

ASSESSMENT OF THE EFFECTIVENESS OF The Utilization OF CHEMISTRY LABORATORIES IN STATE HIGH SCHOOLS IN THE EAST LOMBOK DISTRICT Indonesia

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ABSTRACT: This study aims to determine the effectiveness of chemical laboratory functions and tools in Public Senior High Schools throughout East Lombok Regency, Indonesia. The approach in this study uses a descriptive quantitative approach. The population of this study was all high schools in East Lombok Regency. The sample for this study were six schools, namely SMAN 2 Selong, SMAN 3 Selong, SMAN 1 Terara, SMAN 1 Pringgabaya, SMAN 1 Sembalun, and SMAN 1 Labuhan Haji, which were taken using purposive sampling. Data collection used questionnaires and interviews. The questionnaire used was closed with a Likert scale to interpret 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) Using chemical laboratory equipment in State Senior High Schools throughout the East Lombok Regency has been effective (80.33%).

Keywords: *effectiveness, chemical laboratory, utilization*

I. INTRODUCTION

Chemistry learning focuses on theory and practical activities; therefore, laboratory activities are very important. The importance of activities in the laboratory in chemistry lessons, the laboratory must be utilized to the fullest (Candra, 2020). The maximum use of chemical laboratories can properly support student practicum activities so that students gain optimal theoretical and practical understanding (Saputra, 2021).

Maximum laboratory use can increase student understanding, train student skills and foster a scientific attitude (Suryawati & Osman, 2017; Aktamis & Ergin, 2008; Isnaeni, 2021). Besides that, students can feel the experiment's process and then prove existing theories or concepts (Steffe, 2000; Domin, 1999). Through practicum activities,

students can also conclude from the experiments that have been carried out. So learning activities need synchronization between theory and practical activities (Maâ€™arij, 2017; Lunetta, 2007)

Tools in the laboratory are also very important to support student learning activities. Maximum use of tools in the chemistry laboratory can support students' practicum activities well. The use of tools in the chemistry laboratory contains several aspects, including students' understanding of using practicum tools, the rationale for the availability of practicum tools with the number of students, and the correct implementation of procedures related to using practicum tools (Hart, C., Mulhall, P., Berry, A., Loughran, J., & Gunstone, R.

(2000). What is the purpose of this experiment? Or can students learn something from doing experiments?. *Journal of Research in Science Teaching: The Official Journal of the National Association for Research in Science Teaching*, 37(7), 655-675.

Kozma, R., Chin, E., Russell, J., & Marx, N. (2000). The roles of representations and tools in the chemistry laboratory and their implications for chemistry learning. *The Journal of the Learning Sciences*, 9(2), 105-143.

implementation (Junaidi, 2017). These factors can be either internal or external. The factors referred to include the availability of tools and materials, the time used to carry out practicums, and the lack of motivation to carry out practicums. Another factor that hinders the implementation of practicums is the use of laboratories that are not used for practicums because class capacity cannot meet students' capacity. The use of laboratories as classes is an alternative chosen by schools

(Azmi, S., Savalas, L. R. T., Haris, M., & Hadisaputra, S. (2022, August). Developing computational chemistry laboratory work module for dye-sensitized solar cells. In *AIP Conference Proceedings* (Vol. 2638,

Hadisaputra, S., Savalas, L. R. T., & Hamdiani, S. (2017). *Praktikum kimia berbasis kimia komputasi untuk sekolah menengah atas*. *Jurnal Pijar Mipa*, 12(1).

Al Idrus, S. W., Purwoko, A. A., Hadisaputra, S., & Junaidi, E. (2020). Pengembangan Modul Praktikum Kimia Lingkungan Berbasis Green Chemistry Pada Mata Kuliah Kimia Lngkungan. *Jurnal Pijar Mipa*, 15(5), 541-547.

Reid, N., & Shah, I. (2007). The role of laboratory work in university chemistry. *Chemistry Education Research and Practice*, 8(2), 172-185.).

Practicum implementation in high school only sometimes runs optimally. It happens because many factors can hinder practicum

Laksmiwati, D., Hadisaputra, S., & Siahaan, J. (2018). Pengembangan Modul Praktikum Kimia Berbasis Problem Based Learning Untuk Kelas XI SMA. *Chemistry Education Practice*, 1(2), 36-41.

Burhanuddin, B., Andayani, Y., Junaidi, E., Hadisaputra, S., & Hakim, A. (2022). Pengelolaan Laboratorium Kimia Sekolah Di Kota Mataram. *Jurnal Pengabdian Inovasi Masyarakat Indonesia*, 1(1), 43-46.

