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The management of science laboratory at senior high school in digital era

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ABSTRACT

The problem in this research is how is the science laboratory management at SMA Negeri 4 Ogan Komering Ulu. The research objective was to identify and describe the science laboratory management at SMA Negeri 4 Ogan Komering Ulu. This study uses a qualitative approach which is an approach to the process of collecting data and information that is deep, detailed and systematic in order to understand the object of the research study. The results of this study generally concluded that the management of the science laboratory at SMA Negeri 4 Ogan Komering Ulu was good enough and supported science learning. This can be seen from the laboratory planning that has been implemented optimally even though there are still many limitations faced, the implementation of the planning has been carried out well, the budget for the laboratory is available even though it is not fully sufficient, the tools and materials in the laboratory are quite complete and has made innovations using virtual laboratories in science learning that are connected via the internet network.



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Introduction

Increasing the abilities and expertise of students can be achieved by building infrastructure in the field of education that is in accordance with the times. The development of increasingly sophisticated science and technology should be followed by progress in the mastery of various valuable skills. Efforts should be made to improve the quality of science, including in the field of natural science. In order to achieve scientific development, it is necessary to increase supporting facilities. Improving the quality of science learning can be done by increasing the maximum laboratory management procedures that refer to government regulations, laboratory staff who are competent in their fields. Things that laboratory staff can do in carrying out their duties include: planning, organizing, implementing, evaluating laboratory activities [1].

Laboratory officers are said to have a good job if the planned objectives can be carried out according to the assigned function. Activities to prove the truth of a theory and develop skills, thoroughness in thinking, painstaking, honesty and accuracy can be carried out in the laboratory. [2] said how to manage a laboratory based on the concept of standard management supported by adequate infrastructure and the expertise of the staff. To produce the right performance in an educational institution, the management components that must be carried out are planning, organizing, actuating, controlling.

The importance of labor as a source of learning science, in practice, it takes a way to organize and manage properly so that it is useful in learning activities properly. This is supported by the statement of [3] Explaining that a well-managed laboratory shows the existence of service quality management that pays attention to service principles for students and teachers in laboratory activities. In fact, there are still many science laboratories whose utilization is not optimal. Experiments in the science laboratory are unplanned, archived, unregulated and seem careless in their maintenance and are only used as a complement to buildings in school. While the hope is that there is more than that, namely as a place that can increase student interest, especially in science.

Etymologically, the laboratory in Latin is defined as a room, but in its development the laboratory is still interpreted as an experiment room [4]. Laboratories can be in the form of closed and open spaces for experiments to prove the truth of a theory [5]. Paying attention to the importance of the role of science laboratories in science learning requires good management in a laboratory organization in schools that is in accordance with technological developments or in this digital era. Innovation in science laboratory management is needed so that the laboratory can function optimally, especially in the era of a pandemic which forces us to implement distance learning. The learning process that utilizes laboratories should be followed by laboratory conditions that are ready to use, facilities and infrastructure in good condition and equipped with effective administration that utilizes technology in the digital era.

Based on preliminary observations at SMA N 4 OKU, it is known that SMA N 4 Ogan Komering Ulu is a reference school accredited A (very good) which is supported by the existence of supporting infrastructure, officers, and students. The building consists of a study room, laboratory, library, principal and waka and administration, teachers, prayer room, cooperative, canteen and other buildings.

There are 73% of SMA Negeri 4 Ogan Komering Ulu potential teachers who already have an educator certificate and 23% have a master's certificate and 20% are selected to be outstanding teachers at the district or provincial level, finalists in innovative teacher competitions and so on.

Potential students include that every year SMA Negeri 4 Ogan Komering Ulu is declared to have passed 100% and many students who have achievements in both academic and non-academic fields include winners of district level science olympiads, winners of youth scientific work (KIR), winners of appropriate technology competition (TTG), a young research finalist at the national level, as well as various competitions in the field of sports and other arts.

The theoretical use of this research is expected to add insight to the development of science and knowledge, especially those related to science laboratory management. Making input for the benefit of science development for interested parties to make further research on similar objects or other aspects that have not been covered in this research.

In practical terms, this research is expected to be useful for school principals, teachers, and staff of SMA Negeri 4 Ogan Komering Ulu and can be used as material for consideration to create more effective laboratory management. The schools in the Ogan Komering Ulu area, especially the senior high school level, are able to implement the maximum management of the science laboratory.

