J. Pijar MIPA, Vol. 18 No. 4, July 2023: 572-577 ISSN 1907-1744 (Print)
DOI: 10.29303/jpm.v18i4.4813 ISSN 2460-1500 (Online)

ANALYSIS OF SCIENCE LABORATORY FACILITIES AT JUNIOR HIGH SCHOOL BINA ILMI, PALEMBANG CITY, INDONESIA

Muhammad Julian and Astrid Sri Wahyuni Sumah*
Biology Education Department, Universitas Muhammadiyah Palembang, Palembang City, South Sumatera, Indonesia
*Email: astrid.sumah@gmail.com

Received: February 25, 2023. Accepted: June 21, 2023. Published: July 31, 2023

Abstract: One of the facilities in the teaching and learning process that should be considered is the laboratory. The laboratory is an effective learning resource to achieve the expected competencies for students in increasing efficiency and effectiveness; the laboratory must be managed and utilized correctly. Science learning is not just theory; it is necessary to carry out practical activities in the laboratory. Following Permendiknas No 24 of 2007, laboratory facilities and infrastructure are needed to support practicum activities. This study aims to determine the carrying capacity of the science laboratory facilities at SMP IT Bina Ilmi Palembang and determine the obstacles faced in conducting practicums at the science laboratory at SMP IT Bina Ilmi Palembang. This study uses descriptive qualitative research. The results showed that most science laboratory facilities in schools needed to meet the standards of Permendiknas No. 24 of 2007. There were many areas for improvement in the availability of practicum equipment and media that could support practicum implementation activities to increase student learning outcomes. Obstacles that affect practicum activities are the lack of ability to manage school laboratories, lack of understanding of the meaning and function of school laboratories and their implications for the development and improvement of science learning systems, the limited ability of teachers to master subjects, and uneven procurement and distribution of Science Kit teaching aids so that makes it difficult for the teacher activity center to carry out its coaching function for teachers. Ironically, the existence of a school laboratory is considered a burden, so it is rarely used correctly.

Keywords: *Constraints on Use, Facility Standards, Laboratory Conditions, Laboratory Equipment.*

INTRODUCTION

Education is a conscious and planned effort to create a learning atmosphere so that students actively develop their potential to have spiritual strength, self-control, personality, intelligence, and skills needed by themselves, society, nation, and state. Basic science is a fundamental part of science education that must teach basic knowledge and is the primary determinant of science study and practice performance [1]. A good education can facilitate students optimally so that they can contribute positively to national development and development [2].

IPA is one of the subjects in the primary education curriculum that always develops, and new findings from the experimental results [3]. Experiments must be carried out because they directly interact with the object under study using the five senses or tools [4]. Therefore, adequate school facilities and infrastructure are needed to support the science learning process [5]. A laboratory is a place where experiments and research activities are carried out. The laboratory is needed as a learning place to learn more about something, such as knowledge about experiments directly and provide a real experience to students [6]. A science laboratory is a place for teachers and students to conduct experiments and research on science to gain a deep understanding and, at the same time, prove the science concepts learned in class.

Scientific work is in the form of practical activities in a laboratory equipped with supporting tools and materials. Practicum in the laboratory in the learning process can increase students' knowledge to solve problems using the theory given systematically [7]. Practicum is a learning process that is carried out in the laboratory. A Practicum process will run well and smoothly if it is supported by adequate facilities and infrastructure [8]. However, there are still laboratories with the availability of facilities and infrastructure that still need to be completed and fit for use. Previous studies revealed that science lessons face problems from different angles, starting with students [9], teachers, schools, government, and parents. Most junior high schools needed laboratory equipment and materials for science lessons [10]. To enhance primary science teaching and learning, the government should provide resources, teaching materials, models, equipment, and adequate laboratories [11].

The educational equipment at SMP IT Bina Ilmi is adequate, and the school is facilitated with complete facilities and infrastructure, including a science laboratory room. The science laboratory room as a practicum place must have appropriate and sufficient practicum equipment for the success and smooth running of a practicum process. The biology laboratory, for example, needs further attention so that learning can be achieved optimally [12]. However, it has yet to be determined with certainty whether the science laboratory room in this school meets the standards of Permendiknas No. 24 of 2007 or not. Therefore, this study aimed to assess the standard of

science laboratory facilities according to Permendiknas No. 24 of 2007 standards and the constraints found.

