CHEMISTRY EDUCATION PRACTICE

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ANALISIS EFEKTIVITAS PEMANFAATAN LABORATORIUM KIMIA DI SEKOLAH MENENGAH ATAS NEGERI DI KABUPATEN LOMBOK TIMUR

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Received: 5 Januari 2025 **Accepted: 30 Mei 2025** **Published: 31 Mei 2025**

doi: 10.29303/cep.v8i1.6422

Abstrak

Penelitian ini bertujuan untuk mengetahui efektivitas pemanfaatan fungsi dan alat laboratorium kimia di Sekolah Menengah Atas Negeri se-Kabupaten Lombok Timur. Pendekatan dalam penelitian ini menggunakan pendekatan kuantitatif deskriptif. Populasi penelitian ini adalah seluruh SMA se-Kabupaten Lombok Timur, kemudian sampel penelitian ini sebanyak enam sekolah yaitu SMAN 2 Selong, SMAN 3 Selong, SMAN 1 Terara, SMAN 1 Pringgabaya, SMAN 1 Sembalun dan SMAN 1 Labuhan Haji yang diambil secara *purposive sampling*. Pengumpulan data menggunakan angket dan wawancara, angket yang digunakan adalah tertutup dengan skala likert. Untuk penafsiran data masalah menggunakan kriteria sebanyak 5 kategori (tidak efektif, kurang efektif, cukup efektif, efektif, sangat efektif) yang ditentukan dengan presentase sederhana dan tabel. Berdasarkan analisis data diketahui bahwa; 1) efektivitas pemanfaatan fungsi laboratorium kimia di Sekolah Menengah Atas Negeri se-Kabupaten Lombok Timur sudah efektif (74,82%). 2) Efektivitas pemanfaatan peralatan laboratorium kimia di Sekolah Menengah Atas Negeri se-Kabupaten Lombok Timur sudah efektif (80,33%).

Kata Kunci: Efektifitas, Pemanfaatan, Laboratorium Kimia, Sekolah Menengah Atas, Kabupaten Lombok Timur

Analysis of The Effectiveness of the Use of Chemical Laboratories in State High Schools in East Lombok Regency

Abstract

This study aims to determine the effectiveness of using chemical laboratory functions and tools in Public Senior High Schools throughout East Lombok Regency. The approach in this study uses a descriptive quantitative approach. The population of this study consisted of all high schools in East Lombok Regency. The sample for this study comprised six schools: SMAN 2 Selong, SMAN 3 Selong, SMAN 1 Terara, SMAN 1 Pringgabaya, SMAN 1 Sembalun, and SMAN 1 Labuhan Haji, which were selected using purposive sampling. Data collection used questionnaires and interviews; the questionnaire used was closed with a Likert scale. For the interpretation of problem data using the criteria of 5 categories (not effective, less effective, moderately effective, effective, very effective) which are determined by simple percentages and tables. Based on data analysis it is known that; 1) the effectiveness of the use of chemical laboratory functions in State Senior High Schools throughout East Lombok Regency has been effective (74.82%). 2) The effectiveness of the use of chemical laboratory equipment in State Senior High Schools throughout the East Lombok Regency has been effective (80.33%).

***Keywords**: Effectiveness, Utilization, Chemical Laboratory, Senior High School, East Lombok Regency*

PENDAHULUAN

Chemistry learning focuses on theory and practical activities. Therefore, activities in the laboratory are very important to do. The importance of activities in the laboratory in chemistry lessons so that the laboratory must be utilized to the fullest (Candra, 2020). The maximum utilization of chemical laboratories can effectively support student practicum activities, enabling students to gain an optimal understanding of both theory and practice (Saputra, 2021). The maximum utilization of the laboratory can enhance student understanding, develop students' skills, and cultivate a scientific mindset in them. Additionally, students can experience the process firsthand in the experiment, which allows them to test existing theories or concepts. Through practicum activities, students can also conclude from the experiments that have been carried out. Therefore, learning activities require synchronization between theoretical and practical components (Maâ€™arij, 2017).

The presence of tools in the laboratory is also crucial in supporting student learning activities. The maximum use of tools in the chemistry laboratory can effectively support students' practicum activities. The use of tools in the chemistry laboratory encompasses several aspects, including students' understanding of using practical tools, the rationale behind the availability of these tools in relation to the number of students, as well as the correct implementation of procedures related to their use.