Method

The study chose a place in SMA Negeri 4 Ogan Komering Ulu which is located on Jalan Kolonel Wahab Sarobu, Sekar Jaya Village, East Baturaja District, Ogan Komering Ulu Regency, South Sumatra Province. This research lasted for 3 months, namely September to November 2020. Based on the purpose of this study, this research uses a descriptive qualitative approach with the type of phenomenology, which means that this research pays attention to and examines the focus of the phenomenon to be studied.

Before the researcher determines the informant, it is necessary to determine the situation which is the place where the social phenomenon actually exists. In order for the information obtained to be valid, interviews and preliminary observations should be carried out before conducting research. The researcher determined that the sources of information in this study were the principal, the head of the laboratory, the science teacher and several students. In collecting the research data, the researcher used three methods, namely: interviews, observation, and documentation.

Interviews were conducted to obtain data about events that could be in the form of direct recordings with information sources [5]. Records are taken to multiply information about science laboratory management whether it is in accordance with the objectives, functions and roles of management as described in the previous section. Guidelines for taking previously prepared records are made. [6] participatory observation or direct

observation is the direct observation of researchers by studying the interactions or relationships of the people concerned in carrying out ongoing activities. In observation, the researcher observes directly the situation to be studied.

The documentation taken can be in the form of photos of the results of activities that can be used as initial data to be processed into final data (Paizaluddin and Ermalinda, 2014). Scribbles or writings about people, places and events that have passed can be used as a source of information that can be used as data in an article [5]. Meanwhile, according to [7], documents that can be used as a source of research data are in the form of laboratory work programs, activity notes, bulletins, year-end reports, inventory books and circulation of laboratory facilities, reports on laboratory activities and documentation of laboratory facilities for SMA Negeri 4 Ogan Komering Ulu. Research results from observations and interviews will be increasingly valid and reliable if supported by photographs.

All data obtained in this study, both those obtained from interviews, observation and documentation, need to be analyzed in order to see how the management of a science laboratory, especially in planning, organizing, implementing and monitoring. The data obtained in the field were analyzed in the following stages: data reduction, data presentation and conclusion drawing. To maintain the validity of this research, the authors conducted observations and interviews and documented studies. It is hoped that by carrying out some of these activities the validity of the data obtained can be maintained. There are four criteria used, namely, extended observations, increased persistence, triangulation and testing the validity of the data.

Result

Planning

The results of observations and interviews with several components involved in the education of SMA Negeri 4 Ogan Komering Ulu show that there is a vision, mission and objectives in the activity plan prepared at the beginning of the school year which is compiled jointly between the principal, vice principal, and science teachers.

As stated by Mulyana (2006), from the perspective of customers, employees, owners, and other stakeholders, vision is a representation of the future organizational form. After conducting interviews with school principals, curriculum representatives, laboratory heads and science teachers, it can be seen that the science laboratory at SMA Negeri 4 Ogan Komering Ulu already has a vision, task and management goals because it realizes that the vision, assignments and goals are useful for the quality of laboratory management.

From the results of interviews between school principals, it was found that the principal had coordinated with the head of the laboratory and science teachers to formulate a vision, mission and goals. The head of the laboratory has not fully obeyed the laboratory leadership to develop the laboratory, while at the same time formulating a vision, mission and goals that become the basis or guideline for improving laboratory quality in the future. From the documentation data, the vision, mission and objectives of the science laboratory at SMA Negeri 4 Ogan Komering Ulu are as follows:

The vision of the IPA Laboratory of SMA Negeri 4 Ogan Komering Ulu is to create a Science Laboratory (Biology, Physics, and Chemistry) as a means of activities for students and teachers in the learning process through practicum and / or research to produce graduates who are environmentally sound, superior, innovative, creative, so that they can follow the development of science and technology which is based on faith and piety to God Almighty.

The mission of the SMA Negeri 4 OKU laboratory is to carry out the administration of the Science Laboratory, the provision of facilities and infrastructure for the science laboratory continuously to improve practicum services both in the learning and research process, to organize science practicum activities, to provide research and development services for scientific papers for students, teachers, and other users.

The scientific laboratory activity plan aims to assist teachers and students in carrying out scientific practicum activities and assisting schools in increasing the capacity of school educational facilities and infrastructure. Specifically, the objectives of the scientific laboratory plan include: 1) Motivating students to study science through practical activities, 2) Cultivating basic skills of experimenting through practice which is one of the requirements for scientific learning, 3) As a science learning tool based on facts and data, 4) Supporting classroom learning materials with face-to-face activities through practical proving scientific theories, 4) Helping schools to increase the capacity of school facilities and infrastructure, especially to maintain and improve the main and supporting facilities included in the science laboratory, so that the science laboratory functions can go as expected.

