

Improving the Quality of Learning Through Laboratory Infrastructure facilities at Sma Negeri 1 Polokarto

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ABSTRACT

This research aims to improve the quality of learning through laboratory infrastructure facilities at Sma Negeri 1 Polokarto. This research uses a qualitative approach with a type of descriptive approach. The subjects in this study are the heads of biology laboratories, chemical laboratories, physics laboratories, and computer laboratories. Methods of collecting data by means of observation, interview, and documentation. Infrastructure facilities data obtained then compared to the standards that have been determined based on Permendiknas No. 24 of 2007. The results showed that 1.) The laboratory is an important part of the learning process. 2.) Overall the laboratory at Sma Negeri 1 Polokarto has met permendiknas standard No. 24 of 2007. 3.) Chemical and computer laboratory facilities are complete or adequate. 4.) Lack of complete equipment in biology and physics laboratories. 5.) There are several procurement of facilities and infrastructure that are not carried out from the school to the government.

KEYWORDS

Learning
Facilities and
Infrastructure
Laboratory

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1. Introduction

Education is important for human life, because education becomes a contributing factor to humans in overcoming all life problems both in the family, society, nation and state. Education has a wider scope than learning, and learning is part of education itself. Simply put, education is a conscious and deliberate effort to mature through values that are transformed to learners. While learning conscious and deliberate efforts to mature learners through the transformation of science.

The success of educational programs through the learning process is strongly influenced by many factors, one of which is the availability of adequate educational facilities and infrastructure accompanied by optimal utilization and management. Educational facilities and infrastructure are one of the important and main resources in supporting the learning process in schools, for that it is necessary to increase in utilization and management, so that the expected goals can be achieved. Educational facilities are one of the determinants of educational success. The completeness and availability of educational facilities in schools greatly affect the effectiveness and fluency of learning in the classroom.

Facilities and infrastructure are important factors that will determine whether a learning process can run effectively or vice versa. To realize a good learning process requires tools and media used as support. For example, the education process cannot run effectively if the classroom used as a place of learning is not maintained or even not worth using. Therefore, the

management of facilities and infrastructure in an educational institution must be done professionally and proportionately.

One of the facilities and infrastructure in the school is the laboratory. The laboratory is one of the sources of learning that is needed to provide real experience to learners, as one of the supporting factors of learning. The existence of laboratories in high schools is already a must in modern science education. The use of laboratories in learning will provide hands-on experience to develop competencies in order to be able to explore and understand the environment scientifically and will provide experience to be able to propose and test hypotheses through experiments, design and assemble experimental instruments, collect, process, and interpret data, compile reports, and communicate the results of experiments orally and in writing (Kertiyasa, 2006). So there is a need to provide practicum tools and materials and good laboratory management, so that the implementation of learning can run optimally.

The laboratory is an important means in supporting the success of practicum. Good laboratory standards are contained in the Regulation of the Minister of National Education (Permendiknas) No. 24 of 2007 on Standards of Educational Facilities and Infrastructure. Based on the regulation, the minimum facilities criteria consist of furniture, educational equipment, educational media, books and other learning resources, information and communication technology, and other equipment that must be owned by each school. While the minimum infrastructure criteria consists of land, buildings, spaces, and power installations and services that must be owned by each school. Laboratory according to Rustaman (2011) is one of the requirements that must be owned by the school as a place for students to conduct practicum activities. A lot of things that are done in the laboratory are doing experiments.

Broadly speaking, laboratory functions provide completeness for accepted theoretical lessons, so that between theory and practice are not two separate things. Second, provide scientific work skills for learners, provide and cultivate the courage to seek the true scientific truth of an object in the natural environment and social environment (Ismail, 2005). According to Suyanto (2013) in the practicum method things that must be considered are the time given to complete the practicum, ways to perform practicum, and various difficulties that will be found when carrying out practicum.