Practicum implementation in high school does not always run optimally. This happens because many factors can hinder the implementation of practicums, including the use of laboratories that are not used for practicums, because the class capacity cannot meet the capacity of students. Participating in laboratories as classes is an alternative chosen by schools.

Recognizing some of the inhibiting factors and the importance of implementing practicum in the laboratory, it is necessary to research to assess the effectiveness of using chemical laboratories. Then, is there a solution to the existing inhibiting factors, such as preparing a schedule for practicum implementation.

The purpose of this research is (1) to determine the effectiveness of the utilization of chemistry laboratory functions in public high schools in East Lombok regency, (2) to determine the effectiveness of the use of chemistry laboratory equipment in public high schools throughout East Lombok regency. This research was conducted by distributing questionnaires and conducting interviews. It is hoped that this research will yield data on the effectiveness of using chemistry laboratories in high schools throughout the East Lombok regency.

RESEARCH METHODOLOGY

This research is a descriptive quantitative study, specifically a type of research that combines two approaches: quantitative and qualitative. According to Sugiyono (2015), the quantitative approach is a research method based on the philosophy of positivism, which examines a particular population or sample. It involves random sampling, data collection using instruments, and statistical data analysis.

The population in this study is the entire Senior High School in East Lombok Regency. The sample in this study was collected using the Purposive Sampling method, where the sampling criteria were based on the researcher's criteria, specifically the geographical location of the school, which was divided into five regions: northern, southern, eastern, western, and central East Lombok. Six schools served as the research samples, namely SMAN 2 Selong, SMAN 3 Selong, SMAN 1 Terara, SMAN 1 Pringgabaya, SMAN 1 Sembalun, and SMAN 1 Labuhan Haji.

The data for this research were collected through questionnaires and interviews. The questionnaire used is a closed questionnaire with a Likert scale. The data obtained in this study were then analyzed using the formula as follows (Anas Sudijono, 2006).

$$P = \frac{F}{N} \times 100\% \ldots\ldots (1)$$

Arrogance:
P: Percentage
F: The number of subjects in a certain category
N: Frequency total or overall number of subjects

The samples were then classified into five categories, as shown in Table 1, as follows.

Table 1. Categories of Effectiveness of Chemical Laboratory Utilization in State Senior High Schools in East Lombok Regency

No.	Intervals	Category
1	86% - 100%	Very effective
2	71% - 85%	Effective
3	56% - 70%	Effective enough
4	41% - 55%	Less effective
5	25% - 40%	Ineffective

(Source: Arikunto, 2015)

RESULTS AND DISCUSSION

Based on a questionnaire completed by 108 students and six chemistry teachers from six different schools in the East Lombok regency, which formed the study sample, we obtained the data on the effectiveness of using chemistry laboratories in senior high schools in the East Lombok regency, as shown in Table 2, as follows.

Table 2. Results of the Analysis of the Effectiveness of Chemical Laboratory Utilization in State Senior High Schools in East Lombok Regency

School	Responden		Total score	Max score	%	Category
	Detail	Amount				
SMAN 2 Selong	Teacher	1	85	100	85,00	Effective
	Student	18	1502	1800	83,44	Effective
SMAN 3 Selong	Teacher	1	89	100	89,00	Very effective
	Student	18	1373	1800	76,28	Effective
SMAN 1 Terara	Teacher	1	80	100	80,00	Effective
	Student	18	1425	1800	79,17	Effective
SMAN 1 Pringgabaya	Teacher	1	93	100	93,00	Very effective
	Student	18	1418	1800	78,78	Effective
SMAN 1 Sembalun	Teacher	1	75	100	75,00	Effective
	Student	18	1421	1800	78,94	Effective
SMAN 1 Labuhan Haji	Teacher	1	92	100	92,00	Very effective
	Student	18	1129	1800	62,72	Less effective
TOTAL		**114**	**8782**	**11400**	**77,04**	**Effective**

The use of chemical laboratories in high schools throughout East Lombok Regency is viewed from two aspects: the utilization of chemical laboratory functions and the use of chemical laboratory equipment. The explanation of these aspects is as follows.