"The vision, mission and objectives of the science laboratory in its work program already exist, which are adjusted to the vision, mission and goals of SMA 4 Ogan Komering Ulu as one of the reference schools in Ogan Komering Ulu Regency. Among them is the arrangement and administration of tools and materials for the science laboratory, while the program is formulated by the principal, vice principal and head of the laboratory at the beginning of the school year.

From the results of the interview regarding the plan for the procurement of tools and materials, the head of the laboratory facilitates science teachers in submitting the need for practical tools and materials in accordance with their respective fields of study, then the principal submits to the principal through the representative of the facilities and infrastructure sector.

The school's procurement plan for equipment and materials is submitted to the provincial office, school committee and stakeholders with an interest in the procurement of science laboratory equipment and materials.

Organizing

In high school, science subjects include physics, chemistry, and biology. At SMA Negeri 4 Ogan Komering Ulu, there is no special laboratory assistant who manages the science laboratory, there are also several teachers with a science education background, in addition to their main duties as teachers, they are also laboratory managers.

The results of interviews with researchers with laboratory managers and science teachers at SMA Negeri 4 Ogan Komering Ulu showed that the school laboratory already had an organizational structure that was installed on the walls of the laboratory room. In addition, the organization is the head of the laboratory and science teacher.[8] in the laboratory structure, a laboratory management structure in schools must be established. The person in charge is the school principal, so the person in charge of the laboratory must understand and understand the importance of the science laboratory in optimizing the science learning process.

The recommended laboratory organizational structure is the principal, namely the principal, the vice principal in the field of curriculum and facilities, the head of the laboratory, laboratory technicians, laboratory assistants (laboratory assistants), and science teachers.

Actuating

Based on the results of the research, it shows that the procurement of laboratory equipment and materials is carried out by the person in charge of the laboratory, and the tools and materials needed are submitted to the principal.

The maintenance of laboratory equipment in order to maintain its integrity and scale is formulated by the person in charge of the laboratory and included in the annual work plan. The person in charge of the laboratory has compiled a list of laboratory tools and materials. The schedule of previous activities has also been set by the head of the laboratory in accordance with their respective class schedules. The selection of tools and materials was carried out by the head of the laboratory, the science teachers who were assisted by students after they did the practicum.

Controlling

Based on the results of the interview, the monitoring of activities in the laboratory is paid close attention to the head of the laboratory and teachers who are doing lab work in the laboratory so that unexpected accidents do not occur, the room is equipped with CCTV surveillance cameras.

Based on the results of observations, supervision was carried out by the Head and Supervisor of the South Sumatra Education Office. The time for supervision is uncertain, sometimes at the beginning or end of each semester.

No	Science Laboratory Management Standards	Result of observation of Science Laboratory Management
A	Planning	
1	Facility procurement program	there are 2 laboratory rooms (physics and chemistry)
2	Program to add tools and other supporting materials	There is already a long-term program planning, especially for the new version of laboratory equipment and supporting tools submitted at the beginning of the new school year
3	Activities to be carried out	There are already short, medium and long term plans

No	Science Laboratory Management Standards	Result of observation of Science Laboratory Management
4	Laboratory development	Sudah ada perencanaan program jangka panjang namun mengikuti dengan ketersediaan dana yang ada
5	Schedule of practicum activities	It has been scheduled according to the agreement between the science manager and teacher
B	Organizing	
1	Arrange an Organizing structure with the principal, vice principal, head of the laboratory, and science teacher	There is already an Organizing structure consisting of the principal, representatives of the curriculum field, representatives of the field of facilities, heads of laboratories and science teachers for laboratory assignments carried out jointly between the head of the laboratory and the science teacher
2	Division of tasks and authorities of science laboratory management personnel	There is already a division of tasks according to the principal's decree
C	Actuating	
1	Implementation of Work Programs	Work programs have been implemented, especially short-term programs
2	Practical implementation	Practical activities that have been carried out can be seen from the science teacher reports and documentation in the final semester or year-end reports
3	Giving Motivation to Teachers	It has been done by the principal and vice principal of the school
4	Pemberian Motivasi Kepada Siswa	There has been done by science teachers
5	General Administration (schedules, rules, financial records)	There is already attached a schedule of activities, rules and records of the science laboratory activities
6	Special Administration (inventory books, stock cards, equipment borrowing records, practicum service records)	There are already inventory books, stock cards, equipment borrowing records and laboratory space
7	Work safety in the science laboratory	There are already masks, laboratory coats, first aid kits, fire extinguishers, hand washing facilities but they are still incomplete
8	Rules of Conduct consist of general and specific rules	There are already rules for students, teachers in general, and special rules if students violate general rules such as breaking tools etc.
D	Controlling	
1	Supervision and Evaluation is carried out by the principal	Supervision is carried out by direct observation to the science laboratory
2	Monitoring and evaluation is done once a semester	Supervision is carried out in the form of activity results reports for one semester
3	Suitability of plans and implementation of work programs	Program implementation has not been carried out optimally, especially long-term programs which are constrained by costs.

