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An Analysis of the Suitability of Science Laboratory Management at the Junior High School Level Based on National Education Standards

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Abstract

This study aimed to evaluate the suitability of science laboratory management at the junior high school level based on the National Education Standards (SNP) and to identify priority areas for improvement. A qualitative case study combined with descriptive quantitative evaluation was conducted at a private junior high school in Tasikmalaya, Indonesia. Data were collected through structured observations, semi-structured interviews, and document analysis using instruments developed from SNP indicators. The findings revealed that the overall suitability of science laboratory management reached 57.89%, indicating a Moderately Suitable category. The highest levels of compliance were found in the availability of electricity and water (86%) and equipment inventory (81%), while laboratory regulations, layout, and procurement of equipment and materials were categorized as suitable (75%). However, several aspects remained suboptimal, particularly laboratory utilization, organization, equipment maintenance, funding, monitoring and evaluation, documentation, and cleanliness. The lowest scores were identified in laboratory safety and security (38%) and laboratory personnel (33%), indicating critical weaknesses requiring immediate attention. These findings suggest that although several management components have complied with the National Education Standards, significant improvements are still needed, particularly in occupational safety, staffing, preventive maintenance, and continuous quality monitoring. Strengthening these aspects is expected to improve laboratory effectiveness and better support practical science learning in junior high schools.

Keywords : Laboratory Management, National Education Standards, Science Laboratory, Suitability Evaluation, Improvement Recommendations.

1. Introduction

Laboratories serve as a platform for practical activities in science learning at the junior high school level. According to Anjiana et al. (2025) and Lapu et al. (2023), in laboratories, students can test theories and conduct practical work, thereby improving problem-solving skills, critical thinking, and in-depth understanding of concepts. This is in line with Setiawati et al (2021) who stated that laboratories can support practical-based learning activities. Laboratories must be ideally equipped to provide the necessary facilities and infrastructure to support practical

activities (Anjiana et al., 2025). Recent international literature also highlights that laboratory quality depends not only on the availability of facilities but also on systematic governance, including safety management, equipment maintenance, competent laboratory personnel, quality assurance, and continuous evaluation (Gudyanga, 2026; Jorga & Tekalign, 2026). The National Education Standards (SNP) even require every school to have a science laboratory with complete facilities and good management, including through Minister of National Education Regulation No. 24/2007 concerning school facilities and infrastructure. Thus, the availability and optimal management of science laboratories are prerequisites for optimal science learning (Lapu et al., 2023).

Numerous studies indicate that science laboratory management in many junior high schools remains suboptimal. Similar findings were reported in a study conducted in Tasikmalaya, which revealed that the planning and supervision of junior high school laboratories are still suboptimal (Arian et al., 2022). Further field observations have also revealed that many school laboratories remain underutilized due to inadequate facilities and unstructured management (Lapu et al., 2023). In other words, although science laboratories play a pivotal role in enhancing the quality of science education, numerous schools continue to encounter infrastructural constraints and deficient management practices. It is also noteworthy that the effective management of educational facilities and infrastructure has been proven to play a significant role in enhancing students' practicum skills, learning effectiveness, and motivation; therefore, the issue of laboratory management in junior high schools must not be overlooked m(Mustika & Hamidah, 2025).

These facts are following with the result observation in the private junior high school Tasikmalaya. It was found that there were many areas of science laboratory management that did not meet with National Education Standards (SNP). Especially, the laboratory safety standard was not fulfilled, indicated by the not availability corner fire extinguisher, the first aid kit was not complete, and also there was no written Standard Operating Procedures (SOPs) in laboratory safety. Indeed, laboratory protocols are extremely important; this is in line with Yulistiyana et al. (2024) provision of adequate safety materials like fire extinguishers is an important aspect of fire prevention and control. In addition, the laboratory management also weak in its organizational aspect, the laboratory technicians are based nonexistent, consequently the whole responsibility of management rested to the science teachers. It is known to make the laboratory an excellent building to studying and practicum (Rahmah et al., 2021). Concerning documentation of equipment maintenance, repair cards or maintenance logs are not used, so there are no formal records of the damage history and maintenance actions. Maintenance is purely reactive (e.g., when equipment is broken or after a practicum). The scheduling of laboratory use is also informal, with no official laboratory schedule in place; hence, usage is managed only through informal coordination among science teachers. Undocumented scheduling can lead to overlapping laboratory usage (Samuel & Yuniawan, 2021). Lastly, the evaluation of laboratory management is conducted only by school supervisors twice a year, without routine internal laboratory evaluation instruments. All these findings indicate that the implementation of science laboratory management at the studied junior high school does not yet comply with the National Education Standards (SNP) and still possesses numerous shortcomings.

