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Journal homepage : <https://jurnal.iainponorogo.ac.id/index.php/insecta>

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## **The Effectiveness of Utilization of the Science Laboratory in Integrated Science Learning at MTs Unggulan Al Qodiri 1 Jember**

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### **Article Info**

Article history:

Received: September 21, 2021

Accepted: October 26, 2021

Published: November 29, 2021

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### **Keywords:**

science teaching, pandemic, online learning.

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### **ABSTRACT**

The purpose of this study was to determine the effectiveness of using science laboratories and the factors that affected the effectiveness of using science laboratories in supporting learning at Mts Unggulan Al-Qodiri 1 Jember. This research was a qualitative research. Data collection techniques in this study used observation guidelines and interview guidelines. The data obtained were from the results of interviews with one of the science teachers as well as the head of the laboratory at MTs Unggulan 1 Alqodiri Jember. The results showed that the use of the science laboratory at MTs Unggulan Al-Qodiri 1 Jember can be said to be effective in supporting learning in schools. This can be seen from the effectiveness of the use of science laboratories facilitated with complete equipment, it can be said to be 90%. The tools contained in MTs Unggulan Al-Qodiri 1 Jember are very effective in utilizing the Science Laboratory in Integrated Science Learning. Based on this explanation, the function of the laboratory as a means of strengthening students' understanding, increasing learning motivation and learning outcomes through science experiment at MTs Unggulan Al-Qodiri 1 Jember has been effective.

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### **INTRODUCTION**

Education is a process by which everyone's attitudes and behavior can be changed during the process of human maturation through various efforts such as training and teaching. As set in UU about the National Education System in UU Nomor 20 tahun 2003, Education is creating a learning atmosphere and learning process consciously and planned so that students can actively develop their potential in all aspects of life (Prayitno, 2009). Every educational institution is very dependent on facilities and infrastructure.

This corresponds to Peraturan Pemerintah Republik Indonesia No. 1. Pasal 42 Standar Nasional Pendidikan Nomor 19 Tahun 2005 stipulates that every educational unit is required to have furniture, educational equipment, media, books and other learning resources, as well as other equipment that can be used to support regular and continuous learning activities (Kustiana, 2019).

One of the subjects that require theory and practice is natural science (IPA). Natural science can be said as a science that studies the whole nature systematically, sequentially and universally, and is a science that collects data from experiments and observations (Kustiana, 2019). In comprehensive science learning, it has the advantage that it can save time, social skills and children's thinking abilities by combining several learning areas (Lestari, 2012). In disseminating knowledge in an integrated manner, appropriate forms of learning media are needed.

Science teaching in each material can be delivered by providing facts, theories and principles about the natural laws that exist around (Sumintono et al., 2010). In a model that is generally applied in countries with advanced education, science teaching is carried out through sharpening students' abilities in solving environmental problems using scientific methods. Learning activities are generally located in the laboratory using equipment and materials needed specifically for each material. Practical activities in the laboratory are factually proven to increase students' critical attitudes, skills and scientific attitudes.

In order to achieve that, laboratory management and science teachers are needed who have professionalism, ability and understand the material in learning. So that the material presented becomes an effective stimulus for students to better understand the nature of science from various aspects of everyday life in particular. In order to have outputs like these things, it is necessary to regulate or manage which will be carried out by education policy makers, managers and other education actors so that the science laboratory is able to produce a generation of researchers who are innovative and have a research ethic basis.

The terms laboratory (lab) and practicum are often used in education, especially in the exact sciences, but precise definitions are rarely found. In general, a lab or practicum is defined as a general activity about students interacting with a material to observe natural phenomena (Hofstein and Mamlok-Naaman, 2007). For years, educators have believed that science cannot mean anything without practical activities, especially in school laboratories.

It is the responsibility of every individual who uses the laboratory to always maintain occupational safety and health when having activities in the laboratory. Many practitioners and observers have realized the importance of practicum activities which cannot be ruled out in science learning in particular, but there are still many who ignore the importance of occupational health and safety. So it is necessary to have two things that have this urgency into culture or behavior even though they cannot be present instantly. The importance of making occupational health and safety a school culture which all school members follow.

Laboratories must have very important and fatal tools such as treatment and prevention tools that are able to deal with infections and prevent transmission effectively. The group of laboratories that work with microorganisms is divided into four according to the World Health Organization (WHO). First, Laboratory Level 1 or Basic Biosafety. This laboratory functions as a basic laboratory and teaching laboratory.