Initial observation activities conducted by the author related to laboratory facilities and infrastructure at Sma Negeri 1 Polokarto provide an overview of the sma which stands on an area of 10,000 m². This high school located in Dusun Butuh, Godog, Kec. Polokarto, Kab. Sukoharjo, Central Java has a distance to the sub-district capital of approximately 2.7 km while the distance to the district capital is approximately 8 km. Sma received an operational permit in 1997. Initially Sma Negeri 1 Polokarto stirred in State High School 1 Mojolaban which only there is class X. The initial number of students received is 145 students. In 1998 it has moved in Godog Village Polokarto Subdistrict. In order to improve education services in schools, SMA N 1 Polokarto strives to meet laboratory facilities and infrastructure so that the learning process can run smoothly in accordance with the Government Regulation of the Republic of Indonesia on facilities and infrastructure standards. Based on the above explanation, the author felt interested in conducting research on laboratory infrastructure facilities in the School in an article with the title "Improving the Quality of Learning Through Laboratory Infrastructure Facilities at Sma Negeri 1 Polokarto".

2. Method

This research uses a qualitative approach with a type of descriptive approach. Nana Syaodih Sukmadinata (2010: 60) stated that qualitative research is a study aimed at describing and analyzing phenomena, events, social activities, attitudes, beliefs, perceptions, thoughts of people individually and in groups.

Nana Syaodih Sukmadinata (2010:72) states that descriptive research is the most basic form of research. Intended to describe or describe existing phenomena, both natural and human engineering phenomena. This study examined the form, activity, characteristics, changes, relationships, similarities, and differences with other phenomena.

To obtain the necessary field data, researchers conducted research at SMA N 1 Polokarto. The research period conducted is from October to December 2021.

Sugiyono (2012: 297-298) objects are called social situations or social situations consisting of three elements, namely places, actors, and activities (activities) that integrate synergistically. The object in this study is the standard of laboratory facilities and infrastructure at Sma Negeri 1 Polokarto.

Muh. Fitrah & Luthfiyah (2017: 152) the research subject is the person who conducted the research (researcher), while the study is the person or something studied. The subject in the research concept refers to respondents, informants who want to be asked for information or dug up the data. Furthermore, the subject of this study was the head of laboratoriaum physics, chemistry, biology and computer Sma Negeri 1 Polokarto.

As for the retrieval of data sources in this study, the authors used the Purposive Sampling technique. This technique is used because the data source is based on certain criteria. Referring to Sugiyono's opinion (2012: 124) that Purposive Sampling is a technique of determining samples with certain considerations.

Data collection in this study uses 2 techniques, namely literature studies and field research. Sugiyono (2012: 398) literature studies deals with theoretical studies and other references related to values, cultures, and norms that develop in the social situations studied. Therefore, data research through literature studies by reading journal books such as expert opinions, aims to collect relevant data and information and relate to the problems being studied.

Field research is the collection of data by conducting research directly to the research site to get the necessary information, namely by conducting:

1. Observation
Margono (2010:158) observation is defined as systematic observation and recording of symptoms seen in the object of the study.
2. Interview
Sugiyono (2012: 194) interview is used as a data collection technique if researchers want to conduct preliminary studies to find problems that must be studied, and also if researchers want to know the things of respondents more deeply and the number of respondents is small.
3. Documentation
Sugiyono (2012: 329) documents are records of events that have passed. Documents can take the form of writing, drawings, or monumental works of a person. Document studies are complementary to the use of observation and interview methods in qualitative research.

3. Results and Discussions

The research conducted at Sma Negeri 1 Polokarto aims to find out the facilities, laboratory infrastructure in supporting learning. After conducting observations and interviews, researchers obtained data relating to the suitability of laboratory space with the minimum

standards that must be owned by schools at Sma Negeri 1 Polokarto presented as in Permendiknas Number 24 of 2007. The observations are as follows.

