratory management poses a barrier for students to conduct practical activities. The shortage of staff in managing the laboratory can disrupt equipment operation and material usage, as well as the maintenance of existing equipment and materials [7]. Therefore, the presence of laboratory assistants and helpers in the laboratory is crucial for preparing practical tools and materials, conducting practical activities, maintaining laboratory cleanliness, caring for equipment and materials, and recording the inventory of existing equipment and materials. These challenges hinder and reduce the effectiveness of practical activities [8].

Based on the background provided above, the purpose of this study is to assess the effectiveness of using the Science Laboratory in teaching Elementary Science Basic Concepts, and to describe the factors that influence the effectiveness of laboratory usage.

2. Methodology

The type of research used is ex post facto research with a quantitative descriptive approach. The Research Design consists of three stages: (1) Preparation Stage, which includes the preparation of research instruments, obtaining research permits, and observations in the Elementary School Teacher Education Program (PGSD) at UNIMEN, (2) Implementation Stage, which includes preliminary testing, interviews, experiment presentations, data collection, and final testing, and (3) Final Stage, which involves information analysis and compilation of collected data. The research sample consists of the Head of the UNIMEN

Laboratory and 50 First Semester PGSD Students at the Faculty of Teacher Training and Education (FKIP) UNIMEN.

The data analysis process consists of data reduction, data presentation, and drawing conclusions. The questionnaire used to obtain the data has been validated by experts and deemed valid, thus it can be used as an instrument to collect research data. The obtained data is then analysed using a Likert scale with scores ranging from 1 to 4, where: a score of 4 if the respondent answers always, a score of 3 if the respondent answers often, a score of 2 if the respondent answers sometimes, and a score of 1 if the respondent answers never. The criteria for laboratory usage can be seen in the following Table 1.

Table 1. Criteria for the Effectiveness of Laboratory Usage

Percentage	Description
86% - 100%	Very Good
76% - 85%	Good
60% - 75%	Fair
55% – 59%	Poor
54%	Very Poor

3. Result and Discussion

Based on the research conducted in the Elementary School Teacher Education Program (PGSD), this chapter will delve further into the effectiveness of using the Science Laboratory in Biology learning. The data obtained are from observations, interviews, and the use of questionnaires by researchers in the field. The data includes the condition of the Science Laboratory, evaluation of student performance, and assessment of the performance of the head of the Science Laboratory at UNIMEN.

3.1. Result

Based on the results of interviews and direct observations with the head of the UNIMEN Science Laboratory, the laboratory space is well-organized, where microscopes are stored and managed properly in cabinets. The UNIMEN Science Laboratory space has been used for teaching and practical activities in the Elementary School Science Basic Concepts course. However, the utilization of the Science Laboratory in the learning process is still not very effective due to a lack of technicians/laborers who can assist lecturers in preparing equipment and materials during laboratory practical's. Therefore, lecturers have to prepare the equipment and materials for practical's themselves. In accordance with the Guidelines for the Use of Science Laboratory and Educational Equipment, issued by the Ministry of National Education (1995), the effectiveness of laboratory utilization requires the presence of management technicians responsible for planning, organizing, implementing, and evaluating, as well as meeting various layout, facility completeness, and administrative requirements.

Overall, the equipment and materials owned by the UNIMEN Science Laboratory are considered sufficient; they have been well maintained and stored by the laboratory head. The

management of the Science Laboratory facilities, including laboratory space and equipment/material storage, has been well-organized.

Regarding the management of the UNIMEN Science Laboratory storage room, it is evident that the space has been utilized well to store laboratory equipment and materials. However, due to the absence of laborers in the UNIMEN Science Laboratory, the storage space is not well-organized, resulting in equipment and material storage that does not align with their classifications.

Based on interviews with the head of the UNIMEN Science Laboratory regarding the equipment and materials for laboratory practical, it was found that the available tools meet the minimum standards set by the Minister of National Education Regulation No. 4 of 2007. The availability of equipment and materials can support student practical activities.

Assessment of student performance was conducted on 50 first-semester PGSD students, consisting of two classes, Class A and Class B. The percentage of data from the completed student performance questionnaire for the average of each statement can be seen in Figure 2.

The percentage of data from the students' performance questionnaire responses for the average of each statement item can be seen in Figure 2 diagram below.

