# The Effectiveness Of Science Laboratory Management At Junior High School

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# The Effectiveness Of Science Laboratory Management At Junior High School

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**Abstract**

*The laboratory is a place to conduct experiments to prove the theories given in class. This research was conducted to look at the effectiveness of management and constraints of managing a science laboratory at the junior high school (SMP) level. This research used a survey research method with a quantitative approach, while the research subjects were the Head of Laboratory Assistants from 4 junior high schools in Riau province, namely SMPN 1, SMPN 3 Kuok sub-district, SMPN 8, and SMPN 43 Pekanbaru. The data was collected by distributing a questionnaire on the effectiveness of management and use of the laboratory which was given to the head of the laboratory with as many as 117 questions. The research results obtained were the level of effectiveness of science laboratory management in the two regions, namely SMPN Kampar Regency obtained an overall average score of 85.3% while SMPN in Pekanbaru received an average result of 83.5%. Overall, the results were obtained by very good category standard value A. However, in reality there are still several problems in laboratory management, resulting in constraints on several indicators such as completeness of tools, and provision of tools and materials and the main problems occur in organizational and administrative indicators with an overall average result of 49, 82% are below the expected standard with a bad category. So it is necessary to re-evaluate and improve administrative and organizational management which is often neglected by school laboratory management so that special attention can be given to further improvements to obtain very good effective results in the future*

***Keywords:*** *Management Effectiveness Lab, Constraint Management Lab, Science Laboratory*

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## INTRODUCTION

Learning in the 21st century can be interpreted as learning that teaches 4C to students, namely: Communication, Collaboration, Critical Thinking and Creativity (Nahdiyaturrahmah et al., 2020). IPA is a branch of science that studies natural phenomena (Wahidah et al., 2021). According to Najema, (2020) Natural Science is a basic science that provides many provisions to students in everyday life. The science learning process in general has several criteria that must be met, these criteria include process, product, and attitude aspects (Malik et al., 2020).

Science learning is not only limited to theoretical knowledge, concrete concepts, facts or principles, but students also need learning that emphasizes the direct experience (Ismiyanti et al., 2021). One of the skills that must be possessed by a science teacher is the ability to manage school laboratories (Rocidin et al., 2020). According to Musdalifa & Faridah, (2021) The laboratory is a place for experiments, scientific research, measurements or scientific training, according to Susilo & Amirullah, (2018) The laboratory is one of the supporting facilities and infrastructure for teaching and learning activities in schools.

Laboratory education is essential in the learning process because it provides opportunities for students to practice intellectual abilities through observation activities, noting natural phenomena, and developing students' motor skills (Nahdiyaturrahmah et al., 2020). In line with Pertiwi, (2019) that laboratory activities must be able to cultivate several skills, namely process skills (observing, measuring, and manipulating physical objects), analytical skills (reasoning, deductive thinking, and critical thinking), communication skills (ability to organize information and write reports), and conceptualization of scientific phenomena.

Research conducted by Adilah et al., (2021) stated the obstacles encountered in carrying out the practicum, including a large number of damaged equipment, expired materials, there were tools available but not used properly, and also there was no specific schedule regarding the implementation of the practicum while the results of research by Marcella et al., (2018) at SMP Negeri 17 Jambi City and SMP Negeri 19 in Jambi City Teachers are still not motivated to carry out practicum, because the facilities and infrastructure in the physics laboratory are not complete, the laboratory is used as a classroom, so to do practicum the tools must be brought to class so that the available time is not effective.

The constraints described above indicate the need for laboratory management and management of laboratories in schools according to Permendiknas standards number 24 of 2007. Minimum science laboratory space can accommodate one group (one class) with ± 20 students. The science laboratory has at least practice space, storage and preparation space. Facilities that should be available at least have adequate light in the room to read and make observations on experimental objects, and there is clean water.

Laboratory Management is an effort to manage the Laboratory based on standard management concepts (Putra et al., 2018). According to Ismiyanti et al, (2021) Laboratory management will be better if carried out before the laboratory is used as a learning resource by students. In carrying out laboratory management it is necessary to meet the criteria for planning, organizing, implementing, monitoring and evaluating.

The results of research conducted by Yolanda et al., (2019) at SMP Negeri 6 Pekanbaru City The science laboratory planning has not been carried out optimally due to the lack of adequate facilities and the implementation of the science laboratory planning is still not well structured, whereas according to Desti & Maryanti, (2019) it shows that the average percentage of completeness of tools and materials for the state junior high school science laboratory in the city of Pekanbaru is 85.43% (including the good category) and the description of the science laboratory is in accordance with Permendiknas No. 24 of 2007 concerning facilities and science laboratory infrastructure for junior high schools.