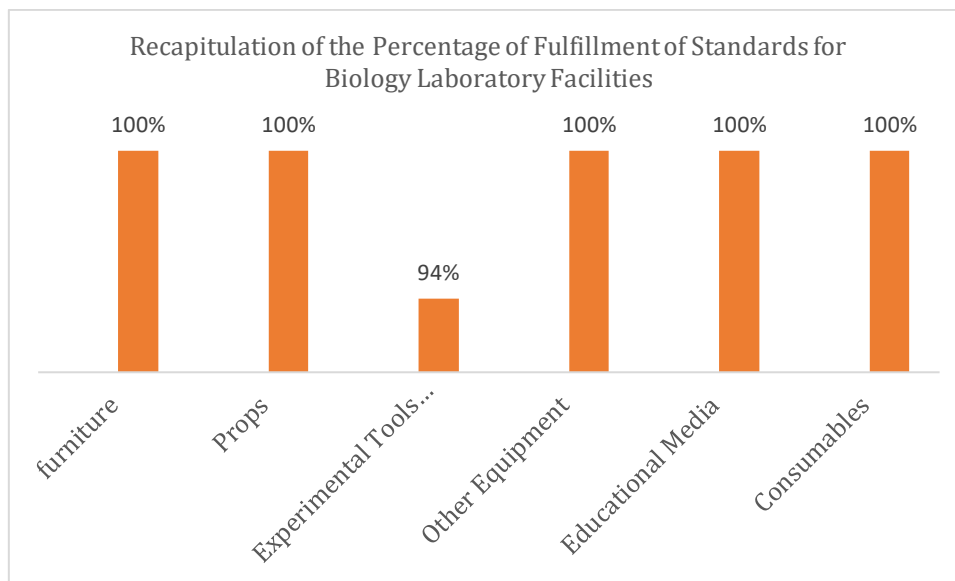
1. Biology laboratory

From the results of interviews about the facilities and infrastructure of biological laboratories, there are indicators that are central to the question, namely the state of biological laboratory infrastructure has met adequate capacity.

Table 1. Results of Obserasi and Interview of Biology Laboratory Space Infrastructure

Type	Standard Ratio	Real Ratio	Desc.
Biology laboratory space	The biology laboratory room can accommodate a minimum of one study group. Minimum ratio of biology laboratory space 2.4 m ² / learners. For study groups with learners of less than 20 people, the minimum area of laboratory space is 48 m ² including storage and preparation space area of 18 m ² . The minimum width of the biology laboratory space is 5 m.	Biology laboratory space can be filled by one study group with a capacity of ± 36 learners, and a building area of 120 m ² .	Appropriate
Preparation Room	The biology laboratory room is minimally equipped with a preparatory room that has a good electrical installation and air ventilation.	The biology laboratory room is equipped with a preparatory room that has a good electrical installation and air ventilation.	Appropriate
Lighting	Biological laboratory rooms need to be equipped with sufficient and adequate lighting consisting of a network of wires, ikring, switch lights and sockets.	The lighting of the biology laboratory room is good, there are windows that allow light to enter, there are 3 light bulbs with good conditions.	Appropriate
Storage Warehouse	The biology laboratory room is minimally equipped with storage space that has electrical installations, good air ventilation and mobeler facilities such as tool cabinets, material cabinets.	The storage room or warehouse there are electrical agencies, air vents, tool cabinets, material cabinets, which are still good and can be locked.	Appropriate
Clean water is available	There is a sink and clean water.	Handwashing or washtafle already has 6	Appropriate

The results of the recapitulation of data analysis obtained by researchers from the results of observation scores on biological laboratory infrastructure facilities can be seen from graph 1.



Graph 1. Percentage of Fulfillment of Standards of Biological Laboratory Infrastructure Facilities

From the percentage graph of the fulfillment of standards of infrastructure facilities in biology laboratories, it can be stated that furniture facilities, namely space filler facilities in the biology laboratory of Sma Negeri 1 Polokarto have a percentage that is 100% very good category, furniture in the laboratory is also available completely and in good condition in accordance with standards. Prop infrastructure is tools used by educators in delivering teaching materials have a percentage of 100% and then there are tools and experimental materials, tools are all equipment used during practicum, while materials are components that are tested when practicum has a percentage of 94%, educational equipment such as human skeleton models, microscopes are available in the laboratory even though conditions are not good. There are also some incomplete equipment such as rotating and quadratic hygrometers. Other equipment or complements for biology laboratories have an excellent 100% percentage of categories, the fulfillment in biology laboratories is very complete such as the presence of contact boxes, fire extinguishers, first aid equipment, wall clocks, and trash cans. Educational equipment used to help communication in learning or educational media in biology laboratories i.e. whiteboards have excellent conditions with a percentage of 100%. Consumables or goods used and exhausted in a relatively short time in the biology laboratory of Sma Negeri 1 Polokarto have a percentage of 100% and are always available in the laboratory because at Sma Negeri 1 Polokarto often practice so that the school always provides the consumables.