Previous research conducted by Muhlis et al. (2025) asserts that effective laboratory management encompasses systematic work program planning, organization through the placement of support personnel such as laboratory technicians, the execution of practicums in

accordance with the curriculum, as well as routine supervision and evaluation. Laboratory management must be implemented systematically and structurally to ensure that all laboratory functions operate optimally and yield maximum benefits in supporting the educational needs of both teachers and students (Lase et al., 2025). Furthermore, Occupational Health and Safety (OHS) aspects and laboratory administration—such as equipment inventory, borrowing documentation, and maintenance schedules, among others—must be standardized. Effective management within the laboratory is crucial to ensure OH&S in the laboratory (Cahyaningruma, 2020). Also, Anjiana et al. (2025) found that the presence of laboratory alone cannot support quality science education without the support of a structured management system. This means that the entire head of solutions to be studied in laboratory management issues so that in the way the laboratory runs can be functioned well.

Several previous studies have been suggested were a problem for improvement laboratory management. Permana et al. (2024) in a mentoring at SMP Muhammadiyah Malang: it would be better if teacher prepares the awareness by science laboratory management training and the formulation of integrated laboratory SOP. The results of this mentoring program are the provision of a practicum procedure poster, labeling of equipment, and SOP for equipment borrowing and maintenance, practicing to improve to the feasible level of laboratory management. In addition, the application of e-TLM QR Code has also been recommended to address various demerits in the inventory of tools and materials, which were traditionally done manually (Kuswandari et al., 2024). Occupational Health and Safety (OHS) standards application as fire extinguishers and emergency response training, availability of personal protective equipment (PPE) are important factors to avert accidents in the laboratory (Lapu et al., 2023). Thereafter, resource allocation must be optimized and laboratory facilities established to improve the efficiency and the effectiveness of the science learning (Lafau et al., 2025). At the organizational level, a number of studies indicate that a specialist laboratory technician is desirable to professionally carry out the maintenance and administration (Anjiana et al., 2025). These quality enhancement methods should cover laboratory SOP formulation, better collaboration among teachers, and sporadic assessment of laboratory performance based on explicit indicators.

Previous studies have repeatedly shown that science laboratory management in high schools is not good enough especially when it comes to planning organizing using the lab and keeping it safe (Setiawati et al. 2021; Arian et al., 2022; Lapu et al., 2023). However most of these studies only look at the lab conditions. Check parts of the management. They do not look at all the parts that the National Education Standards (SNP) require. Also the suggestions for improvement are usually very general and not connected to the problems found in the field. This means that school leaders often do not know which problems to fix first especially when they have not money or people to help. Similar issues have also been found in studies about lab quality management around the world. These studies say that quality checks should help make things better by using evidence not just show that rules are followed (Hughes & Jackups, 2022). To fix this problem the current study adds something. It uses a check based on the National Education Standards (SNP) along with real evidence from observations, interviews and looking at documents. This helps find the areas to improve in science lab management. Of creating a new way to manage labs this study offers a simple method that connects how well each part of the lab management meets the standards with what is seen in the field. This helps find the important problems that need fixing right away. This method goes beyond checks by turning the results into clear suggestions. These suggestions help school leaders plan better and use their

resources wisely to improve their labs. The method follows the ideas as quality management rules from, around the world. These rules say that improvement should keep happening use evidence make decisions based on risks and work on improving quality in a planned (Hughes & Jackups, 2022).