RESEARCH METHODS

This study uses a qualitative research approach. In this study, the researchers did not manipulate or provide specific treatments for the research object; all activities went as planned. The qualitative research approach was chosen because it was conducted in natural conditions, describing the situation at SMP IT Bina Ilmi.

Data source

The observation subjects of this study were the science laboratory at SMP IT Bina Ilmi. Things that will be the point of attention are facilities (conditions and laboratory equipment) and constraints on using laboratory activities.

Data Collection Techniques

This study used data collection techniques through observation, interviews, and documentation. Observations or observations are made to see and directly observe data on laboratory facilities and infrastructure needed for class IX Science practicum activities at SMP IT Bina Ilmi and constraints on laboratory use during practicum activities. Interviews were conducted to collect data by conducting face-to-face oral debriefing with science teachers and class IX students. Documentation is the collection of written or printed data about facts to be used as physical evidence of research and research results. This documentation will be used as physical evidence of the research and results of the position.

Data Analysis

The data analysis technique used in this study consisted of four stages: data collection, data reduction, data presentation, and conclusion. Data analysis techniques can be interpreted as processing data into information. This process is necessary so that the processed data is easier to understand. This descriptive analysis technique determines the completeness of the tools and practicum materials in the science laboratory in supporting learning. Data on the completeness of tools and materials for the science laboratory were obtained from data on observation sheets for the laboratory's inventory of tools and materials.

RESULTS AND DISCUSSION

Description of Laboratory Facilities

The research was conducted at SMP IT Bina Ilmi with a sample of teachers and class IX students. The biology learning process at the school still needs to be improved, where the teacher provides material without involving practical activities. The condition of the science learning process facilities at the school is suitable for supporting science learning. It is also supported by the presence of teachers who teach according to the field of study.

Table 1. Science laboratory facilities in SMP IT Bina Ilmi.

No	Facility	Amount	Condition	
			Good	Bad
1	Demonstration table	1	v	-
2	Fire extinguisher	1	v	-
3	Practical table	1	v	-
4	Cupboard	1	v	-
5	The sink on the demonstration table	1	v	-
6	Rack	1	v	-
7	Blackboard/whiteboard	1	v	-
8	Room with temperature control	1	v	-
9	LCD media	1	v	-
10	Wall clock	1	v	-
11	First aid kit	1	v	-
12	Hygiene equipment	1	v	-
13	Glassware	1	v	-
14	Iron tools	1	v	-
15	Wood tools	1	v	-
16	Storage of glassware	1	v	-
17	Human skeleton	1	v	-
18	Anatomical models	1	v	-
19	Microscope	1	v	-
20	Preparation box	1	v	-
21	Balance sheet	1	v	-
22	Thermometer	1	v	-
23	Experiment instructions	1	v	-

SMP IT Bina Ilmi has laboratory conditions that do not meet infrastructure standards (Table 1), in terms of tools and materials, complementary equipment, and strategic laboratory layout, per Permendiknas No 24 of 2007 standards. Science laboratories already support biology laboratories, especially with learning media, equipment, materials, and other supporting equipment that supports the implementation of learning activities in the laboratory, even though some facilities need to be completed. Observational data regarding laboratory facilities, including laboratory design and practicum equipment, must meet the minimum standards in Permendiknas No. 24 of 2007. However, educational media were included in the poor category and far from the minimum standards. Educational media include models of the human skeleton, models of the human body, pictures of chromosomes, DNA, and RNA, pictures of Mendelian inheritance, pictures or models of the respiratory, circulatory, digestive, and nervous systems in humans, and others.

Management of tools and materials is an activity that also determines the success of laboratory utilization. The smooth running of laboratory

activities will depend heavily on storing and maintaining tools and materials. The arrangement is closely related to grouping, placement, storage, and traceability. The maintenance and use of science laboratory equipment can be grouped into several categories, for example, activity tools (observation and measurement), basic tools used to complete experimental tools/equipment, teaching aids (such as KIT, including models, torso, insectarium, and other similar tools), and others. The complete practicum tools and materials will make the teacher maximize the use of the laboratory in supporting the implementation of learning, and students will get hands-on experience that will make it easier for students to understand and learn science.

Biology is one of the science subjects that deal with how to find out about nature systematically, so biology is not only mastery of a collection of knowledge in the form of facts, concepts, or principles but also a process of discovery [13]. Practicum activities are methods that influence students' success in learning biology [14]; through practicum activities, students can learn biology by observing biological processes, training thinking skills, being scientific, and solving problems through the scientific method [15]. Through Practicum, students can generate interest in learning, and students' boredom in participating in learning can be overcome because experiments or experiments make it easier for students to gather information [7]. Based on the results of the research that has been done, the facilities and intensity of using the laboratory can affect learning outcomes because a good laboratory will support students' understanding of the material. It will be very useful for students whose level of thinking is normative so that it can direct them to things that are concrete (real) [6].

