



Evaluation of the Use of Equipment and Chemical Materials in the Department of Biology, Universitas Negeri Surabaya

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Abstract. Lectures, laboratory activities, and/or field practicums are essential activities in the learning process. Most courses in the Department of Biology require equipment and chemicals for their practicum activities. This research aims to identify the needs and evaluate the equipment and chemicals in the Department of Biology, Universitas Negeri Surabaya. Data were collected using instruments such as equipment and chemical borrowing forms for practicums and research, interviews, and user response questionnaires regarding the use of equipment and chemicals in the laboratory. Quantitative data analysis was conducted using the average percentage technique for each variable, while qualitative data were obtained through a document study approach. The results of this study indicate that most users are satisfied with the use of equipment and chemicals in the Biology laboratory. Additionally, the equipment and chemicals in the Biology laboratory are available and sufficient.

Keywords: Laboratory; Chemical Equipment and Materials; Evaluation

1 Introduction

Lectures, laboratory activities, and/or field practicums are essential activities in the learning process. In the Biology Education Undergraduate Program and the Biology Undergraduate Program, there are laboratories that support various courses, including the Taxonomy Laboratory, Ecology Laboratory, Physiology Laboratory, Developmental Structure Laboratory, Basic Biology Laboratory, Biotechnology Laboratory, Tissue Culture Laboratory, Microbiology Laboratory, Genetics Laboratory, Animal Testing Laboratory, Molecular Biology Laboratory, and Greenhouse.

Courses within the Biology Department are predominantly practical-based, with these practical sessions playing a crucial role in supporting the lectures. These courses include General Biology, Biochemistry, Cell and Molecular Biology, Biotechnology, Animal Physiology, Plant Physiology, Microbiology, Genetics and Genomics, Plant Systematics, Animal Systematics, Plant Developmental Structure, Animal Developmental Structure, Laboratory Techniques, Molecular Biology Analysis Techniques,

Microtechnique Practicum, and other courses. In laboratory activities, students are not only proficient in theory but also skilled in practice. They can also develop their potential by conducting practicums, project assignments, or research activities. Practicums can significantly influence students' success in learning. Other research indicates that students develop a scientific awareness involving scientific attitudes, processes, and products through practicum activities.

Each year, there is an increase in the number of new students in the Biology Department. The growth in student numbers results in a higher demand for laboratory equipment and materials. Moreover, laboratory services must be enhanced in response to the increasing student population. According to the researchers' data, the number of active students in the Biology undergraduate program during the Even Semester of 2022/2023 was 321, which increased significantly to 535 active students in the Odd Semester of 2023/2024. In the Biology Education undergraduate program, there were 453 active students in the Even Semester of 2022/2023 and 639 active students in the Odd Semester of 2023/2024. Therefore, the use of laboratory equipment and materials must be continuously monitored and evaluated. This effort aims to ensure the effective and efficient use of equipment and materials, leading to improved laboratory services. For instance, the use of preservative solutions such as 70% alcohol and 4% formalin for preserving animal and plant specimens.

This research addresses the following problem statements: (1) How is the evaluation of laboratory equipment usage in the Biology Department, Universitas Negeri Surabaya, (2) How is the evaluation of laboratory material usage in the Biology Department, Universitas Negeri Surabaya, (3) How is the user satisfaction with the laboratory's performance?

The objectives of this research are to evaluate the use of laboratory equipment and materials in the Biology Department and to assess the laboratory services in the Biology Department.

2 Method

This type of research is qualitative (document study). Data were collected using instruments such as borrowing forms for practicum and research equipment and materials, procurement forms for equipment and chemicals, and documentation. Quantitative data analysis was conducted using the average percentage technique for each variable, while qualitative data were obtained through a phenomenological approach. The research was conducted at the laboratories in the Biology Department.

3 Result and Discussion

Data collection was conducted in two stages:

Stage 1: A survey was administered via Google Forms. Respondents, consisting of active students in the Biology Education and Biology undergraduate programs, were asked to complete a questionnaire. This survey focused on their responses regarding

the availability and use of laboratory equipment and chemicals, as well as user satisfaction with laboratory management.

Stage 2: Interviews were conducted as a follow-up with active students from the same programs to gain deeper insights. These interviews aimed to gather detailed feedback on their experiences and satisfaction with laboratory facilities and services.

The research results are presented in the following figures

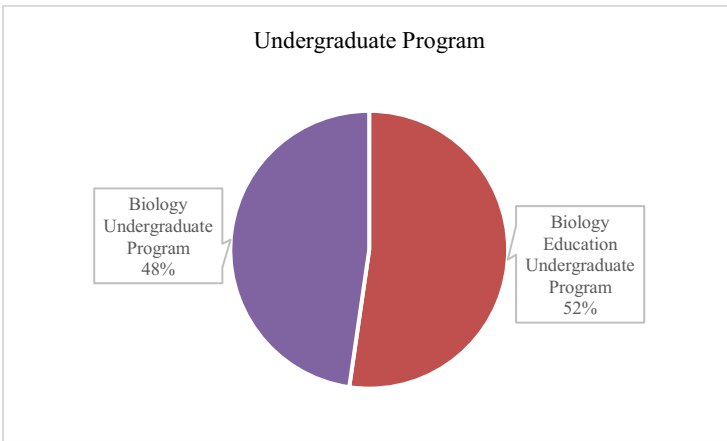


Fig.1. Percentage of Respondents.