Second, Laboratory Level 2 or Basic Biosafety. General laboratories are used for research, research services and health diagnostics. This Level 2 class laboratory has a higher risk level than the previous level due to the presence of pathogenic microorganisms that have a low risk for research. Although the risk is low, it can still cause serious illness and infection in individuals in the laboratory, pets and communities in the laboratory environment.

Three, is a Level 3 Laboratory. Diagnostic services that require intensive examination are carried out in this laboratory. This laboratory also maintains microorganisms with a

medium risk level and is not infectious to animals and humans from individuals to others. Finally, Laboratory Level 4 or Maximum Biosafety. Specific research with pathogenic microorganisms is carried out in this level laboratory. Any microorganism synthesized in this laboratory can cause infection, disease and be transmitted directly and indirectly in animals and humans.

The laboratory in the school uses microorganisms that are not harmful to human and animal health. The laboratory in the school is classified as a level 1 laboratory. This facility specifically used for the secondary school level does not require special safety equipment but it is still necessary to have hand washing basins and basic personal protective equipment which will be used by every individual who works in it.

However, at the Level 1 laboratory which is specifically devoted to teaching science. Basic security rules need to be met, in order to avoid incidents that can endanger students as well as teachers and administrators. Level 1 laboratories are expected to have at least one equipment such as an emergency shower or a laundry room. Thus, the laboratory is easier to clean and there is a place to wash hands after or after contact with chemicals during the practicum.

Accordance with the function of the science education laboratory, where teachers and students while in the laboratory can conduct experiments and research, the laboratory must assist in carrying out learning activities. So a high school science lab design or layout might follow the following pattern:

#### 1. Laboratory Location

If it is still possible, it is highly recommended to arrange the laboratory in a "north-south" direction. These locations are closely related to the amount of sunlight entering and related to the installation of windows or the number of windows required.

#### 2. Room Size

The science laboratory functions as a place for practical science learning activities that require special equipment. The area of the laboratory is mainly determined by the type of room according to its needs and uses. The learning space should be at least  $2.4\text{m}^2/\text{student}$ . So,  $(2.4 \times 40)\text{m}^2 = 96\text{m}^2$ . The minimum width of the science laboratory room is 5m. The room can be rectangular, for example  $(8 \times 13)\text{m}^2 = 104\text{m}^2$  or  $(9 \times 11)\text{m}^2 = 99\text{m}^2$ . The shape of this long room has a weakness in the distance between the teacher and students, the students sitting at the back are too far away. To reduce this weakness, it is recommended that the room be square.

#### 3. Equipment

Laboratory equipment is largely determined by the type of laboratory. A SMP/MTs has at least one science lab. If the school has sufficient funds, the lab space that can be divided into a physics science lab, a biology science lab, a chemistry science lab, and an IPBA lab will make it easier for administrators and teachers to prepare themselves for students. The tools and materials used by students are more effective.



Figure 1. Science Laboratory Design (Junior High School)

**Keterangan**

- A Ruang Administrasi dan Persiapan Alat dan Bahan
- A1 Meja Kepala Laboratorium
- A2 Meja Tempat Komputer
- A3 Lemari Buku
- B Ruang Penyimpanan Alat dan Bahan
- B1 Meja Persiapan Alat
- B2 Lemari Penyimpanan Alat dan Bahan
- C Ruang Pelaksanaan Praktikum
- D Meja Tempat Tas/ Buku Siswa
- E Lemari Penyimpanan Alat dan Bahan
- F Meja Tempat Wastafel
- G Meja Guru Instruktur
- H Lemari Asam
- I Meja Praktik Siswa
- J Papan Tulis
- K Kotak P3K
- L Tempat sampah
- 1 Pintu Masuk
- 2 Pintu Keluar
- 3 Pintu Ruang Administrasi

Practicum at school is supported by suggestions and infrastructure that support students, especially in the laboratory. The laboratories of each school can be served as a means of supporting the smooth running of learning activities, and the field of education can be achieved, one of which is the cognitive field (Arham et al., 2020).

The facilities and infrastructure need to be managed. Lab management refers to activities that ensure the sustainability of features in the managers and users of lab facilities (IPA infrastructure), as well as in the lab. As a general rule, laboratory management is a shared responsibility between administrators and users. So there needs to be awareness in organizing, maintaining and prioritizing work safety for every individual in the school. The arrangement and maintenance of the laboratory is an effort to ensure that the laboratory always functions properly, and efforts to maintain work safety include the possibility of accidents occurring while working in the laboratory and in it.