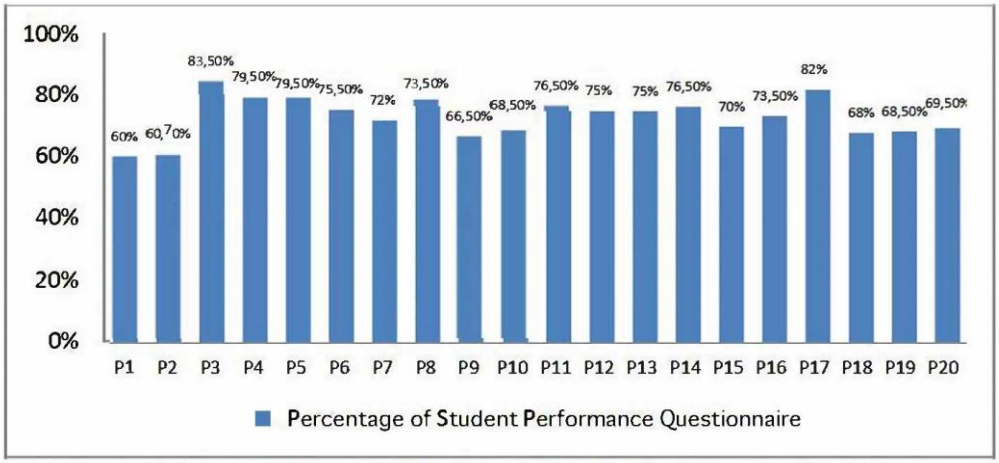

Figure 2. Diagram of Student Performance Questionnaire Assessment Results

Based on the data in Figure 2 above, the averages for each statement item on the questionnaire consisting of 20 statements are as follows: the average for statement item 1 is 60% with a category of fairly good, the average for statement item 2 is 60.70% with a category of fairly good, the average for statement item 3 is 83.50% with a good category, the average for statement item 4 is 79.50%, the average for statement item 5 is 79.50% with a good category, the average for statement item 6 is 75.50% with a good category, the average for statement item 7 is 72% with a category of fairly good, the average for statement item 8 is 73.50% with a good category, the average for statement item 9 is 66.50% with a category of fairly good, and the average for statement item 10 is 68.50% with a category of fairly good.

Furthermore, the averages for statement items 11 is 76.50% with a good category, the average for statement item 12 is 75% with a fairly good category, the average for statement item 13 is 75% with a fairly good category, the average for statement item 14 is 76.50% with a good category, the average for statement item 15 is 70% with a fairly good category, the average

for statement item 16 is 73.50% with a fairly good category, the average for statement item 17 is 82% with a good category, the average for statement item 18 is 68% with a fairly good category, the average for statement item 19 is 68.50% with a fairly good category, and the average for statement item 20 is 69% with a fairly good category.

Then, the assessment of the performance of the Head of the UNIMEN IPA Laboratory was conducted by providing a questionnaire consisting of 15 statement items. The results of the questionnaire regarding the performance of the Head of the UNIMEN IPA Laboratory can be seen in Figure 3 below.

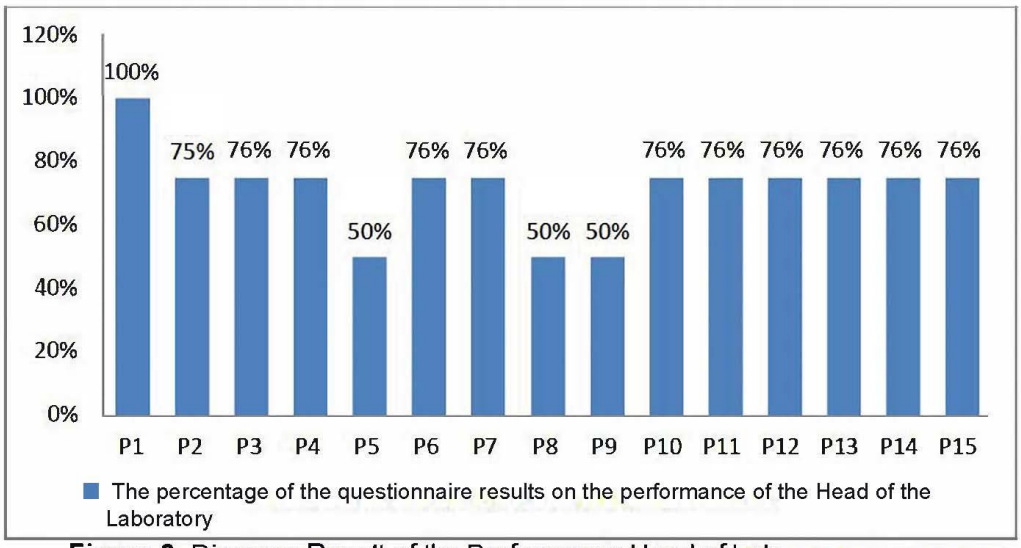

Figure 3. Diagram Result of the Performance Head of Lab

Based on the above diagram, it shows that the percentage for each statement consists of 15 statements. After the calculation, the average percentage of the performance of the Head of the Laboratory IPA UNIMEN is obtained at 72.59%, categorized as fairly good.