Biology laboratories serve as a place for practical biological learning activities that require special equipment. Fulfillment of biological laboratory facilities has reached the maximum due to the renovation or repair of damaged infrastructure facilities. The fulfillment of facilities such as tools and basic materials measuring practicum has been carried out by the school with planned in advance, namely at the end of the year and has been agreed jointly by the principal, deputy infrastructure facilities, administrative employees in the meeting of the school's activity plan and budget (RKAS) which regulates facilities and infrastructure. All the necessary needs in the teaching and learning process have been discussed jointly by the school. The ideal laboratory must be equipped with various facilities and competent labor technicians to facilitate the implementation of practicum activities in the laboratory. However, in Sma Negeri 1 Polokarto there is no Laboran who prepares tools and materials for

practice other than maple teachers. There is no labor so the preparation of practicum is done the day before.

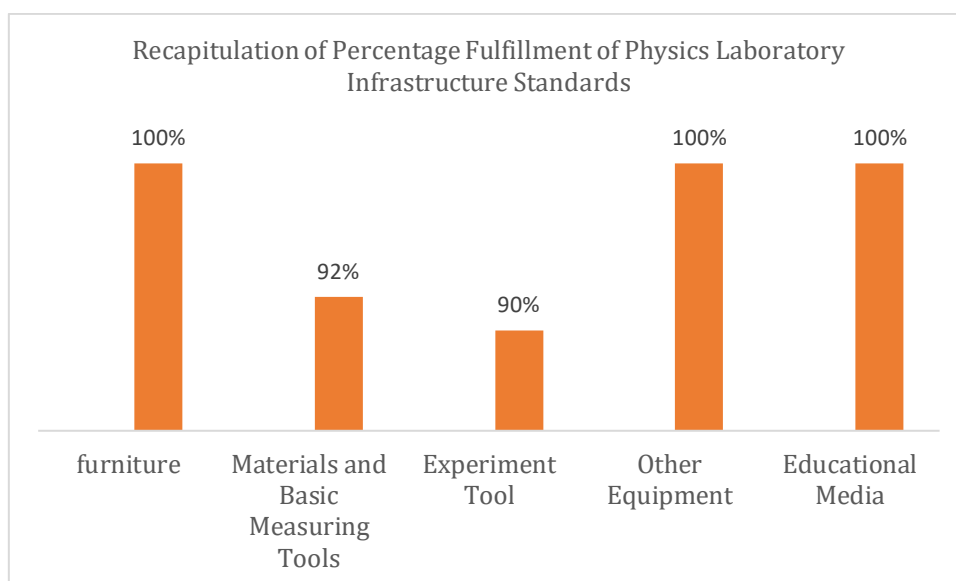
2. Physics Laboratory

In the interview about the facilities and infrastructure of the physics laboratory, there are two components of the indicator that are at the center of the question, namely the fullness of the physics laboratory infrastructure. The results of interviews and observations of researchers on infrastructure in the physics laboratory are as follows:

Table 2. Results of Observation and Interview of Physics Laboratory Space Infrastructure

Type	Standard Ratio	Real Ratio	Desc.
Physics laboratory space	The biology laboratory room can accommodate a minimum of one study group. Minimum ratio of biology laboratory space 2.4 m ² / learners.	Biology laboratory space can be filled by one study group with a capacity of ± 36 learners, and a building area of 120 m ² .	Appropriate
Preparation Room	The physics laboratory room is minimally equipped with a preparatory room that has a good electrical installation and air ventilation.	The physics laboratory room is equipped with a preparatory room that has a good electrical installation and air ventilation.	Appropriate
Lighting	The physics laboratory space needs to be equipped with sufficient and adequate lighting consisting of a network of wires, ikring, switch lights and sockets.	The lighting of the physics laboratory room is good, there are windows that allow light to enter, there are 3 light bulbs with good conditions.	Appropriate
Storage Warehouse	The physics laboratory room is minimally equipped with a storage room that has electrical installations, good air ventilation and mobeler facilities such as tool cabinets, material cabinets.	The storage room or warehouse there are electrical agencies, air vents, tool cabinets, material cabinets, which are still good and can be locked.	Appropriate
Clean water is available	There is a sink and clean water.	Handwashing or washtafle already has 6	Appropriate

Hasil rekapitulasi analisis data yang diperoleh peneliti dari hasil skor observasi mengenai sarana prasarana dilaboratorium fisika dapat dilihat dari gambar grafik 2 tentang persentase pemenuhan sarana prasarana laboratorium fisika.