Utilization of Chemical Laboratory Functions

This aspect assesses the extent to which the function of the chemical laboratory in State Senior High Schools throughout East Lombok Regency has been practical or not. This research evaluates the effectiveness of chemical laboratory functions using three indicators. The indicators in question include strengthening students' understanding through applying theory to practicum, cultivating students' scientific attitudes, and training students' skills. Data from research on the effectiveness of using chemical laboratory functions are presented in Figure 1.

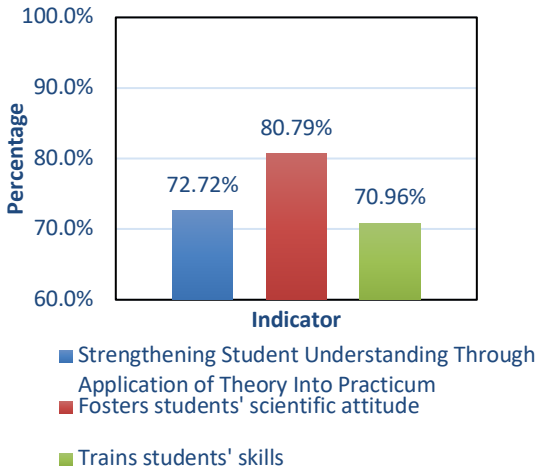

Figure 1. The effectiveness of the utilization of chemical laboratory in East Lombok public high schools

Indicator 1: Strengthening Student Understanding Through Application of Theory into Practicum

Achievement indicators increase student understanding in the effective category with a percentage of 72.72%. The teacher always explains the objectives of the practicum, provides practicum modules, and then divides the practicum groups for each practicum activity carried out. Students understand the material better after completing a chemistry practicum. This is evident from the students' practicum reports, where they can present the results and conclusions of the practicum. Carrying out practicums can be used to increase students' understanding and correct misconceptions about the chemical theories being studied. Effective categories for increasing student understanding can be obtained because all these aspects are carried out well. This aligns with Yaman's (2016) opinion that the laboratory serves as a practical learning resource for students to achieve the expected competencies.

Indicator 2: fosters students' scientific attitude

A scientific attitude can be enhanced by designing a learning process that enables students to explore and develop their scientific mindset (Astuti et al., 2012). The percentage of indicators for cultivating students' scientific attitudes is 80.79%, which falls into the effective category. Based on the research results, students are happier and more enthusiastic when participating in practicum activities compared to traditional classroom learning activities. Chemistry teachers and laboratory assistants also supervise students when they are carrying out practicums. This causes students to be more careful and careful in carrying out the practicum. Additionally, it is easier for teachers to assess student reports that align with the results of the practicum. The limited time available causes students to be unable to repeat the practicum at another meeting if they fail to complete it. This can only be done simultaneously if the learning hour has not been completed. Given the numerous aspects that have been going well, the assessment of the effectiveness of using chemical laboratory functions in cultivating students' scientific attitudes is classified as effective.

Indicator 3: trains students' skills

Based on Figure 1, the category of indicators for training students' skills is classified as effective; however, the percentage of this indicator is the lowest, at 70.96%. Some of the aspects evident in the indicators of training students' skills include students being able to carry out observations and record the symptoms that arise during the practicum, as documented through student work sheets and reports. Students are also able to use practicum tools because they have been explained previously. Some aspects that students still lack include planning practicums independently, and not all students are able to present the results of their practicums. Due to these aspects, the indicator for training students' skills is classified as an effective category; however, the percentage is still lower than that of the other indicators. This is following the opinion of Zainuddin (in Susanti, 2013), Through practicum activities, many things can be obtained by students, including practicum activities that can train students' skills

The Effectiveness of Equipment Utilization in the Chemical Laboratory

Assessment of the effectiveness of the use of chemical laboratory equipment is a measurement of the extent to which the effectiveness of the use of chemical laboratory equipment. The effectiveness of using laboratory equipment is evident from two indicators: the rational use of the equipment and the implementation of procedures for its proper use in the chemical laboratory. Data on indicators of the effectiveness of using chemical laboratory equipment in state high schools throughout East Lombok Regency are presented in Figure 2 as follows.