Laboratory facilities can be an indicator of an ideal laboratory [16]. The laboratory is ideal if it meets the practicum needs. A laboratory is a place for practical science learning activities that require special equipment that is challenging to present in class. Description of the results of interviews regarding laboratory facilities in schools with teachers can be seen in Table 2 and Table 3 for the results of interviews with class IX students.

The laboratory is a place to work to conduct experiments or investigations in certain fields of science, such as physics, chemistry [17], biology, and others [18]. A laboratory is a place or room for carrying out practical or research activities supported by a complete set of laboratory equipment and laboratory infrastructure [19]. One of the laboratory functions is a place to improve and develop skills. Skills must be continuously upgraded so that competency standards are maintained [20].

Table 2. Results of teacher interviews in the learning process activities.

Indicator	Interview result
Laboratory equipment and materials	Some tools and materials need to be improved, the tools and materials are unavailable, and sometimes some materials can only be given theoretical material without Practicum. Media education is very minimal, and there are only a few. After every Practicum, always check first.
Laboratory regulations	All regulations are in place, students are active, and all materials are contained in the Science package lab book. Before starting the Practicum, the teacher directs first. Students must dress neatly and politely. During practice, the laboratory atmosphere is conducive.
The role of the science laboratory in the implementation of Practicum	The laboratory supports student understanding so that learning outcomes can be increased. Then students report the results of their reports in groups or individually so the teacher knows that they understand the results they get.
Teacher skills	Study the practicum instructions first so that the Practicum will go well, understand the use of a microscope, and monitor students properly.

Table 3. Results of interviews with class IX students in the learning process activities.

No.	Indicator	Interview result
1.	Laboratory conditions	A laboratory is a place for Practicum, experiments, and observations. One of its functions is to balance theory and practice and unify theory and practice.
2.	Laboratory equipment and materials	Tools and materials are complete. The teacher has prepared practical tools and materials.
3.	Laboratory regulations	Yes sir. We must be active to capture what is learned quickly. The entire material for one semester can be practiced. Students who are naughty and don't follow the rules are reprimanded and given a

		warning. Before the Practicum, we were directed first so that everything was clear in the implementation of the Practicum. Teachers always give advice on how to use lab coats neatly & properly.
4.	The role of the science laboratory in the implementation of Practicum	The laboratory can be a source of learning to solve various problems through practical activities. Students are always monitored during the activity. Carry out activities properly presenting the results of the Final report.
5.	Practical material	Not all materials are practiced, sir, because all the tools and materials are complete. Sometimes we use simple tools and materials that can be brought from home.

Barriers to Laboratory Use

School laboratory management should have been carried out more. It even impressed me that the laboratory room that was built needed to be fixed. Not a few rooms built for school laboratory activities have changed their function. It is regrettable and detrimental. Based on the results of observations, science laboratories whose utilization and management as learning resources are not optimal or are not used due to various factors, including:

1. The teacher's ability and mastery of equipment and practical materials still need to be improved.
2. Inadequate both in terms of quality and quantity of laboratory personnel.
3. Many damaged laboratory equipment and materials have yet to be recovered.
4. Insufficient/limited tools and materials result in only some learners getting the opportunity to learn to conduct experiments.

The study's results also found that schools had laboratory conditions that needed to be by the minimum standards of Permendiknas No. 24 of 2007. It is because the budget for purchasing equipment and replacing damaged equipment budgeted by schools still needs to be bigger to meet these standards. The practicum book also still uses the IPA package practicum book issued by the publisher. So, the science practicum carried out was different from the lesson plan made by the subject teacher. Therefore there are many shortages of laboratory facilities needed for learning, and this problem will certainly impact the not optimal process of learning science and contribute to the low average student learning outcomes [21]. Education authorities and school systems should encourage using available laboratory facilities by providing them fully [22].