3.2.Discussion

Facilities and infrastructure in an educational institution, including laboratories, are crucial factors in supporting teaching and learning activities, especially in the Basic Concepts of Elementary Science subject. Establishing standards for facilities and infrastructure is essential for every school. According to the interview results with the lecturer of the Basic Concepts of Elementary Science course, the UNIMEN Science Laboratory does not have a lab assistant, but the equipment and materials owned meet the standards. Nevertheless, some equipment is not well-maintained, such as microscopes that have become moldy and cables that are damaged, due to the absence of lab assistants who can maintain laboratory equipment.

According to the lecturer of the Basic Concepts of Elementary Science course, the primary factor contributing to the ineffectiveness of using the IPA laboratory at the school is the absence of lab assistants to manage the laboratory facilities and infrastructure, which makes it difficult for teachers to conduct practical activities. This finding is consistent with the research conducted by [4], which stated that one of the factors that can lead to the ineffectiveness of

using the IPA laboratory in teaching is the absence of lab assistants to manage, direct, and assist in the implementation of laboratory practices.

The challenges result in instructors seldom conducting laboratory sessions, as they tend to concentrate on delivering lessons within the classroom setting only. However, laboratory activities are considered crucial as they provide students with the opportunity to apply the theories they have learned [5]. According to interview findings, when instructors conduct laboratory sessions, they require more time because they have to prepare the practical activities themselves in the laboratory. This leads to suboptimal lesson delivery. Furthermore, in the UNIMEN IPA laboratory, the head of the laboratory is also an instructor, causing conflicts between their duties as the head of the laboratory and their teaching responsibilities. This situation leads to suboptimal management of the laboratory.

Assessment of the performance of Semester 1 PGSD UNIMEN students is conducted through the completion of a questionnaire consisting of 20 statements, which is filled out by 50 students divided into two classes, namely Class A and Class B. The aspects assessed generally include students' abilities to prepare laboratory equipment and materials, responsibility after using the equipment and materials, implementation of laboratory activities, ability to communicate about the results of the activities, maintenance of laboratory order, and safety in the laboratory.

To draw conclusions regarding the effectiveness level of using IPA laboratories in teaching Basic Concepts of Science in Elementary School (IPA SD), an average calculation for each statement is performed. The calculation results indicate that the average for all statements reaches a percentage of 75%, which falls into the category of fairly good. This provides an overview that the utilization of IPA laboratories in teaching is considered fairly good with a percentage of 75%.

The primary factor contributing to the ineffectiveness of using the IPA laboratory at UNIMEN is the absence of laboratory assistants to manage the facilities, making it difficult for teachers to conduct practical sessions. This finding aligns with the research conducted by [4], which indicates that the absence of laboratory assistants as managers, directors, and assistants in conducting laboratory practices is one of the factors that can lead to the ineffective use of IPA laboratories in teaching.

Furthermore, the success of laboratory practical activities needs to be supported by the role of teachers in overseeing the entire student interaction process. Student interaction encompasses all steps undertaken by students during the practical session, from preparing equipment and materials to the stage of data retrieval and conclusion drawing. Teachers should systematically explain the procedural activities that students must undertake during the practical session.

By utilizing the laboratory properly, students can learn the subject matter directly, either through observation or by conducting experiments. This enables students to remember the study material more easily and can enhance their overall learning outcomes. Practical work is one of the laboratory activities that plays a crucial role in supporting the success of the teaching and learning process, especially in the Basic Concepts of Elementary Science subject.

4. Conclusion

Based on the research findings and in accordance with the problem formulation, the conclusions drawn are as follows: (1) The level of effectiveness of using IPA laboratories in teaching Basic Concepts of Elementary Science shows that the average of all statements reached a percentage of 75% with a fairly good category. This can be evaluated that the use of IPA laboratories in teaching has reached a fairly good level, with a percentage of 75%. (2) The sufficient percentage is influenced by several factors, such as the results of interviews with Basic Concepts of Elementary Science lecturers. The main factor that causes the less optimal use of UNIMEN's IPA laboratory is the absence of laboratory technicians as managers of laboratory facilities and infrastructure. This condition makes lecturers have difficulty in conducting practical activities.

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