Based on this consideration, this study aims to find out the feasibility of science laboratory management in the junior high school level based on the National Education Standards (SNP) and to recommend some necessary actions. This study covers work safety, management organization, equipment maintenance, scheduling of the practical sessions, and monitoring of the laboratory. With the review of literature and observation data from the empirical field, this study is expected to contribute to the improvement of junior high school science laboratory management, which will help to realize better science educations.

2. Methods

This study used a qualitative case study design along with a descriptive quantitative evaluation to assess science laboratory management according to the National Education Standards (SNP). A qualitative case study was chosen because the research aimed for an in-depth look at laboratory management practices in one school, which allowed for a robust understanding of management processes, current conditions, and contextual challenges (Yin, 2018). The descriptive quantitative evaluation supported the qualitative approach by measuring how well each lab management component met the SNP. This was done using a structured scoring system and percentage analysis. Combining the quantitative evaluation with qualitative evidence provided a clearer interpretation of laboratory management conditions and helped prioritize areas for improvement.

The research took place at a private junior high school in Tasikmalaya City, West Java, Indonesia. The school was chosen intentionally because initial observations showed several lab management practices that needed systematic evaluation according to the National Education Standards. The case study method was suitable because it allows for a thorough examination of a current phenomenon within its real-life context, using multiple sources of evidence (Yin, 2018). Participants were selected using a purposive sampling technique, as they had direct responsibilities and sufficient experience in science laboratory management. The main participant was the head of the science laboratory, responsible for planning, organization, administration, use, maintenance, and evaluation. To ensure data credibility through source triangulation, science teachers involved in lab activities also took part in interviews. Their participation helped cross-validate information on lab management practices and challenges faced during lab implementation.

Data were gathered through structured observations, semi-structured interviews, and document analysis. Structured observations used a checklist developed from the National Education Standards indicators. Each indicator was assessed using a scoring rubric that measured compliance for each lab management component. Semi-structured interviews followed with laboratory managers and science teachers to gather detailed information on lab management practices, supporting factors, obstacles, and strategies used by the school. The interview data also helped to explain and validate the quantitative evaluation findings from the observations. Document analysis involved reviewing lab inventory records, organizational documents, lab schedules, maintenance records, borrowing records, photographs, Standard Operating Procedures (SOPs), and other relevant administrative documents. Combining

observations, interviews, and document analysis strengthened the trustworthiness of the research findings.

Three research instruments were used in this study: an SNP-based observation checklist, a semi-structured interview guide, and a document analysis checklist. The observation instrument was created based on lab management indicators defined by the National Education Standards and related regulations. All instruments were reviewed by experts in science education and lab management before data collection to ensure their validity. The observation instrument contained fourteen aspects of science laboratory management, as shown in Table 1.

Table 1. Observation Instrument Grid

No	Observed Aspects	Number of Items
1	Equipment Inventory	11
2	Laboratory Utilization	9
3	Laboratory Organization	4
4	Safety and Security	13
5	Availability of Electricity and Water	7
6	Equipment Maintenance	7
7	Procurement of Equipment and Materials	4
8	Laboratory Funding	4
9	Laboratory Layout	4
10	Laboratory Personnel	3
11	Laboratory Regulations	4
12	Monitoring and Evaluation	2
13	Laboratory Documentation	2
14	Laboratory Cleanliness	2

Source: Researcher's Data

Data analysis combined descriptive quantitative evaluation and qualitative analysis. The observational data were initially scored based on how well each indicator met the National Education Standards (SNP). These percentages were then classified into categories to show how well each aspect of laboratory management aligned with the National Education Standards. Qualitative data from interviews and document analysis were assessed using the interactive model suggested by Miles, M. B. & Saldaña (2014) which included data condensation, data display, and drawing/verifying conclusions. Qualitative findings were used to clarify the quantitative evaluation results, identify the reasons behind lab management shortcomings, and suggest evidence-based improvement priorities. Lastly, findings from all data sources were combined to provide a comprehensive view of science laboratory management conditions.

The study's trustworthiness was established through content validation, source triangulation, and methodological triangulation. Content validity was confirmed through expert judgment involving specialists in science education and lab management. Source triangulation involved comparing data from the laboratory head and science teachers, while methodological triangulation included cross-verifying information obtained through structured observations, semi-structured interviews, and document analysis. Consistency of

findings across various participants and data collection methods boosted the credibility, dependability, and confirmability of the research results (Yin, 2018).