The respondents are active students from 2 programs: the Biology Education undergraduate program (S1 Pendidikan Biologi) and the Biology undergraduate program (S1 Biologi). There were a total of 111 respondents, with 52.3% from the Biology Education program and 47.7% from the Biology program.

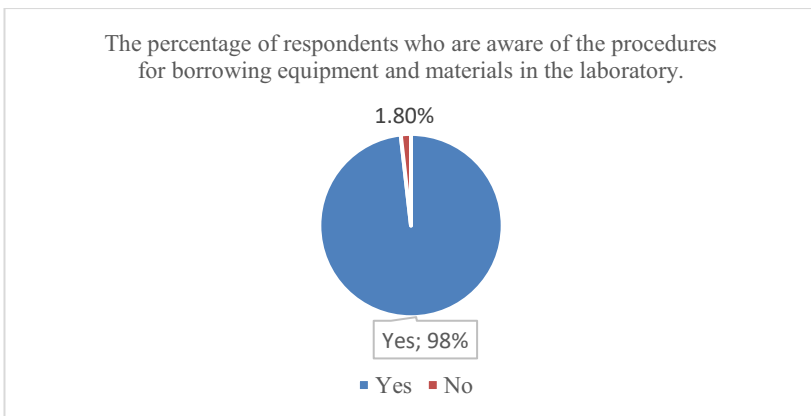


Fig.2. Percentage of respondents familiar with the procedure for borrowing equipment and materials in the laboratory.

The knowledge of students regarding the procedure for borrowing equipment and materials in the biology laboratory is presented in Figure 2. A total of 98.2% of students are familiar with the procedure for borrowing equipment and materials in the biology laboratory, while 1.8% of students are not familiar with it. When students first enroll, they are informed about the Standard Operating Procedures (SOP) of the laboratory, including SOPs for borrowing equipment and materials, laboratory access outside regular hours, and laboratory safety (K3 SOP). This explanation of the laboratory SOPs is provided at the beginning of each semester to ensure that students understand the procedures and to optimize the efficiency of equipment and material use in the laboratory. Additionally, 100% of students are knowledgeable about the use of equipment in the laboratory, as well as the storage and maintenance procedures for equipment and materials according to the SOPs.

The frequency of students using equipment and materials in practical/research activities is presented in Figure 3. A total of 84.7% of respondents answered "often," 14.4% answered "rarely," and 0.9% answered "never" use equipment and materials in practical/research activities.

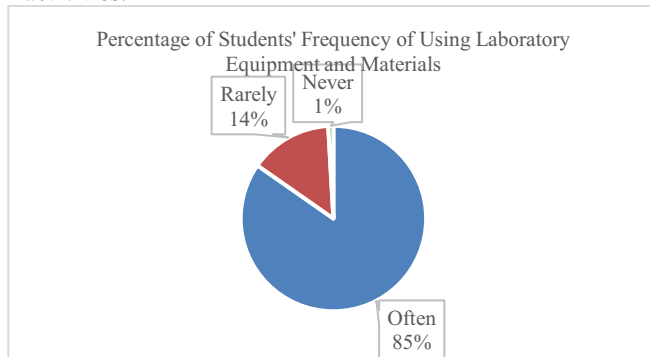


Fig.3. Percentage of Students' Frequency of Using Laboratory Equipment and Materials

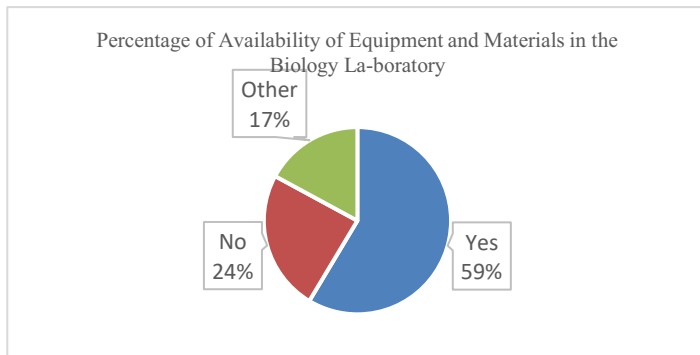


Fig.4. Percentage of Availability of Equipment and Materials in the Biology Laboratory

From figure 4, 58.6% responded that the equipment and materials are available,

while 24.3% indicated they are not fully available. Additionally, 17.1% of respondents mentioned that some equipment and materials in the laboratory are inadequately available. Specifically, respondents cited shortages of microscopes and certain materials in one of the laboratories, such as Nutrient Agar and Nutrient Broth. The availability of Nutrient Agar and Nutrient Broth is crucial as growth media for bacterial cultures. Contamination issues often occur with growth media, necessitating repeat experiments in media preparation practicums. The use of preservative solutions like 70% alcohol and 4% formalin in the Taxonomy and Developmental Structure Laboratories requires large quantities.