Graph. 2. Percentage of Fulfillment of Standards of Physical Laboratory Infrastructure Facilities

From graph 2 recapitulation of the fulfillment of standards of physical laboratory infrastructure facilities can be obtained the results of research that infrastructure facilities that have met the standard are 100% prabot with excellent categories and available in full. Basic materials and gauges have a percentage of 92% but there are still incomplete basic materials and measuring instruments such as Dynamometers (Precision Springs) and loudspeakers. The experimental tool has the lowest percentage which is 90% there is still an unavailable trial tool that is the trial manual. Other equipment has a 100% percentage with the fulfillment of equipment in accordance with permendiknas standard No. 24 of 2007, namely contact boxes, fire extinguishers, first aid equipment, trash cans, and wall clocks. Educational media in the form of whiteboards in the physics laboratory of Sma Negeri 1 Polokarto has a 100% percentage with excellent conditions.

From the percentage graph of the fulfillment of standards of facilities and infrastructure of physics laboratories there are two infrastructures that have a percentage of less than 100% namely basic materials and measuring instruments and experimental tools. Reasons why equipment such as Dinamometer (Precision Spring), Loudspeakers and manual experiments in this physics laboratory do not exist because the goods in the physics laboratory adjust from government assistance so that although in the draft proposals exist but in reality the goods received are not appropriate. For the procurement procedure itself, the first is the government to give a puff if there is the help of labotatorium tools to schools, then State High School 1 Polokarto submits a draft proposal according to the needs of the central government that determines the goods and prices.

The physics laboratory serves as a place for practical physics learning activities that require special equipment. When the observation laboratory physics is under repair or renovation. There are four objectives of laboratory activities, namely encouraging students to (1) practice looking at problems and addressing them, (2) discovering facts and new principles, (3) developing the ability to cooperate, (4) develop a critical attitude¹¹ (Santiboon: 2012). The practicum room is a major part of a school physics laboratory. The practicum room is the space where the physics learning process takes place in the laboratory. The process of learning physics in a practicum space can be a demonstration or demonstration, an individual or group practicum, and research.

In the study of physics in school the existence of laboratories becomes very important. In the context of the process of learning to teach physics in schools, often the term laboratory is interpreted in a narrow sense, namely a room in which there are a number of tools and practicum materials. Based on the description above, it can be concluded that a physics laboratory is a place both open and closed that contains an experimental tool or practicum of physics lessons that serves to provide certainty, ferment a theory, concept or law in physics and strengthen information.