3. Result and Discussion

The findings of this study were obtained through observation, interviews, and documentation regarding science laboratory management at a private junior high school in Tasikmalaya City. The collected data were analyzed by comparing the actual conditions against indicators derived from the National Education Standards (SNP). Furthermore, data analysis was conducted by calculating the percentages of the observation results to determine the level of suitability for each aspect of laboratory management. Scores were derived from the observation checklists by assigning a value of 1 for compliant indicators and 0 for non-compliant ones. These scores were subsequently converted into percentages utilizing the following formula:

$$Percentage\ (\%) = \frac{Actual\ Score}{Maximum\ score} x\ 100\%$$

The obtained score represents the number of fulfilled indicators, while the maximum score corresponds to the total number of indicators within the observation instrument. The percentage results were subsequently interpreted into suitability level categories referring to (Arikunto, 2013). Based on the results of the percentage calculation for each aspect of science laboratory management, the interpretation of the suitability level was then conducted according to the pre-established criteria. The results of the suitability level for science laboratory management are presented in Table 2.

Table 2. Interpretation Criteria for Suitability Levels

Persentase (%)	Category
81-100	Highly Suitable
61-80	Suitable
41-60	Moderately Suitable
21-40	Less Suitable
0-20	Unsuitable

Source: Arikunto (2013)

Consequently, the percentage calculation results not only indicate the achievement level of the indicators but also provide qualitative significance to the condition of laboratory management based on the predetermined categories. Based on the percentage calculations for each aspect of science laboratory management, a conformity analysis is then conducted based on previously established criteria. This analysis serves to provide a general overview or factual results regarding the condition of laboratory management based on the assessed aspects. The results regarding the suitability levels of science laboratory management are presented in Table 3 below.

Table 3. Suitability Levels of Science Laboratory Management

No	Aspect	Score	Max Score	Percentage	Category
1	Equipment Inventory	9	11	81%	Highly Suitable
2	Laboratory Utilization	4	9	44%	Moderately Suitable
3	Laboratory Organization	2	4	50%	Moderately Suitable
4	Safety and Security	5	13	38%	Less Suitable
5	Availability of Electricity and Water	6	7	86%	Highly Suitable
6	Equipment Maintenance	3	7	43%	Moderately Suitable
7	Procurement of Equipment and Materials	3	4	75%	Suitable
8	Laboratory Funding	2	4	50%	Moderately Suitable
9	Laboratory Layout	3	4	75%	Suitable
10	Laboratory Personnel	1	3	33%	Less Suitable
11	Laboratory Regulations	3	4	75%	Suitable
12	Monitoring and Evaluation	1	2	50%	Moderately Suitable
13	Laboratory Documentation	1	2	50%	Moderately Suitable
14	Laboratory Cleanliness	1	2	50%	Moderately Suitable

Reviewing the results from table 3 above, the actual score obtained was 44 out of a maximum total score of 76, so the percentage results for the suitability of science laboratory management were as follows:

$$Percentage\ of\ conformity = \frac{44}{76} x\ 100\% = 57{,}89\%$$

Data analysis shows that the overall compliance rating for private science laboratory management is 57.89%, categorized as "fairly appropriate." This finding indicates that some aspects of laboratory management in schools already meet the National Standards for Education (SNP) requirements, but several areas requiring improvement during implementation were identified.

Specifically, the highest compliance rating was electricity and water availability, with a score of 86%, and equipment inventory, with a score of 81%, categorized as "very appropriate." These results indicate that laboratory support facilities and equipment and material recording are well-managed. Furthermore, within the appropriate rating, aspects such

as equipment and material management, laboratory layout, and regulations each scored 75%. Furthermore, several aspects were found to be "fairly appropriate," including laboratory utilization (44%), laboratory organization (50%), equipment maintenance (43%), laboratory financial management (50%), monitoring and evaluation (50%), documentation (50%), and laboratory cleanliness (50%). These findings indicate that these aspects have been managed, but do not fully meet the SNP. Finally, the aspects with the lowest levels of compliance were laboratory safety and security (38%) and laboratory staff availability (33%). This concludes that these findings represent weaknesses that must be addressed immediately and become a top priority in laboratory management at this private school.