According to Nugroho et al., (2022) the intensity of utilization of the junior high school science laboratory in Siak district is in the high category. This is due to good cooperation between the head of the laboratory and the subject teacher in managing strategies to provide easy access to the use of science laboratory equipment and rooms in schools.

Based on the description above, with various forms of science laboratory problems, researchers are interested in research to measure the level of effectiveness of laboratory use and management by topic *management Effectiveness and Constraints in Managing Science Laboratories in Junior High Schools* to see if laboratory management and management effectiveness meets Permendiknas standard No.24 2007 and Permendiknas No. 26 of 2008.

## METHOD

This research was conducted at SMP Negeri 1, SMP Negeri 3 Kuok and SMP Negeri 8, SMP Negeri 48 Pekanbaru. This research is a survey research with a quantitative approach namely by taking data on the effectiveness of the use of science laboratories which is carried out by distributing questionnaires, Questionnaires were given to 4 laboratory assistants to obtain data on the effectiveness of the use of natural science laboratories at school. The questionnaire used has 117 questions consisting of 2 answer choices, namely, yes and no. Obstacles found were obtained through direct interviews with the head of the laboratory regarding any problems that became obstacles during the implementation of laboratory management. The results of laboratory effectiveness data collection were then analyzed descriptively quantitatively, while the results of constraints were obtained from low effectiveness indicator scores or in the not good category and analyzed qualitatively. as for instruments laboratory effectiveness based on PERMENDIKNAS No. standard. 24 of 2007 and No.26 of 2008 which were adapted from**:** (Meita, 2018; Munarti & Sutjihati, 2018) can be seen in Table 1.

**Table 1.** Laboratory effectiveness indicators

| No | Variable | Number of Questions |
|---|---|---|
| 1 | Location and laboratory space | 8 |
| 2 | Laboratory equipment and materials | 41 |
| 3 | Storage of laboratory equipment and materials | 5 |
| 4 | Laboratory equipment | 13 |
| 5 | Maintenance of laboratory equipment | 7 |
| 6 | Laboratory utilization | 6 |
| 7 | Laboratory organization and administration | 18 |
| 8 | Provision and preparation of tools and materials to be used for practicum | 9 |
| 9 | Laboratory Work Safety | 5 |
| 10 | Cleanliness of Room and Laboratory Furniture | 5 |
| Total Questions | | 117 |

*Source :(Meita, 2018; Munarti & Sutjihati, 2018)*

The data obtained is in the form of survey results and questionnaire scores. The data obtained will be analyzed using the following formula (Rajagukguk, 2022):

$$P = \frac{f}{n} \times 100\ \% \qquad (1)$$

Information:
P = The percentage value of the respondent's answers
f = frequency of respondents' answers
n = Number of respondents

The descriptive analysis conducted by the researcher on the effectiveness of science laboratories in schools was guided by the percentage and rating scale criteria which can be seen in Table.2.

**Table 2.** Science laboratory effectiveness rating scale

| No | Laboratory Effectiveness Interval (%) | Category | Laboratory Standard Value |
|---|---|---|---|
| 1 | 81–100 | Very good | A |
| 2 | 61 - 80.99 | Well | B |
| 3 | 41 - 60.99 | Not good | C |
| 4 | ≤ 40 | Not good | D |

Source: adaptation (Satrio & Sabani, 2018)

## RESULTS AND DISCUSSION

### Results

The survey results obtained regarding the effectiveness of management and laboratory management at the junior high school level can be seen from the laboratory conditions and the implementation of practicums that take place at school. The questions given consist of 10 indicators. Data analysis was divided into two places or two regions, namely based on schools in the city of Pekanbaru and schools in the Kampar district, as a comparison between laboratory management in schools in the area and urban areas, while the data analysis was grouped with overall data from SMPN 1 Kuok and SMPN 3 Kuok as schools in Kampar Regency and SMPN 8 Pekanbaru and SMPN 43 Pekanbaru as schools in Pekanbaru City, the results of the data obtained are as shown in the Figure 1:

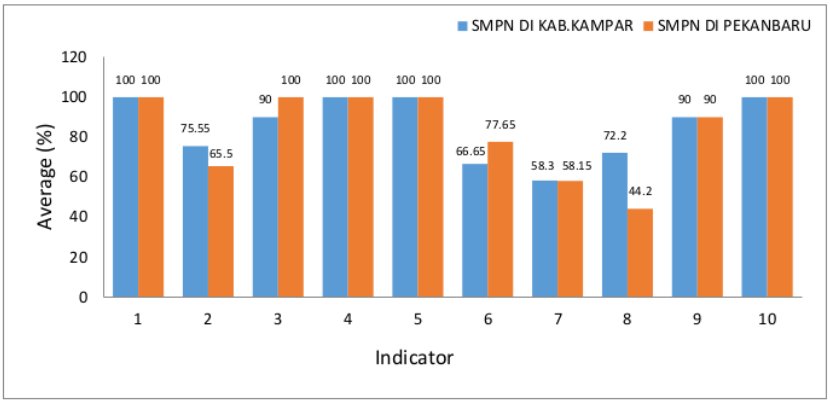


Figure 1. Data analysis of management effectiveness for each indicator.