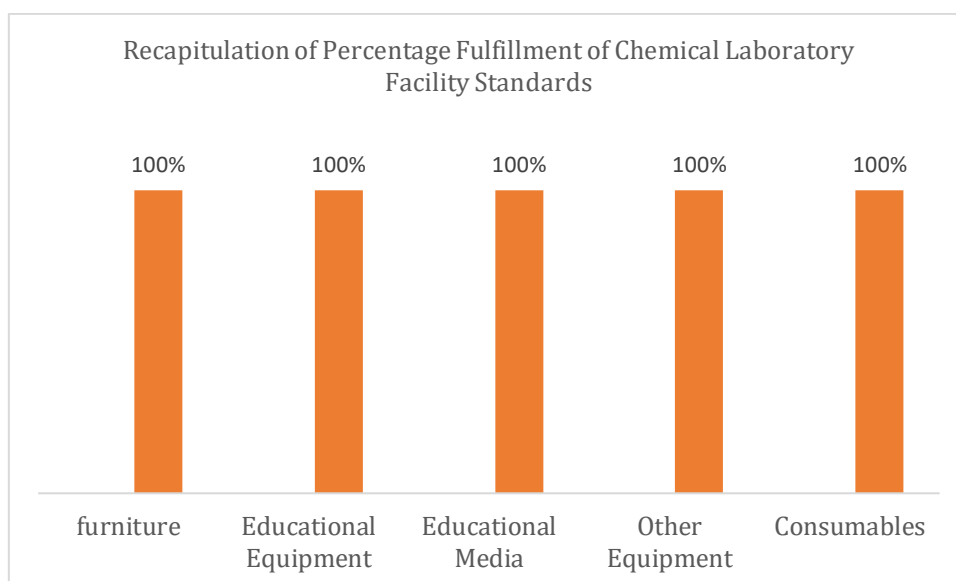
3. Chemical Laboratory

The results of interviews and observations of researchers on infrastructure in the chemical laboratory are contained in table 3 as follows.

Table 3. Results of Obseration and Interview of Chemical Laboratory Infrastructure

Type	Standard Ratio	Real Ratio	Desc.
Chemistry laboratory room	The chemistry laboratory room can accommodate a minimum of one study group. Minimum ratio of biology laboratory space 2.4 m ² / learners.	The chemistry laboratory room can be filled by one study group with a capacity of \pm 36 learners, and a building area of 120 m ² .	Appropriate
Preparation Room	The chemistry laboratory room is minimally equipped with a preparatory room that has a good electrical installation and air ventilation.	The chemistry laboratory room is equipped with a preparation room that has a good electrical installation and air ventilation.	Appropriate
Lighting	Chemical laboratory rooms need to be equipped with sufficient and adequate lighting consisting of a network of wires, ikring, switch lights and sockets.	The lighting of the chemical laboratory room is good, there are windows that allow light to enter, there are 3 light bulbs with good conditions.	Appropriate
Storage Warehouse	The chemistry laboratory room is minimally equipped with a storage room that has electrical installations, good air ventilation and mobeler facilities such as tool cabinets, material cabinets.	The storage room or warehouse there are electrical agencies, air vents, tool cabinets, material cabinets, which are still good and can be locked.	Appropriate
Clean water is available	There is a sink and clean water.	Handwashing or washtafle already has 6	Appropriate

The results of the recapitulation of data analysis obtained from the results of the ceklist observation score on facilities and infrastructure in the chemical laboratory can be seen from graph 3 image about the fulfillment of chemical laboratory infrastructure facilities as follows:



Graph. 3. Percentage of Fulfillment of Chemical Laboratory Infrastructure Standards

From graph 3 recapitulation of the standard fulfillment of chemical laboratory infrastructure facilities can be obtained the results of research that infrastructure facilities that have met the standards are 100% prabot with excellent categories and available in full. Educational equipment has a 100% percentage. Educational media in the form of whiteboards in the chemistry laboratory of Sma Negeri 1 Polokarto has a 100% percentage with excellent conditions. Other equipment has a 100% percentage with the fulfillment of equipment in accordance with permendiknas standard No. 24 of 2007, laboratory safety is a shared responsibility of both managers and users, therefore everyone involved must have work safety awareness. Efforts to maintain work safety include efforts to always prevent the possibility of accidents while working in the laboratory Teachers and students are one of the users of laboratory facilities who need to understand sufficient knowledge in terms of management about laboratory safety. Indicators of the safety of the teacher's laboratory work is responsible in the event of an accident in the laboratory, Sma Negeri 1 Polokarto has provided a fire extinguisher that is easy to operate and provides first aid equipment in the laboratory. While the percentage of consumables by 100%. Of the five categories of furniture, educational equipment, educational media, other disclosures, and consumables of chemical laboratories at Sma Negeri 1 Polokarto is good and complete.