3.1. High Suitability Level Aspects

The equipment inventory and the availability of electricity and water has high suitability scores which shows that the provision of basic facilities has been relatively well executed. This is an important finding because the availability of basic facilities is one of the minimum requirements to conduct science practicum sessions (Setiawati et al., 2021). For example, Widiyanto et al. (2025) in Tegal City found the laboratory administration score in the “good” category (79%) which is in line with the equipment inventory results of this study (81%). This alignment indicates that the school has made efforts to document and provide equipment in accordance with National Education Standards (SNP). In addition, good equipment inventory indicates that there is a relatively orderly administrative system in place, which is an important part of laboratory management (Lafau et al., 2025).

The results show that the school has met the requirements for buildings and how things are run, as set by the National Education Standards. This success probably comes from the fact that managing supplies and using utilities is done in a way. This usually depends on following rules than on constant checking from managers. Studies, from other countries say that having good facilities is just a starting point, not a promise that students will learn well in the lab. If theres no planning, checking and fixing even the best labs might not help students learn science or get good hands-on skills (Abrahams & Reiss, 2013).

The aspects of procurement of equipment and materials (75%), laboratory layout (75%), and laboratory regulations (75%) are in the category of “Suitable.” The existence of a laboratory layout and rules shows that the school’s efforts to create the lab environment orderly, safe, and organised are proactive. This finding is consistent with the findings of Permana et al. (2024), who state that the development of Standard Operating Procedures (SOPs), regulations, and good administrative management can improve the overall quality of laboratory management and help to implement practicum sessions more effectively.

3.2. Medium Suitability Levels Aspects

There are several aspects that are still in the Moderately Suitable category which are laboratory utilisation, laboratory organization, equipment maintenance, laboratory financial management, monitoring and evaluation, laboratory documentation and laboratory cleanliness. This shows that the laboratory has not been optimally used to

support science learning based on practicum. The laboratory is not used often because the schedule for practical work is very tight, the teachers are not ready and there are not enough materials and equipment. The condition is consistent with the findings of Malik et al. (2020) that suboptimal planning of laboratory utilization can affect the effectiveness of practicum activities and reduce student involvement in the experimental process. Moreover, Widiyanto et al. (2025) found that the utilization of laboratory in several schools is still not optimal because the schedule of practicum is often combined with the theoretical instruction.

With regard to the organization of the laboratory, the results showed that the management structure was not effective. The distribution of tasks and responsibilities among laboratory staff is still limited and therefore laboratory management is not fully coordinated yet. The condition indicates that the organizational role of the laboratory does not have an optimal management system. Effective laboratory management requires a clear division of responsibilities between teachers, the head of the laboratory and laboratory technicians so that practicum activities can be run in a more directed and systematic manner (Zahara et al. (2022). This finding indicates that organizational effectiveness depends not only on the existence of formal management structures but also on clearly distributed responsibilities and institutional commitment. International studies demonstrate that laboratories operating under well-defined organizational systems tend to achieve higher operational efficiency, stronger safety compliance, and more sustainable quality improvement than laboratories relying primarily on individual initiatives (Gudyanga, 2026).

Suboptimal maintenance of equipment has the potential to accelerate equipment degradation and to reduce the operational life span of laboratory instruments. This is consistent with Laning et al. (2024) who stated that periodic maintenance of laboratory equipment is important for the functionality and sustainability of practicum tools. Anjiana et al. (2025) further state that the persistence of reactive maintenance practices demonstrates that the preventive approach has not been fully adopted. Such a situation can have a negative effect on the long-term efficiency of the use of the equipment. From a quality management perspective, preventive maintenance should be considered a strategic investment rather than a routine operational activity. Regular maintenance improves equipment reliability, reduces unexpected failures, minimizes replacement costs, and ensures laboratory readiness for practical instruction. Recent laboratory management studies have consistently shown that preventive maintenance contributes significantly to sustainable laboratory performance and long-term resource efficiency (Gudyanga, 2026; Jorga & Tekalign, 2026).