The results obtained as a whole based on the picture presented between laboratory effectiveness at SMPN Kabupaten Kampar and SMPN in Pekanbaru each have relatively the same score per indicator. The average score at the SMPN in Kampar Regency was 85.27% in the very good category and at the SMPN in Pekanbaru, the average score was 83.55% in the very good category. So, the results obtained as a whole show that the laboratory management of the two areas is effectively in the very good category with an A score, while the results for the constraints are obtained from the average score on the effectiveness indicator which is

included in the low category, which is in the 3rd indicator. 2, 7 and 8th indicators as can be seen in Figure 1.

## DISCUSSION

Based on data that has been conducted on 4 junior high schools with two schools in Kampar district and two schools in Pekanbaru City, the results of the analysis of several indicators are as follows: the same average, namely 100% with a very good category, this result is by the study of Harefa et al, (2021) that if the laboratory room has good conditions and is suitable for use so that the practicum process can run very well, then the location selection for these four schools is very easy to reach for students and teachers because of its strategic location making it easier for students to carry out practicums.

The second is the indicator part of the completeness of laboratory equipment and materials where the average school in Kampar district is 75.55% in the good category while the average school in Pekanbaru city is 65.5% in the good category too, but for the completeness of the equipment in one of the schools Pekanbaru and Kampar still have deficiencies because these schools are still relatively new, based on the results of a study by Trisianawati et al, (2020) states that the management of tools and materials is an activity that determines the success of laboratory management, if in the laboratory there is a set of tools that are appropriate and sufficient for the implementation of practicum for students, then there are no obstacles in the practicum process, but based on field facts there are several obstacles such as several tools and materials incomplete laboratories at SMPN 43 Pekanbaru and SMPN 3 Kuok. The laboratory conditions of the two schools can be seen in Figure 2:

(a)

(b)

Figure 2. (a) Condition of equipment and material supplies and laboratory room of SMPN 43 Pekanbaru (b) Condition of laboratory room of SMPN 3 Kuok.

According to the Head of the Laboratory at SMPN 43 Pekanbaru, the use of the laboratory went well by utilizing the limitations of existing tools, while SMP 3 Kuok also experienced problems with the completeness of tools and materials, because there were still

many practicum tools not available and some tools with poor conditions were used. so that there are obstacles when conducting experiments in the laboratory.

The third indicator is the storage of laboratory equipment and materials, the average school in Kampar district is 100% in the very good category, then for the average for schools in Pekanbaru city, it is 90% in the very good category, which can be seen in terms of storage of laboratory equipment and materials, which have very good criteria. so that the practicum process can run well, this is also by Harahap et al, (2022) If the storage of laboratory equipment and materials is not stored in the appropriate place, the practicum process can be disrupted and can reduce students' concentration during the practicum process because these tools are not used according to their function.

The fourth is the laboratory equipment indicator section where the average school in Kampar district is 100% in the very good category while the average school in Pekanbaru city is 100% in the very good category as well, so for an average of all schools that have been researched can be seen in terms of laboratory facilities which is very good. Based on the results of a study from Karlina, (2022) states that if a school has laboratory equipment, the practicum process will run effectively because the aspect of laboratory equipment is an aspect of supporting practicum activities.

The five indicators of maintaining school laboratory equipment in Kampar district have a percentage of 100% in the very good category, while schools in Pekanbaru city also have a percentage of 100% in the very good category. can run smoothly according to Handayani et al, (2022) states that maintenance of laboratory equipment is an effort to find out opportunities for damage to laboratory equipment to prevent potential hazards that can result in injury to humans and the environment so if laboratory maintenance is optimal, the practicum process will run very well.

The six indicators of laboratory utilization in Kampar district have a percentage of 66.65% in the good category while schools in Pekanbaru city have a percentage of 77.65% in the good category, laboratory utilization is good because the teacher also carries out several practicums in the laboratory, but there are problems found that laboratory utilization has not been optimally utilized due to a shortage of hours for practicum and incomplete tools and materials so that most students only study in class instead of carrying out practicums, the cognitive and psychomotor abilities of students in the learning process also decrease, in line with Rafiqah et al, (2022) stated that what resulted from the indicators of laboratory utilization was to make students more motivated and excited to learn science and to increase students' cognitive understanding of concepts previously learned in class.