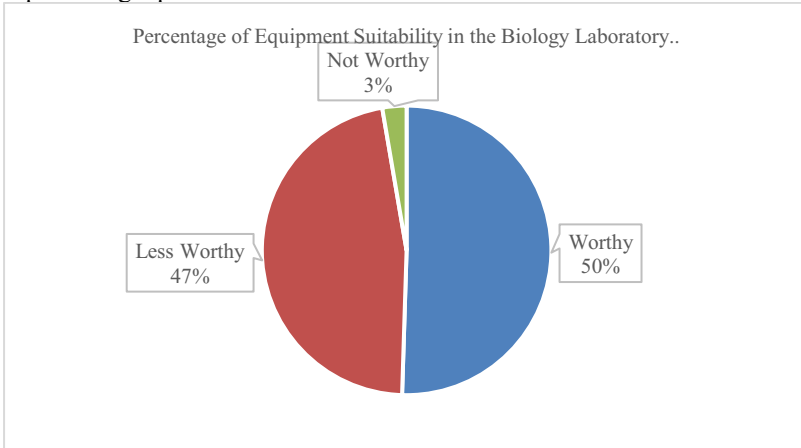


Fig.5. Percentage of Equipment Suitability in the Biology Laboratory..

50.5% of respondents rated the equipment as worthy, 46.8% rated it as less worthy, and 2.7% rated it as not worthy. The conditions of Less worthy and not worthy are largely due to the mismatch between the number of equipment and the number of users..

Students' satisfaction with laboratory services: 76.6% of students are satisfied with the laboratory services, while 23.4% are dissatisfied. Regarding the facilities and infrastructure of the laboratory, 54.1% of respondents are satisfied, 45% are dissatisfied, and 0.9% are very dissatisfied. The limitations of laboratory equipment and materials contribute to the reasons why respondents are dissatisfied or very dissatisfied.

The most commonly used laboratory equipment is microscopes (89.1%), while 10.9% use other equipment such as pH meters, spectrophotometers, rotary evaporators, balances, autoclaves, incubators, microtomes, and others. These equipment are often used simultaneously in the laboratory.

Most students stated that the laboratory equipment and materials are available and sufficient for both practicals and research activities. The equipment and materials available are in good condition and in adequate quantities. Students are satisfied with the availability of chemicals in the laboratory.

The sufficient availability of laboratory equipment indicates effective inventory management. However, equipment maintenance must be continuously improved to ensure the equipment is always in optimal condition. Providing specialized equipment

for certain practicums demonstrates the department's commitment to supporting specific teaching and learning activities aligned with curriculum needs.

Good chemical stock management ensures no obstacles in conducting practicums. Adequate availability of chemicals supports the smooth execution of practical and research activities. It is important to continuously monitor the specific chemical needs for certain practicums to prevent shortages that could disrupt the learning process.

Most students are satisfied with the laboratory's performance, especially in terms of service and the availability of equipment and materials. Students also provide positive feedback on the cleanliness and safety of the laboratory. Some users suggested improvements in equipment maintenance and chemical stock management to avoid shortages during practicums.

High student satisfaction levels indicate that the laboratory provides good service. This includes the availability of equipment and materials, as well as maintaining a clean and safe environment. Student feedback on equipment maintenance and chemical stock management is important to consider for continuously improving the quality of laboratory services.

4 Conclusion

Overall, the results of this study indicate that the laboratories in the Biology Department adequately meet the students' practical needs. However, continuous improvements in equipment maintenance and chemical management are necessary to ensure optimal service quality.

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References

- [1] Ambarwati, Shinta dan Prodjosantoso, A.K. 2018. Analisis Kelengkapan Alat dan Bahan laboratorium, dan Keterlaksanaan Praktikum Kimia di SMA Negeri 2 Yogyakarta. *Jurnal Pembelajaran Kimia*. Vol 7 (1): 9 – 18.
- [2] Asri, Mahanani Tri dan Kuswanti, Nur. 2026. Pengembangan Buku Panduan Laboratorium Di Jurusan Biologi FMIPA. Laporan Akhir Penelitian Kebijakan FMIPA. Universitas Negeri Surabaya. 77 hal.
- [3] Sugimin., Oxi, RY., Trisiswanti., Rzqita, EA., Arista. AM. 2022. The Effectiveness of Various Concentrations of Alcohol as Preservative of Bamboo Shells (*Ensis leei*) and Blood Clams (*Anadara granosa*). Proceedings of the International Joint Conference on Arts and Humanities 2022. Vol 724 : 1152 – 1159.
- [4] Sugimin., Oxi, RY., Trisiswanti., Rzqita, EA., Arista. AM. 2023. *Efektivitas Penggunaan Formalin 4% dan Alkohol 70% sebagai Larutan Pengawet pada Herbarium Basah (Buah-buahan)*. Laporan Akhir Penelitian Tenaga Kependidikan Unesa. FMIPA Universitas Negeri Surabaya. 28 hal.

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