The basic principle that must be obeyed and applied so that the laboratory can operate properly and accurately is one of them is the improvement and development of Human Resources (HR) in the laboratory. In structural laboratories, human resources are needed to manage laboratory activities and play a role in supporting existing facilities.

Human resources who have the skills and knowledge of laboratory equipment and chemicals, laboratory managers are suitable for this area of expertise and responsibility. Acquiring basic knowledge is the initial requirement, and skills contribute significantly to the success of a well-run lab.

The government issued Peraturan Menteri Pendidikan Nasional No. 26 tahun 2008. This includes qualification and competency standards for laboratory managers, technicians, and laboratory assistants. To meet the standards, schools routinely program to participate in training and education on laboratory management and operating procedures (SOP) for scientific laboratory equipment in accordance with Standard Operating Procedures (SOP).

Learning science in high school, as defined and explained in the 2013 curriculum, students carry out learning activities through a scientific process that includes observation,

inquiry, examination, inference, presentation, display, and create. Students develop Science Process Skills (SPS) by observing, describing, classifying, measuring, conducting experiments, analyzing data, and drawing conclusions.

In principle, scientific learning in secondary schools should place a lot of emphasis on self-knowledge or exploration activities, inviting students as learning subjects to have direct contact with the objects being studied. Develop scientific attitudes and skills through activities with a question-and-answer-based learning approach. Learning takes place in at least three contexts, namely science in the context of daily life, the surrounding environment and society, so that there is a link between science, the environment, technology, and community relationships (classmates).

The facilitator in learning is a teacher who is in the class when learning science in particular. The teacher's role is to facilitate, motivate, direct and guide students in inquiry activities. The role of students in scientific learning is the role of investigative agents (investigators). Therefore, the science laboratory is an indispensable tool in the investigative science learning process and for the development of SPS.

Laboratories need to be managed properly. Laboratory management has components which are divided into two categories. The first group is a group of human resources or laboratory management individuals. Furthermore, the managed groups such as buildings, facilities, materials and tools in the laboratory.

The first is the management group or management team. The management team is one of the key elements of laboratory management. The management team is the human resources responsible for performing laboratory management tasks. Based on Permendiknas No. 26 tahun 2008, standards for school/madrasah lab staff include school/madrasah lab leaders, school/madrasah lab technicians and school/madrasah lab assistants.

The team formed to manage the laboratory, ideally consists of individuals who have direct contact in all laboratory activities according to their duties and responsibilities. Each individual must understand and understand his field of work, be consistent with the applicable regulations in his workplace, and stay focused on the objectives and functions of the laboratory being managed. Therefore, it is necessary to build good relations between personnel involved in laboratory management based on the perception that they are an important part of the system and education.

The development of technical and administrative personnel from time to time needs to be continuously improved and encouraged in order to achieve optimal work performance. The success of the lab's operations mission will be determined by staff and support from other parts of the school, from principals and science teachers to cleaning and security staff. To achieve the learning/practice objectives, the management team must pay special attention to the administrative and operational aspects of internship activities and laboratory work safety. Meanwhile, the principal's job is to pay attention and evaluate the most important use of laboratory time, respect the workload of laboratory managers, personal health working in laboratories and most importantly the safety of students while working in laboratories.

Second, the group managed by the laboratory generally includes laboratory buildings, laboratory facilities, laboratory equipment, and laboratory equipment. So that they can carry out their respective management well, various efforts can be made in accordance with the facilities, functions, and objectives of the laboratory. In order to make progress in laboratory management, optimization is needed.

Efforts to use a facility that is already available is optimization. In the laboratory, optimization is the use of school laboratories with good settings in order to obtain maximum benefits and support the output of science learning that requires practical practice in the lab. It is hoped that this optimization can have a direct impact on students, such as increasing competence in the aspects of attitude, skills in the laboratory and knowledge primarily in the

scientific process.

Optimization of laboratory utilization is carried out by:

- Preparation of laboratory usage schedule
- Structural list of tasks for students, teachers and administrators while in the laboratory
- Efficient placement of equipment and materials for students and teachers
- Continuous maintenance schedule.

In order to support Laboratory Optimization, it is necessary to have good administration so that there is written data that can be observed its progress. Administration itself is a documentation process consisting of recording activities of all facilities and infrastructure, human resources, and finance as well as laboratory activities. Record keeping is very important to support laboratory optimization. The process of recording or administering includes many things that aim to make the laboratory can be used in an organized and systematic manner. The first administration is a complete record of physical facilities such as infrastructure suggestions. For example, the number of rooms owned by the laboratory and their uses, the chemicals available in the laboratory and other physical facilities. Laboratory room administration. An administration must have a plan that describes the structure or parts of the room such as the size of each room, electrical installations and water piping. These rooms must be fully recorded and documented such as their names, sizes, and capacities. Furthermore, administration related to public laboratory facilities, such as protective equipment from work accidents, blowers, gas installations and power sources.