The seven indicators of laboratory organization and administration in Kampar district have a percentage of 58.3% in the unfavorable category while schools in Pekanbaru city have a percentage of 58.15% in the unfavorable category. concurrently as a laboratory assistant so that in carrying out practicums it is good but less effective depending on subject teachers instead of relying on laboratory personnel, so the problem found and an obstacle in 4 schools is that the head of the laboratory always thinks that organization and administration do not need additional staff such as laboratory assistants and technicians who help manage the laboratory because the head of the laboratory and the teachers concerned are enough, this is in line with Susilo & Amirullah, (2018) stated that the existence of laboratory assistants is very important because it is a component of the development and even decline of a laboratory.

The eight indicators for the provision and preparation of tools and materials to be used for practicum in Kampar district have a percentage of 72.2% in the good category while for the percentage of schools in Pekanbaru city it is 44.2% in the category of unfavorable. From

the percentage it can be seen that there is little difference between schools in the Kampar district with schools in the city of Pekanbaru, this was due to the lack of available teachers in the city of Pekanbaru when the practicum was carried out in the provision and preparation of tools and materials. In line with Harahap et al, (2022) that the provision and preparation stage has an important role to direct students about the activities that will be carried out in the practicum so that it must be maximized which will have an impact on achieving student competence in learning science. The obstacles that occur in schools in the city of Pekanbaru are at SMPN 43 Pekanbaru with the provision of tools that are still lacking because they tend to carry out practicums only using existing tools and materials, easy to find and use.

The nine indicators of laboratory work safety in Kampar district have a percentage of 90% in the very good category while the percentage of schools in Pekanbaru said 100% with the very good category of the four schools the indicator of laboratory work safety there is a very high awareness of work safety so that risks can be dangerous students and teachers can be prevented in line with Wicaksana, (2022) Laboratory work safety are conditions and factors that can have an impact on the safety of students and teachers. Scientific work safety is a pattern of thinking and its application to minimize the occurrence of accidents or occupational diseases. Occupational accidents can be interpreted as an activity that can cause a hazard while working and can have an impact on humans, property, and processes. This concept is expected to minimize the occurrence of a work accident when using the IPS laboratory, to reduce the risks that can endanger the laboratory environment and practitioners. Accidents can be broadly interpreted as unexpected events.

In the assessment of laboratory work safety and cleanliness of laboratory space and furniture at SMP Kampar and Pekanbaru, both have a score of 90% for laboratory work safety and 100 for the cleanliness of laboratory space and furniture. At the Laboratory Effectiveness Interval, the values are 90% and 100%, which get a very good Meita rating, (2018) revealed in his journal entitled Standardization of the Science Laboratory of SMPN 3 Sumenep regarding laboratory facilities and infrastructure, work safety and cleanliness of laboratory rooms and furniture, including important things, this is in line with standardization or SOP from Prmendiknas no 24 of 2007.

Based on the overall results of the recapitulation that has been presented, the effectiveness of school laboratory management at SMPN in Kampar District obtained a score of 85.27% in the very good category while SMPN in Pekanbaru City obtained a score of 83.55% in the very good category too. No. 24 of 2007 and No. 26 of 2008 that laboratory management in the Kampar district and Pekanbaru city is in the very good category with a standard value of A.

## CONCLUSION

Based on the results of the research that has been done, it can be concluded that there are 10 indicators to determine the management and management of science laboratories in junior high schools with the results of effectiveness obtained by the two regions, namely SMPN in Kampar Regency obtaining a score 85.27% with very good category and SMPN in Pekanbaru obtained a score of 83.55% with a very good category as well, in terms of laboratory management in the two areas, very good effectiveness results were obtained with a standard value of A, but in fact, there were still several problems in the field that led to constraints on several indicators such as the completeness of tools, provision of tools and materials as well as the main problems occur in organizational and administrative indicators with the average results obtained below the expected standard in the unfavorable category. So it is necessary to evaluate and improve administrative and organizational management which

is often overlooked by school laboratory management so that it can be further improved and given special attention for further improvements.

## RECOMMENDATION

Recommendations for future researchers to be able to expand the study studied regarding Student Perceptions of Practicum Implementation in Middle School Science Laboratories so that it can be known what factors can influence the implementation of practicum in Middle School Science laboratories in accordance with Standard Operating Procedures (SOP) implementation in the laboratory. for future researchers to be able to compose questions using sentences that can indirectly trigger students to answer honestly.

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