Discussions

Planning

Based on the results of interviews with the principal and head of the science laboratory regarding the planning of science laboratory activities, it was found that there was an activity plan contained in the vision, mission and objectives. Vision, mission and goals are the initial plans that will be designed in the work program and will be realized in accordance with the work program.

The vision, mission and objectives of the laboratory are formulated jointly by the principal, vice principal in the field of curriculum, facilities and science teachers. The vision, mission and objectives are disseminated

to school residents through the WhatsApp group and in meetings with the teacher council, parents of students, and the education office after that they are socialized on the official website of SMA Negeri 4 OKU.

The preparation of a science laboratory work program is in line with the expert opinion, namely [9] which states that in planning the specified activities include what to do, how to do it, why do it, who does it, when it must be done, where the activity is carried out and how much it costs. that must be issued.

Checking and setting experimental objectives, methods, considerations, projects, programs, procedures, systemic, buging, and product provisions. Planning is also called hope that will be realized through a comprehensive thought process in the future with a systematic framework [10]

Organizing

The results of the interviews and observations show that the laboratory of SMA Negeri 4 Ogan Komering Ulu shows that there is a science laboratory organization consisting of the principal, the vice principal in the curriculum field, the assistant in the field of advice, the head of the laboratory, and science teachers.

The organization in the management of the science laboratory at SMA Negeri 4 Ogan Komering Ulu is already good, because it has referred to the Regulation of the Minister of National Education of the Republic of Indonesia Number 24 of 2007 concerning Standard of Facilities and Infrastructure for SD / MI, SMP / MTS, and SMA / MA.

Organizing is a process of distributing work and tasks and coordinating them to achieve organizational goals. Five actions must be taken in the organizing process (1) explaining the workload, (2) dividing work, (3) creating task groups, (4) working mechanisms, (5) monitoring and taking evaluation steps with the intention of clarifying success [11].

Laboratory organization is a system of cooperation from certain groups of people, goods, or units about the laboratory to achieve goals [12].

The people who are directly involved in laboratory organizations are the Principal, Deputy Principal of Curriculum Affairs, the head of the laboratory, the laboratory technical person in charge, laboratory assistants, and teachers of science subjects (Chemistry, Physics, Biology). The principal's duty is to provide guidance, motivation, monitoring and evaluation to all staff involved in laboratory management, providing funds for laboratory operational needs. In carrying out this task is assisted by the Deputy Principal of curriculum affairs who also collaborates with the head of the laboratory in implementing laboratory activities [13].

Organizing the facilities and infrastructure of the Science Laboratory also includes activities to regulate the storage of science laboratory equipment and materials. The principal has a role in monitoring and evaluating the arrangement and storage of tools and materials in the science laboratory. However, the activities of organizing and storing tools and materials in the science laboratory are the responsibility of the teacher and head of the science laboratory. However, students are also involved in tidying up the science laboratory tools and materials they have just used.

Actuating

To carry out science laboratory activities, it is necessary to plan systematically in order to achieve optimal learning objectives. Based on this, laboratory management in an effort to realize science learning achievement at SMA Negeri 4 Ogan Komering Ulu describes the performance of the human resources who manage the science laboratory as quite good. They have carried out their obligations in accordance with their duties and authorities.

The laboratory manager has carried out the storage of tools and materials according to standards, even though it has not been fully implemented because the school lacks shelves and cupboards for storing materials and tools. The implementation of the storage of tools / materials at SMA Negeri 4 Ogan Komering Ulu is carried out by science teachers and the head of the science laboratory.