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It is necessary to research the effectiveness of chemical laboratories to see some of the inhibiting factors and the importance of implementing practicum in the laboratory. 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 and (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 interviews. This research will obtain data on the effectiveness of using chemistry laboratories

in high schools throughout the East Lombok district.

SMAN 1 Pringgabaya, SMAN 1 Sembalun, dan SMAN 1 Labuhan Haji.

II. RESEARCH METHODOLOGY

This research is descriptive quantitative research, consisting of two kinds, quantitative and qualitative. According to Sugiyono (2015) that the quantitative approach is research based on the philosophy of positivism to examine a particular population or sample and random sampling by collecting data using instruments. Data analysis is statistical.

The population in this study is the entire Upper Meineingah School in Sei-East Lombok Regency. The sample in this study was taken using the Purposive Sampling method, i.e., the sampling criteria contained the researcher's criteria, namely the school's geographical location, which was divided into northern, southern, eastern, western, and central East Lombok. Six schools were the research samples, namely SMAN 2 Selong, SMAN 3 Selong, SMAN 1 Terara,

The data in this research were taken using questionnaires and interviews. The questionnaire used is a closed questionnaire with a Likert scale. Then the data obtained in this study were analyzed using the formula:

$$P = \frac{F}{N} \times 100\%$$

Arrogance:

P: Percentage

f: The number of subjects in a certain category

N: Frequency total or overall number of subjects

(Anas Sudijono, 2006)

Then classified into five categories as in Table 1

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

Intervals	Category
86% - 100%	Very effective
71% - 85%	Effective
56% - 70%	Effective enough
41% - 55%	Less effective
25% - 40%	Ineffective

Suharsimi Arikunto (2015)

III. RESULTS AND DISCUSSION

Based on a questionnaire filled out by chemistry students and teachers in the

schools that were the sample of the study, data on the effectiveness of the use of

chemistry laboratories in senior high schools

in the East Lombok district were 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	Responder		Total score	Max score	%	Category
	Rsp	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, namely, the use of chemical laboratory functions and the use of chemical laboratory equipment. The explanation of these aspects is as follows:

3.1 Utilization of Chemical Laboratory Functions

This aspect assesses the extent to which the function of the chemical laboratory in State Senior High Schools

throughout the East Lombok Regency has functioned effectively or not. This research assesses the effectiveness of the use of chemical laboratory functions from three indicators. The indicators in question include strengthening students' understanding by applying theory to practicum, cultivating scientific attitudes, and training students' skills. Data from research on the effectiveness of the use of chemical laboratory functions is presented in Figure 1.

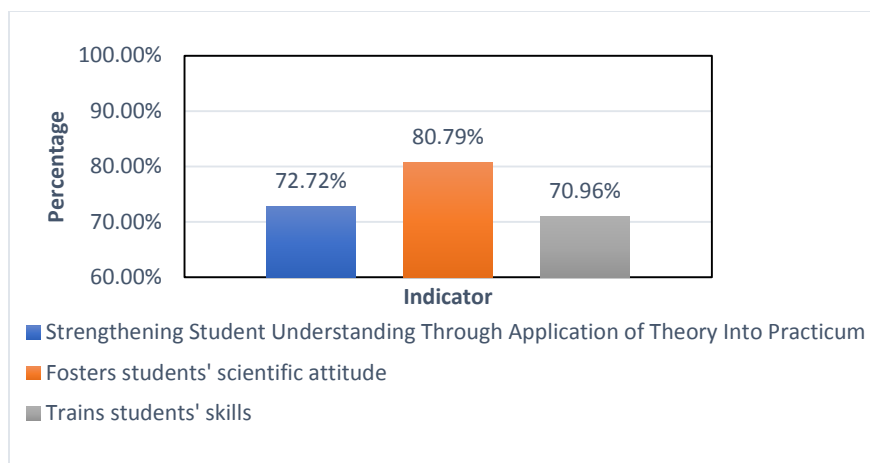


Figure 1 Research results on the effectiveness of the use of chemical laboratory functions in public high schools in East Lombok Regency

3.1.1 Indicator Strengthening Student Understanding Through Application of Theory Into Practicum

Achievement indicators increase student understanding in the effective category by 72.72%. The teacher always explains the practicum objectives, provides practicum modules, then divides the practicum groups for each practicum activity. Students understand better after carrying out chemistry practicum. It can be seen from the students' practicum reports, and students can present the results and conclusions of the practicum. Carrying out practicums can increase students' understanding and correct misconceptions about the chemical theories being studied. Effective categories for increasing student understanding can be obtained because these aspects are carried out well. Yaman (2016) believes that The laboratory is an effective learning resource for achieving the expected competencies for students.