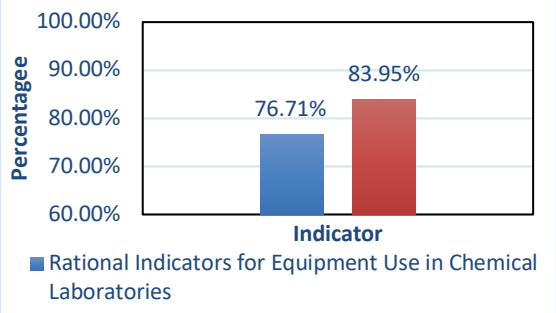

Figure 2. The effectiveness of using chemical laboratory equipment in public high schools in East Lombok Regency

Indicator 1: Rational Indicators for Equipment Use in Chemical Laboratories

The rational percentage for the use of chemical laboratory equipment in public senior high schools in East Lombok Regency is 76.71%, which is classified as effective. Based on the results of interviews with laboratory assistants

and chemistry teachers from all six participating schools in the study, the tools available in the school chemistry laboratories were deemed suitable for use in the practicum. Some practicums do not always require laboratory materials; instead, they can be conducted using simple materials that students bring. However, the equipment available in the laboratory cannot accommodate all students, so the practicum is conducted in groups. This means not all students get the opportunity to use practicum tools.

Indicator 2: Tool Use Procedure Implementation

The percentage of indicators for implementing procedures for using tools in chemical laboratories in public high schools in East Lombok Regency falls within the effective category, at 83.95%. Based on the results of interviews with laboratory assistants and chemistry teachers, the introduction of laboratory equipment was carried out in class 10. This activity was specifically designed to introduce students to laboratory equipment. The laboratory assistant prepares the practicum tools, and then students use them during the practicum. After practicum, students clean the practicum tools used and then return them. In carrying out practicum, students are always given modules and student worksheets made by the chemistry teacher at the school concerned. The module provided is complete, including objectives, tools, materials, and practical work instructions. Receive guidance and supervision from the teacher and laboratory assistant during the practical implementation, as not all students can immediately understand the workings of the module or student worksheets. According to Mulyasa (2009), educational facilities and infrastructure can make an optimal contribution to the educational process, provide adequate learning facilities quantitatively, qualitatively, and are relevant to needs, and can be used optimally for the benefit of the education and teaching process, both by teachers as instructors and students as students.

These results suggest that utilizing the chemical laboratory is essential to enhance the chemistry learning process. Most of the chemistry laboratory equipment is not adequately available in all the schools, the equipment is limited in quantity, which makes it very difficult for teachers and students to use them effectively. This resulted in the practical lessons consuming a significant amount of time and made Science laboratory activities boring due to the inadequacy of instructional resources, which is one of the significant constraints hindering the conduct of practical work (Mohammed, 2021). Additionally, laboratory resources, including apparatus, supplies, and facilities, have several significant implications for science teachers, especially those in secondary schools (Cabusor and Antonio, 2025). Jofrishal and Munandar (2021) emphasize the vital role of laboratory settings in supporting effective teaching and learning. With adequate laboratory resources, science teachers are able to apply various instructional strategies, including inquiry-based learning and practical experiments, which in turn enhance students' engagement and comprehension of scientific concepts. Well-equipped laboratories allow for a wider range of experiments, enhancing the overall learning experience. Compared to traditional classroom instruction, many students find lab activities more engaging. The hands-on nature of experiments can spark students' curiosity and make learning more enjoyable, potentially boosting their interest in science (Gericke et al., 2022). A laboratory provides a valuable environment for learning and can help students develop essential research skills, including making observations, formulating hypotheses, and conducting experiments to test them (Scaradozzi et al., 2021).

SIMPULAN

Based on the research results, the following conclusions can be drawn: 1) The effectiveness of using chemical laboratory functions in State Senior High Schools throughout East Lombok Regency has been effective (74.82%). The effectiveness of the use of chemical laboratory functions in terms of three indicators, namely strengthening students' understanding through the application of theory into practicum with the effective category (72.72%), growing students' scientific attitudes with the effective category (80.79%), and training students' skills in the effective category (70.96%). 2) The effectiveness of the use of chemical laboratory equipment in State Senior High Schools throughout the East Lombok Regency has been effective (80.33%). The effectiveness of the use of chemical laboratory equipment in terms of two indicators, namely the rational use of tools in chemical laboratories with the effective category (76.71%) and implementation of procedures for the use of equipment in the chemical laboratory in the effective category (83.95%). Based on the results obtained, suggestions for consideration in this study

include the need to evaluate and improve the use of chemistry laboratories in learning to enhance the effectiveness of these laboratories.

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