A good laboratory must be equipped with public facilities used by all laboratory users and special laboratory facilities in the form of facilities specifically for tools and chemicals [23]. The existence of a science laboratory is very beneficial for students and plays an important role in learning science [24]. The laboratory certainly requires a proper set of tools to support teaching and learning activities; these supporting tools are related to practicum tools and materials [25]. A significant difference existed in students' performance and the availability of laboratory facilities in teaching [26]. The years of teaching experience significantly impact student performance, where schools with more teachers with teaching experience achieved better results than teachers with less teaching experience [27]. One of the facilities needed and must be owned by every educational unit to support the success of learning [28] and practicum activities is the availability of a laboratory. Laboratory management starts with program management and administration activities, organizing teachers and laboratory assistants, monitoring & evaluation, and implementation [20]. However, there are still many who have not utilized laboratories in schools, as argued by [29] that many science laboratories in schools have not been utilized optimally; this is due to a lack of interest, knowledge of management, and use in the utilization of human resources in laboratories. There are still many schools that use the science laboratory as a classroom. Therefore, laboratory personnel in each school must, of course, meet standards in managing laboratories, as stated in Permendiknas No. 26 of 2008 concerning Standards for School Laboratory Personnel [30].

CONCLUSION

The results of this study can be concluded that science laboratory facilities at SMP IT Bina Ilmi are not by Permendiknas No. 24 of 2007 standards because there are still many deficiencies in terms of facilities, minimal educational media, and no laboratory assistants. Obstacles to the use of the laboratory were inadequate laboratory equipment, practicum guidebooks that were not by the lesson plans made by each subject teacher, and the teacher's ability and mastery of equipment and the use of practical materials still needed to be improved.

ACKNOWLEDGEMENTS

The researcher thanks Mrs. Vera, who has helped observe all the science laboratory equipment at school.

REFERENCES

[1] Amoo, O. (2019). Towards effective teaching and learning of integrated science at Upper Basic SchoolsKara' levels in Nigeria. *Journal of Education Studies and Research*, 6 (1), 117 - 124.