Financial administration, human resources, and laboratory activities. Administration related to finance for laboratory operations should be recorded properly the origin of the funds and their use. Meanwhile, the administration of human resources, including recording the qualifications and competencies of teachers and laboratory managers, uses these data as material for designing learning programs and optimizing laboratories and their future development. Meanwhile, activity administration consists of a record of activities in the laboratory complete with a description of the time, tools and materials needed.

The results of observations and interviews conducted in MTs Unggulan Al-Qodiri 1 Jember, it can be seen that MTs Unggulan Al-Qodiri 1 Jember already has a science laboratory. However, the science laboratory there has not been used optimally for a while during the learning process, this is because the laboratory layout is inadequate, resulting in the low efficiency of science learning during the pandemic.

The use of laboratories plays a very important role in realizing the effectiveness of science learning in students (Novianti, 2011). But currently in MTs Unggulan Al-Qodiri 1 Jember has made efforts to develop a new spatial plan. The purpose of this research is to find out how the effectiveness of the use of the science laboratory in integrated science learning.

## **METHODS**

The main data sources in qualitative research are words and actions. the rest is additional data such as documents and others.( Lofland, 1984). Words and actions are the main data source the author does with written notes from interviews as evidenced by recordings. The main data source approach through interviews is the result of listening and asking activities, because it is the main activity.

The research method is a qualitative research according to Bogdan and Taylor (Moleong, 2004). The technique of collecting data is by interviewing and observing, therefore an interview guide and an observation guide are made, by looking at the making of the grid.

This research is a qualitative research. The research location is in MTs Unggulan Al-Qodiri 1 Jember. This research was conducted on April 5, 2021. The data collection

technique used in this research is to use observation guidelines and direct interview guidelines. The data obtained is based on the results of an interview with one of the science teachers who is also the head of the laboratory at the MTs Unggulan Al-Qodiri 1 Jember.

## RESULT AND DISCUSSION

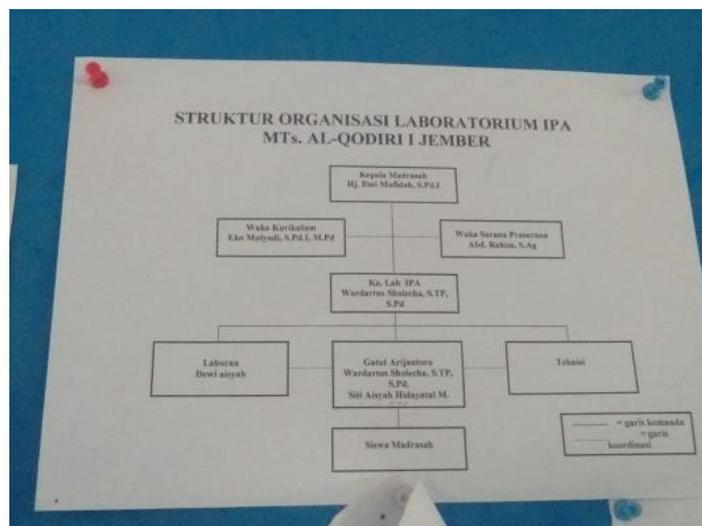
The function of the science laboratory at MTs Unggulan Al-Qodiri 1 Jember itself has been used effectively. The effectiveness of the use of laboratories in science learning also runs well and is coordinated between teachers, students and laboratory managers. Because the management of the science laboratory at MTs Unggulan Al-Qodiri 1 Jember is structured and complete, both administrative and infrastructure.

The head of the laboratory stated that the science laboratory was used for several materials in integrated science learning that required practicum, such as to introduce students to cells, tissues to researching the content of food with liquid indicators. Currently the science laboratory there has just undergone repairs. With the room still not neatly arranged, because all the items have not been moved, but the science laboratory is still used by science teachers and students in integrated science practicum learning.

The time for using the science laboratory is arranged according to the schedule for class VII, VIII and IX. The preparation of the schedule was agreed upon by the head of the laboratory and all Al-Qodiri science teachers. In addition, the organizational structure in the science laboratory is also made separate between subject teachers and laboratory assistants, thus facilitating coordination in the use of laboratories when conducting practicals.