Regarding the laboratory funding aspect, the research results indicate that the management of laboratory budgets is still in the category of "Moderately Suitable". This condition indicates that the systems for planning, recording and allocation of laboratory funds have not been optimally performed or fully documented. Funding is important for the laboratory to sustain the practicum activities because all the laboratory operational needs depend on the availability of an adequate budget. According to Puspitasari et al. (2020), the administration and management of laboratory funds that are well organised will facilitate the procurement of practicum equipment and materials efficiently. In addition, Rahmawati et al. (2024) mention that quality-based laboratory management

requires the support of systematic budget planning for the sustainability of laboratory development programs.

The monitoring and evaluation component scored 50%. This indicates that there have been no systematic periodic reviews of laboratory management. But periodic assessment is needed to identify deficiencies and develop programs for continuing improvement. Continuous monitoring and evaluation based on quality are very important to improve the effectiveness of laboratory management and support the improvement of the quality of science learning Rahmawati et al. (2024). In addition, previous studies have shown that regular monitoring and evaluation is a prerequisite for systematically improving the quality of laboratory management (Cahyaningrum, 2020). The absence of systematic internal monitoring also limits opportunities for continuous quality improvement because management decisions are no longer supported by empirical evidence. International quality management literature emphasizes that continuous monitoring allows institutions to identify recurring operational problems, evaluate improvement strategies, and establish evidence-based decision making for laboratory development (Gudyanga, 2026).

The research findings show that recording of laboratory activities and cleanliness management has not been consistently carried out in terms of laboratory documentation and cleanliness aspects. When documentation is incomplete, it can be hard to keep track of how the equipment is being used, follow the maintenance history, and evaluate what is happening in the laboratory. At the same time, laboratory cleanliness is an important part of establishing a safe and comfortable practicum environment for students. Effective laboratory management depends not only on the availability of facilities, but also on the administrative orderliness and the laboratory environment conditions that support learning activities (Lase et al., 2025).

The fact that the laboratories are not used much also suggests that hands-on activities are not a big part of science teaching. This means that students may not have many chances to develop important skills like scientific thinking and inquiry. Recent research has shown that when students do laboratory work they tend to understand science concepts better and think more critically as long as the laboratory is managed well (OECD, 2023).

3.3. Low Suitability Levels Aspects

Laboratory safety and security aspect scored 38%. Laboratory personnel scored only 33%. These two aspects are important components that directly influence the effectiveness and safety of practicum activities. The low achievement in these areas indicates that the management of laboratories have not completely adhered to the operational standards for science laboratories needed to support safe and optimal practicum activities.

The low score of safety and security shows that the laboratory has not been equipped with safety facilities, such as fire extinguishers (APAR), first aid kits, safety symbols, and emergency response procedures optimally. This condition may increase the risk of accidents in practicum activities. The safety of laboratory work is a very important support for practicum-based learning, because it is directly related to the protection of students and teachers during the experimental process. Cahyaningruma (2020) explains that the implementation of Occupational Health and Safety (K3) in the school laboratory must be

carried out systematically by providing safety facilities, rules and procedures for handling emergencies.

Meanwhile, the low score in the laboratory personnel aspect indicates that the school has not had laboratory technicians or assistants who are specifically responsible for managing labs. Therefore, the management of laboratory still depends on science teachers whose main task is on the instructional process. This condition results in the implementation of administrative management, maintenance and preparation of practicum equipment suboptimaly. Rahmah et al. (2021) stated that the lack of laboratory personnel is one of the main obstacles to optimizing the function of school science laboratories. Zahara et al. (2022) states that the presence of laboratory technicians is needed to support good laboratory management especially in managing practicum equipment and materials, maintaining facilities and implementing occupational safety procedures.

These findings show that laboratory safety and the people who work in the lab are the important areas needing improvement. This is because they directly affect how good the education is and how safe the students are. Unlike problems with management or buildings issues with safety and the people in the lab make things more dangerous during lab work. Also make hands-on learning less effective. So focusing on these two areas is likely to lead to the improvements in how well labs are run. This idea matches what recent studies from around the world have found. They say that a strong safety culture, in the lab and skilled workers are the base of an lasting lab quality system (Gudyanga, 2026).