[2] Muhibbin, S. (2007). *Psikologi pendidikan dengan pendekatan baru*. Bandung: PT. Remaja Rosdakarya.
[3] Salim, B., Wulandari, R., & Kusnaningsih. (2022). Analysis of laboratory management and utilization in science learning at Banyuajuh 2 Elementary School implementation of farming activities to grow children's natural intelligence. *Maktab: Jurnal Pendidikan dan Teknologi, 1* (3), 701-707.
[4] Agustina, M. (2018). Peran laboratorium ilmu pengetahuan alam (IPA) dalam pembelajaran IPA Madrasah Ibtidaiyah (MI) / Sekolah Dasar (SD). *Jurnal Ilmiah Pendidikan Islam, 10*, 1-10.
[5] Salabi, A. (2016). Needs Assessment Laboratorium Biologi Pada Madrasah Aliyah negeri (MAN) di Kota Banjarmasin. *Jurnal PTK dan Pendidikan*, 2(2).
[6] [6] Sari, S., Dayana, D., & Farida, I. (2018). Analisis profil manajemen laboratorium dalam pembelajaran kimia di SMA Wilayah Sumedang. *JTK (Jurnal Tadris Kimiya), 3*(1), 73-82.
[7] Van Harling, V. N., & Tobi, M. D. (2019). Hubungan antara pemanfaatan fasilitas laboratorium kimia dan kedisiplinan belajar kimia dengan prestasi belajar kimia siswa kelas XII IPA SMA Negeri 1 Sorong. *SOSCIED, 2*(2), 64-75.
[8] Peraturan Menteri Pendidikan Nasional Nomor 24 tahun 2007 Tanggal 28 Juni 2007 Standar Sarana Dan Prasarana Untuk Sekolah Dasar / Madrasah Ibtidauayah (SD/MI), Sekolah Menengah Pertama/Madrasah Tsanawiyah (SMP/MTS), Dan Sekolah Menengah Atas /Madrasah Aliyah (SMA/MA)
[9] Abidoye, F. O. (2018). Impact of biology teachers on the Students' Performance in senior secondary Schools in Osun State, Nigeria. *European Journal of Health and Biology Education, 7*(2), 35-40.
[10] Elechi, C. N. & Eya, N. M. (2015). Availability and utilization of basic science laboratory facilities in junior secondary schools: A panacea for reform in stem education. *International Journal of Education and Research*, 3 (7),213-222.
[11] Olubu, O. M. (2015). Influence of Laboratory Learning Environment on Students' Academic Performance in Secondary School Chemistry. *US-China Education Review A, 5* (12), 814-821.
[12] Widianti, I., & Sulistiyawati. (2021). Study of completeness and utilization of biology laboratories as supporting biology learning activities of State Madrasah Aliyah (MAN) in Sleman Regency. *Proceeding of. International. Conference. Science and. Engineering 4*, 357-361.
[13] Asih, L. S., & Muderawan, W. (2012). Analisis Standar Laboratorium Kimia dan Efektivitasnya Terhadap Capaian Kompetensi Adaptif di SMK Negeri 2 Negara. *Jurnal Pendidikan dan Pembelajaran IPA Indonesia, 3*(2).
[14] Widodo, A., & Ramdhaningsih, V. (2006). Analisis Kegiatan Praktikum Biologi dengan Menggunakan Video. *Metalogika, 9*(2): 146-158.
[15] Meita, N. M. (2017). Studi Kelayakan Pengelolaan Laboratorium IPA SMPN 4 Sumenep Berdasarkan Permendagri 26/2008. *Jurnal Lensa (Lentera Sains): Jurnal Pendidikan IPA, 7* (1).
[16] Amin, M. (1988). *Buku Pedoman Laboratorium Dan Petunjuk Praktikum Pendidikan IPA Umun* (*General Science*) Untuk LPTK. Depdikbud: Jakarta.
[17] Jahro, I. S., & Susilawati. (2008). Analisis Penerapan Metode Praktikum pada Pembelajaran Ilmu Kimia di Sekolah Menengah Atas. *Jurnal Pendidikan*, 20-26.
[18] Kertiasa, N. (2006). *Laboratorium Sekolah dan Pengelolaannya*. Bandung: Pudak Scientific.
[19] Darsana, I. W., Sadia, I. W., & Tika, I. N. (2014). Analisis Standar Kebutuhan Laboratorium Kimia dalam Implementasi Kurikulum 2013 Di SMA Negeri Kabupaten Bangli. *Jurnal Pendidikan dan Pembelajaran IPA Indonesia, 4*(1).
[20] Kemendiknas. (2011). *Pedoman Penilaian Kinerja Kepala Laboratorium/Bengkel Madrasah/Sekolah.* Jakarta: Kementrian Pendidikan Nasional.
[21] Arikunto, S. 1996. *Pengelolaan Kelas dan Siswa Sebuah Pendekatan*. CV. Rajawali: Jakarta.
[22] Abidoye, F. O., Adebisi, A. M., Rihanat, A. A., & Aliyu, M. Z. (2022). Availability of Laboratory Facilities on Students' Performance in Upper Basic Schools in Kwara State, Nigeria. *International Journal of Educational Research Review, 7* (2), 262-267.
[23] Van Harling, V. N., & Martono, S. M. (2021). Chemical laboratory completeness analysis in SMA Negeri 3 Sorong. *SOSCIED, 4* (1), 1-6.
[24] Wardhiana, I. K., & Wahyono, U. (2021). Penerapan Perangkat Laboratorium IPA Untuk Meningkatkan Hasil Belajar Siswa Sekolah Dasar Di Daerah Terpencil. *Jurnal Pendidikan Fisika Tadulako Online*, 12-16.
[25] Zahara, N., & Elita, A. (2019). Pemanfaatan dan Pengelolaan Laboratorium bagi Guru IPA di Madrasah Tsanawiyah Negeri dan Swasta Aceh Besar. *Prosiding FTK UIN Ar-Raniry Banda Aceh*, 751:755.
[26] Yusuf, H. O., & Dada, A. A. (2016). Impact of teachers' qualification and experience on the performance of students in colleges of education in Kaduna State Nigeria. *Journal of Quality in Higher Education, 3*, 52-78.
[27] Ewetan, T. O. & Ewetan, O. O. (2015). Teachers' teaching experience and academic performance in mathematics and English

ISSN 1907-1744 (Print)
ISSN 2460-1500 (Online)

language in public secondary schools in Ogun State, Nigeria. *International Journal of Humanities Social Sciences and Education (IJHSSE) 2(2), 123-134.*

[28] Etiubon, R. U. (2020). Availability and utilization of laboratory facilities for teaching Carbohydrates in senior secondary schools in Uyo education zone, akwa ibom state. *International Journal of Education and Research*, 8 (5), 91-104.

[29] Elseria. (2016). Efektifitas Pengelolaan Laboratorium IPA. *Manajer Pendiidkan*, *10* (1), 109–121.

[30] Trisianawati, E., Ita, & Fitria, K. (2020). Analisis kelengkapan alat dan bahan laboratorium IPA sekolah di Kota Pontianak. *Jurnal Pendidikan Sains dan Aplikasinya (JPSA), 3* (2): 66-72.