3.1.2 The indicator fosters students' scientific attitude

Scientific attitude can be improved by creating a learning process that allows students to explore and improve their scientific attitude (Astuti, 2012). The percentage of indicators for cultivating students' scientific attitudes is 80.79% which is classified as an effective category. Based on the research results, students are happier and more enthusiastic when carrying out practicum activities compared to learning activities as usual in class. Chemistry teachers and laboratory assistants also supervise when carrying out practicums. It causes students to be more careful and careful in carrying out practicum. Besides that, it is also easier for teachers to assess student reports from the practicum results. Limited time causes students only to be able to repeat the practicum at another meeting if they do the practicum. It can only be done simultaneously if the learning hour still needs to be completed. Seeing many aspects that have been going well, the assessment of the effectiveness of the use of chemical laboratory functions from indicators of cultivating students' scientific attitudes is classified as effective.

3.1.3 The indicator trains students' skills

Based on Figure 4.1, the category of indicators for training students' skills is classified as effective, but the percentage of this indicator is the lowest, namely 70.96%. Some of the aspects seen in the indicators of training students' skills are students being able to carry out observations and record the symptoms that arise during the practicum through sheets of student work and student reports. Students are also able to use practicum tools because they have been explained previously. Some aspects that students are still lacking, such as planning practicums independently, and not all students can present the results of practicums. Because of these aspects, the indicator for training students' skills is classified as an effective category, but the percentage is still lower than the other indicators. It is to the opinion of Zainuddin (in Susanti, 2013), Through practicum

activities, many things can be obtained students, including practicum activities that can train students' skills.

3.2 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 the use of laboratory equipment is seen from two indicators, namely, the rational use of the equipment and the implementation of procedures for using the equipment in the chemical laboratory. Data on indicators of the effectiveness of the use of chemical laboratory equipment in state high schools throughout East Lombok Regency are presented in Figure 2.

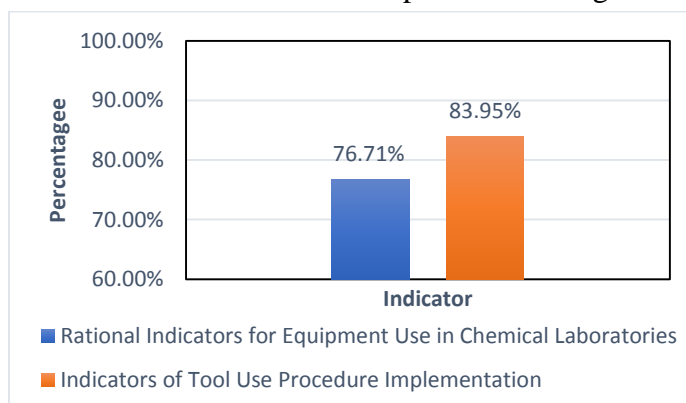


Figure 2. Research results on the effectiveness of using chemical laboratory equipment in public high schools in East Lombok Regency

3.2.1 Rational Indicators for Equipment Use in Chemical Laboratories

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

laboratory assistants and chemistry teachers in all the schools sampled for the study, the tools in the school chemistry laboratory were available and could be used for practicum. Some practicums only sometimes use materials in the laboratory, and practicums can take place using simple materials from students. However, the

equipment available in the laboratory can only facilitate some students, so the practicum is carried out in groups. It causes not all students to get the opportunity to use practicum tools.

3.2.2 Indicators of 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 is 83.95% in the effective category. Based on the results of interviews with laboratory assistants and chemistry teachers, laboratory equipment was introduced in class 10. This activity was specifically carried out to introduce laboratory equipment to students. The laboratory assistant prepares the practicum tools used, and then students take them themselves for 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 with objectives, tools, materials, and practical work instructions to be guided and supervised by the teacher and laboratory assistant during the practical implementation because not all students can immediately understand the workings of the module or student worksheets. According to E. Mulyasa (2009), educational facilities and infrastructure can make an optimal contribution to the educational process, provide adequate learning facilities quantitatively and 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.

Conclusion

1. Using chemical laboratory functions in State Senior High Schools throughout the East Lombok Regency has been effective (74.82%). The effectiveness of the use of chemical laboratory functions in terms of three indicators: 1) strengthening students' understanding through the application of theory into practicum with the effective category (72.72%); 2) growing students' scientific attitudes with the effective category (80.79%); 3) training students' skills in the effective category (70.96%).
2. Using chemical laboratory equipment in State Senior High Schools throughout the East Lombok Regency has been effective (80.33%). The effectiveness of chemical laboratory equipment in terms of two indicators: 1) the rational use of tools in chemical laboratories with the effective category (76.71%); 2). implementation of procedures for using equipment in the chemical laboratory in the effective category (83.95%).

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