3.4. Recommendations for Improvement

In light of the previously discussed outcomes, targeted and strategic interventions are urgently required. Primarily, it is essential to establish a well-structured and meticulously documented system for laboratory planning and scheduling. Prior research indicates that efficient management, particularly in usage planning, plays a pivotal role in optimizing the laboratory's function as an educational science facility (Pardilla & Ningrum, 2025). Consequently, institution leaders must develop a comprehensive practicum timetable aligned with the curriculum to guarantee balanced utilization across all classrooms. Furthermore, upgrading laboratory safety and security protocols (K3) needs to be treated as a paramount concern. Inadequate safety enforcement not only elevates accident risks but also compromises student comfort and instructional efficacy (Fauzi et al., 2024). Lastly, appointing dedicated laboratory personnel is indispensable for streamlined management, as qualified technicians are vital to maintaining equipment readiness, chemical inventories, and administrative order.

Fourth, reinforcing structured, preventive equipment maintenance alongside a well-documented inventory system is vital for ensuring the long-term sustainability of laboratory resources. The current reliance on reactive maintenance models has demonstrably led to equipment deterioration and reduced readiness for practical sessions as noted by Puspitasari et al. (2020), deficient oversight of equipment and materials particularly concerning their care and operation restricts the laboratory from operating effectively as an instructional asset. To address this, an administrative framework that systematically logs usage history, routine servicing, and repairs must be established. Fifth, establishing a robust system for continuous, quality-focused monitoring and evaluation (M&E) serves as a strategic element to gauge laboratory management performance

objectively. The institution should design internal evaluation instruments aligned with National Education Standards (SNP) to periodically review both operational and administrative dimensions. This M&E framework can utilize a continuous quality management paradigm through the Plan-Do-Check-Act (PDCA) cycle, encompassing program design, operational execution, data-driven assessment, and quality-driven refinement. This cyclical strategy has been shown to successfully elevate laboratory management standards by facilitating ongoing monitoring derived from empirical field data (Rahmawati et al., 2024b).

Rather than implementing isolated corrective actions, laboratory improvement should be viewed as a continuous quality improvement process integrating planning, implementation, monitoring, evaluation, and follow-up actions. Such an approach enables schools to prioritize improvement efforts according to empirical evidence while optimizing available resources. International quality management literature increasingly recognizes that evidence-informed management contributes to more sustainable institutional improvement than compliance-oriented approaches alone.

Lastly, enhancing the integration of laboratory activities within the instructional framework is imperative to transition the laboratory from a secondary facility into a foundational pillar of science education. The laboratory serves as a strategic resource center that empowers students to engage in active experimentation, empirical observations, and direct scientific inquiry (Suryana et al., 2024). In the absence of proficient administration, this facility cannot fully serve as a catalyst for advancing students' science process skills. Ultimately, executing these collective recommendations necessitates a profound institutional commitment alongside the cultivation of a quality-driven managerial culture. Remedial efforts must transcend mere administrative compliance, aiming instead to revitalize the laboratory into a secure, efficient, and sustainable educational ecosystem. Consequently, science laboratories will be well-positioned to fulfill their optimal capacity in fostering student competencies as mandated by the National Education Standards (SNP).

4. Conclusion

In conclusion, the evaluation reveals that science laboratory management at the junior high school level aligns with the National Education Standards (SNP) at a rate of 57.89%, placing it within the 'Moderately Suitable' classification. This outcome demonstrates that specific management benchmarks have been successfully met; notably, infrastructure elements like electricity and water supply, alongside equipment inventorying, achieved a 'Highly Suitable' rating. Additionally, components such as laboratory regulations, layout design, and resource procurement were classified as 'Suitable.' Despite these positive indicators, critical deficiencies persist in several operational areas, including utilization efficiency, routine equipment maintenance, monitoring and evaluation (M&E) systems, safety protocols, and the recruitment of dedicated staff. Therefore, sustained interventions focusing on operational frameworks and occupational safety are imperative to elevate management standards toward full SNP compliance and to better facilitate practical science education.

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