The school has tried to keep the science laboratory tools and materials in accordance with the standards. This is in accordance with the opinion of an expert which states that the storage of each tool / material depends on the circumstances and arrangement of the laboratory, as well as room facilities (including the size of the lab). Tools / materials that are often used should be placed in a cupboard that students can open and collect themselves, so that it is time and energy efficient. However, if the safety and disciplinary considerations of students are in doubt, the number available is limited [13].

Actuating in science laboratory management at SMA Negeri 4 Ogan Komering Ulu also includes activities to improve student achievement. Therefore, the principal always supervises the science learning planning

prepared by the teacher. This is done to ensure that teachers have used the science laboratory and its equipment in science learning. In addition, SMA Negeri 4 Ogan Komering Ulu has carried out extracurricular activities based on science to prepare students for OSN competitions and Youth Scientific Work.

.At the time of the Covid 19 pandemic, which requires implementing distance learning, practicum activities cannot be carried out in laboratories, science managers and teachers at SMA Negeri 4 Ogan Komering Ulu are trying to take advantage of virtual laboratory applications so that students can still do science learning intensively. Learning methods in the laboratory have developed very rapidly with various innovations. One of these innovations is through the use of virtual laboratory classes in science classes [14]

Virtual laboratories can be used to improve students' understanding and thinking skills [15] To be able to take advantage of virtual laboratories in learning, of course, teachers are required to master information technology and the internet [16].

Controlling

Aspek pengawasan dalam manajemen laboratorium dalam upaya mewujudkan prestasi belajar IPA di SMA Negeri 4 Ogan Komering Ulu sudah sangat baik. Hal ini tercermin dari penentuan tolak ukur keberhasilan. keberhasilan teridentifikasi dari adanya penyusunan standar pengawasan program laboratorium IPA.

The aspect of supervision in laboratory management in an effort to realize science learning achievement at SMA Negeri 4 Ogan Komering Ulu has been very good. This is reflected in the determination of success benchmarks. success was identified from the existence of standard preparation of science laboratory program supervision.

[17] managers supervise program implementation in order to ensure that a program is implemented or not by comparing expectations with what happens then corrects if there are discrepancies. Supervision is carried out by sufficient activity plans, time, facilities, costs and human resources to achieve the expected goals [18].

The performance assessment of the head of the laboratory is carried out using instruments consisting of the main duties of the head of the laboratory

The work performance of the school laboratory principal in carrying out his main duties needs to be assessed to measure the competence of the laboratory head in managing the laboratory as well as an appreciation for his management achievements.

Based on the Guidelines for Assessing the Performance of School Laboratory Heads (Kemendiknas, 2011), performance appraisal is defined as a series of assessment processes to determine the degree of quality of performance against the activity targets of the head of the laboratory in carrying out his duties or work that has been achieved.

Based on the Regulation of the Minister of State Apparatus Empowerment Number 21 of 2010 the target of the performance assessment of the laboratory head includes: personal, social, managerial, and social competencies, while in this study the competencies used to measure the improvement of laboratory management competencies are the main management competencies, namely managerial competence and professional competence. .

Based on the foregoing, the performance appraisal of the school laboratory principal is a series of assessment processes to determine the degree of quality of performance against the activity target of the head of the laboratory / workshop in carrying out his duties or work that has been achieved.

Conclusions

Based on the results of the research and discussion described by the researcher, it can be concluded that the science laboratory planning has been done well, it can be seen by the coordination between the principal, the head of the laboratory and the science teacher in determining the vision, mission and goals and budget for the science laboratory at the beginning of the school year. together. The implementation of the science laboratory activity plan has been well structured, the order of activities in the laboratory has been stated in the vision, mission and objectives and there is also a laboratory use schedule, in the annual and semester programs. During the current pandemic, science learning is directed to utilize virtual laboratories connected via the internet network. The laboratory organization has been arranged, starting from the principal, deputy principal in the field of curriculum and facilities, laboratory head, science teacher, but the organizational structure is still

lacking in personnel, namely the absence of laboratory assistants to smooth laboratory management, but science teachers work together to overcome this by going directly as a laboratory assistant. Supervision of laboratory management is also carried out through activities of supervision, teacher performance evaluation (PKG), and evaluation of additional assignments for the head of the science laboratory which are carried out periodically every semester. The results of this research should be taken into consideration by the school to continue to improve science laboratory management, especially in terms of funding and recruiting laboratory staff, as well as a laboratory management training program so that laboratory activities can run optimally.

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