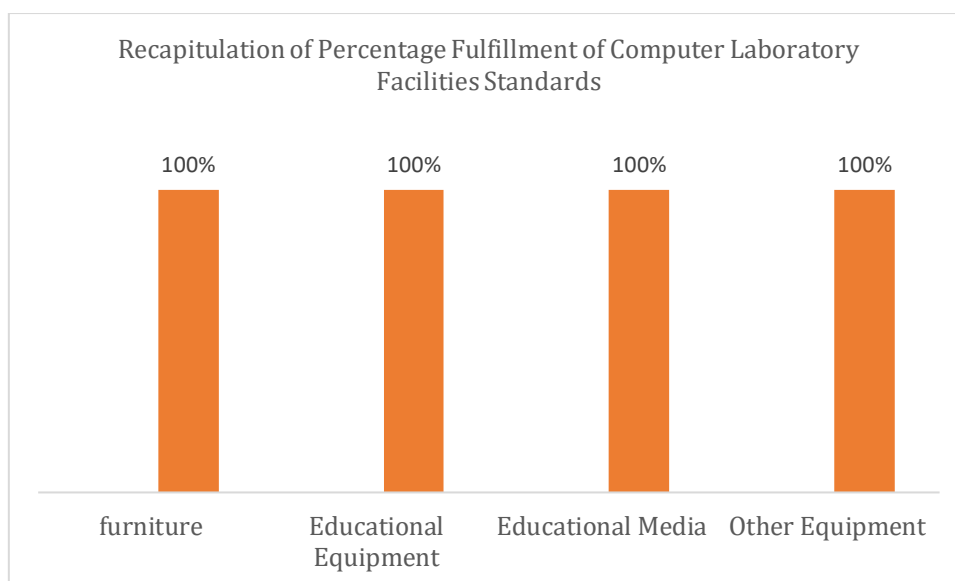
Chemical laboratories serve as a place for practical chemical learning activities that require special equipment. Fulfillment of chemical laboratory facilities has reached the maximum due to the renovation or repair of damaged infrastructure facilities. The fulfillment of facilities such as tools and basic materials measuring practicum has been carried out by the school with planned in advance, namely at the end of the year and has been agreed jointly by the principal, deputy infrastructure facilities, administrative employees in the meeting of the school's activity plan and budget (RKAS) which regulates facilities and infrastructure. All the necessary needs in the teaching and learning process have been discussed jointly by the school. Therefore, it is necessary to control the tools and materials by the school so that it is not damaged or can be used optimally. In addition, it is also necessary to collect inventory in chemical laboratories so that facilities and infrastructure are not damaged or lost.

4. Computer Laboratory

Table 4. Results of Obseration and Interview of Computer Laboratory Room Infrastructure

Type	Standard Ratio	Real Ratio	Desc.
Computer laboratory space	Computer laboratory space can accommodate a minimum of one group Study that works in groups of @ 2 people. Minimum ratio of computer laboratory space area of 2 m ² / learners. To study group with learners less than 15 people, minimum area Computer laboratory space 30 m ² . Minimum width of laboratory space Computer 5 m.	The computer laboratory space can be filled by one study group with a capacity of ± 36 learners, and a building area of 120 m ² .	Appropriate
Lighting	Computer laboratory space needs to be equipped with sufficient and adequate lighting consisting of a network of cables, ikring, switch lights and sockets.	The lighting of the computer laboratory room is good, there are windows that allow light to enter, there are 3 light bulbs with good conditions.	Appropriate

The results of the recapitulation of data analysis obtained from the results of the checklist observation score on facilities and infrastructure in chemical laboratories can be seen from graph 3 about the percentage of fulfillment of chemical laboratory infrastructure facilities as follows:



Graph. 4. Percentage of Standard Fulfillment of Computer Laboratory Infrastructure Facilities

From graph 4 recapitulation of the standard fulfillment of computer laboratory infrastructure facilities can be obtained the results of research that infrastructure facilities that have met the standards are 100% prabot with excellent categories and available in full. Educational equipment has a 100% percentage. Educational media in the form of whiteboards in the computer laboratory of Sma Negeri 1 Polokarto has a 100% percentage with excellent conditions. Other fixtures have a 100% percentage with excellent categories. All those in the computer laboratory are in accordance with permendiknas standard No. 24 of 2007. The actual condition of the facilities and infrastructure in the computer laboratory of Sma Negeri 1 Polokarto is more complete than the standardization criteria.

A condition is the state of an object or thing. The condition of the facilities and infrastructure of sma Negeri 1 Polokarto computer laboratory meets the standards of high school level laboratory, permendiknas no. 24 of 2007, it can be seen from the building and the conditions in it. The computer laboratory building in this high school is in accordance with high school level laboratory standards with an overall area of 120 m2.