During practicum activities in the laboratory, students are guided and supervised by a science teacher in the implementation of the practicum. Practicum implementation activities adjust science material that requires practical work in the laboratory, for example on cell observation material and others. The science laboratory in integrated science learning is very important for students and very useful, because the material will be more easily understood by students by doing practical work in real (fact) than just learning in class in the form of writing and pictures in books.

Based on this explanation, the function of the science laboratory as a means of strengthening students' understanding in integrated science learning through practicum at MTs Unggulan Al-Qodiri 1 Jember has been effective. This is in line with the opinion (Novianti, 2011) that the laboratory is a place to conduct experiments or research. Utilization in a laboratory has an important role in realizing the effectiveness of science learning in students.



**Figure 2.** Organizational Structure in the Laboratory at MTs Unggulan Al-Qodiri 1 Jember

The data in this study, shows the effectiveness of the utilization of the science laboratory facilitated with complete equipment, which can be said to be 90%. The tools contained in the science laboratory at MTs Unggulan Al-Qodiri 1 Jember have been effectively used in the Utilization of the Science Laboratory in Integrated Science Learning.

The manager of the science laboratory at MTs Unggulan Al-Qodiri 1 Jember stated that the Integrated Science teaching teacher and science laboratory laboratory assistant first managed the tools and materials before the practicum activities were taught. Although the number of tools available is still lacking, the practicum can run well by using an alternate system.

Practicums that use certain equipment and materials, the teacher will record them and then submit them to the laboratory manager. So that practicums that require certain materials have been provided in full. Science practicum equipment in the Al-Qodiri laboratory is in very good and adequate condition, it is proven that the equipment can be used properly in science learning and practicum.



**Figure 3.** Some tools in the Laboratory

Before the practicum is carried out, the science teacher provides a science practicum module and relevant guidebooks to be used when practicum in the laboratory. Based on the results of the analysis, in learning that requires an Integrated Science practicum. Students can understand all the material well because the science teacher first introduces and explains how to use the equipment properly before students use it, so that students can understand well how to operate the practicum equipment and its implementation.



**Figure 4.** Salah Satu Karya Siswa IPA MTs Unggulan Al-Qodiri 1 Jember

The effectiveness of the use of the science laboratory in integrated science learning at MTs Unggulan Al-Qodiri 1 Jember is carried out by measuring the extent to which the

school can use the laboratory in integrated science practicum activities effectively. Integrated Science Learning by utilizing the Science Laboratory at MTs Unggulan Al-Qodiri 1, This can increase the effectiveness of student learning including:

- a. The use of the science laboratory can affect the improvement of student learning outcomes at MTs Unggulan Al-Qodiri 1 Jember. Nasution (Yuliana et al., 2017) states that motivation has three benefits including being able to encourage people to always want to know or do, determine a direction of action towards the goal to be achieved, and select actions to determine an action. must be done whose main goal is to achieve an initial goal.
- b. Motivation is a determining factor whether something is good or bad in achieving goals, so the greater the motivation, the greater the success, do not want to give up before doing, and always study hard to improve academic achievement.
- c. The effect of the use of laboratories on Integrated Science subjects is very positive on student learning outcomes. The results of this study are in line with the results of research (Simalango & Zainuddin, 2008) which states that a learning outcome by using the practicum method is more effective than learning outcomes without using the practicum method in integrated science learning. In this study, the effectiveness of the science laboratory was demonstrated by direct experience to students by observing, exploring and understanding the subject matter.

## CONCLUSION

The analysis that has been carried out allows researchers as writers to draw conclusions about the effectiveness of using the science laboratory for integrated science learning at MTs Unggulan Al-Qodiri 1 Jember by measuring the extent to which schools can be utilized. Laboratory in comprehensive scientific practice activities. This is taken from observations that have been obtained and complete equipment for practical needs, the level of utilization of science laboratory support for learning at MTs Unggulan Al-Qodiri 1 Jember can be said to be around 90%.

The tools in MTs Unggulan Al-Qodiri 1 Jember are very effectively used during science practicums in integrated science learning. Efficient use of science laboratories can increase students' learning motivation, and can also further improve student learning outcomes. The use of laboratories for science learning can have a positive impact on student learning outcomes.

The function of learning in the laboratory, as a means of strengthening students' understanding in Integrated Science learning. Learning outcomes using practicum methods are better or more effective than learning outcomes without practicum methods in Integrated Science learning, by utilizing laboratories (practicums) in schools, so that they can provide a direct experience of their own, observe various things, explore and understand the material. Integrated Science learning materials, and can provide direction to students to always be motivated in the Integrated Science learning process at MTs Unggulan Al-Qodiri 1 Jember.

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