Computer laboratories serve as a place to develop skills in the field of information and communication technology. The results of observations in the laboratory of Sma Negeri 1 Polokarto showed the condition of the facilities and infrastructure of sma Negeri 1 Polokarto computer laboratory meets the standards of high school level laboratory, Permendiknas no. 24 of 2007, it can be seen from the building and the conditions in it. The computer laboratory building in this high school is in accordance with high school level laboratory standards with an overall area of 120 m2. Even the computer lab is equipped with a projector layer that is not mentioned in permendiknas standard No. 24 of 2007, and has a good room condition only the student seating position does not face the projector layer so as to make students uncomfortable. When observations were made, the computer laboratory of Sma Negeri 1 Polokarto only got help in the form of several new notebooks and routers.

5. Conclusion

The laboratory at Sma Negeri 1 Polokarto is one of the infrastructure facilities that aims to support processes or activities related to the school process, both the learning process and things related to the activities of school residents, for it is expected that with the maximum laboratory facilities this Sma Negeri 1 Polokarto becomes a school that can support the school activity process, especially the KBM process.

Based on research conducted at Sma Negeri 1 Polokarto showed that:

1. The laboratory is an important part of the learning process.
2. Overall the laboratory at Sma Negeri 1 Polokarto has met permendiknas standard No. 24 of 2007.
3. Chemical and computer laboratory facilities are complete or adequate
4. Lack of complete equipment in biology and physics laboratories
5. There are several procurement of facilities and infrastructure that are not carried out from the school to the government.

References

- Anita Christy Simatupang, A. F. (2021). Analisis Sarana dan Prasarana Laboratorium Biologi dan Pelaksanaan Kegiatan Praktikum Biologi Dalam Mendukung Pembelajaran Biologi Kelas XI. *Jurnal Pelita Pendidikan*, 109-115.
- Hayati, A. (2020). Evaluasi Standar Sarana dan Prasarana Laboratorium IPA di Sekolah Model SMA Negeri 7 Bengkulu Selatan. *Jurnal Manajer Pendidikan*, 14, 60- 67.
- Hera, R. (2017, Maret). Studi Kasus Pengelolaan Laboratorium SMA Lab School Universitas Syiah Kuala Banda Aceh. *Jurnal Bionatural*, 4, 34-45.
- Maryadi, N. d. (2018, Januari). Manajemen Sarana dan Prasarana Pendidikan dalam Pembelajaran di SD. *Jurnal Manajemen Pendidikan*, 13, 15 - 23.

Megasari, R. (2014, Juni). Peningkatan Pengelolaan Sarana dan Prasarana Pendidikan Untuk Meningkatkan Kualitas Pembelajaran di SMPN 5 Bukittinggi. *Jurnal Adminisreasi Pendidikan*, 2, 637 - 831.

Meimuharani, N. I. (n.d.). Pengelolaan Sarana dan Prasarana Pendidikan Untuk Meningkatkan Kualitas Pembelajaran di MAN 4 Aceh Besar.

Mutiara Adilah, A. E. (2021, Februari). Analisis Standarisasi Laboratorium Biologi Sekolah Menengah Atas (SMA) di Kota Pontianak. *Jurnal Ilmiah DIDAKTIKA*, 21, 195-207.

Sarjono. (2018, Agustus). Pentingnya Laboratorium Fisika di SMA/MA Dalam Menunjang Pembelajaran Fisika. *Jurnal Madaniyah*, 8, 262-271.

Saryono, B. S. (2016, April). Manajemen Pengelolaan Sarana dan Prasarana Pendidikan Jasmani di SMA Negeri Se Kota Yogyakarta. *Jurnal Pendidikan Jasmani Indonesia*, 12, 23 - 33.

Yaum, S. (n.d.). Sarana dan Prasarana Administrasi Pendidikan. Retrieved from <https://www.academia.edu/21974393/>

Hilmiati. (2021). Pemanfaatan Laboratorium Komputer Sebagai Sumber Belajar Pada Pembelajaran Tik (Studi Kasus di SMP N 2 Pagar Alam). *Jurnal Ilmiah Teknologi Pendidikan*, 216-217.