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Chemistry laboratory management: Reviewing planning, organization, and evaluation for effectiveness

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ABSTRACT

Chemistry laboratory management at SMA Dr. Wahidin is important in supporting learning. This research aims to describe chemistry laboratory management using a qualitative descriptive approach. Research subjects included school principals, deputy heads of curriculum, laboratory assistants, technicians, and chemistry teachers. Data was collected through observation, interviews, and documentation. The research results show that laboratory work program planning is prepared systematically by the head of the laboratory, including vision, mission, and long and short-term plans. The organizational structure involves various parties, including school principals, laboratory assistants, technicians, and chemistry teachers. The school principal plays a role in organizing and supporting laboratory management to be more optimal. The implementation of the work program went according to plan. However, coordination between parties still requires improvement. Apart from that, supervision and evaluation carried out by school principals need to be further improved so that the effectiveness of laboratory management is more optimal.

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ABSTRAK

Manajemen laboratorium kimia di SMA Dr. Wahidin berperan penting dalam mendukung pembelajaran. Penelitian ini bertujuan untuk mendeskripsikan manajemen laboratorium kimia dengan pendekatan deskriptif kualitatif. Subjek penelitian meliputi kepala sekolah, wakil kepala bidang kurikulum, laboran, teknisi, dan guru kimia. Data dikumpulkan melalui observasi, wawancara, dan dokumentasi. Hasil penelitian menunjukkan bahwa perencanaan program kerja laboratorium disusun secara sistematis oleh kepala laboratorium, mencakup visi, misi, serta rencana jangka panjang dan pendek. Struktur organisasi melibatkan berbagai pihak, termasuk kepala sekolah, laboran, teknisi, dan guru kimia. Kepala sekolah berperan dalam pengorganisasian guna mendukung pengelolaan laboratorium agar lebih optimal. Pelaksanaan program kerja telah berjalan sesuai rencana, namun koordinasi antar pihak masih memerlukan peningkatan. Selain itu, pengawasan dan evaluasi yang dilakukan oleh kepala sekolah perlu lebih ditingkatkan agar efektivitas pengelolaan laboratorium semakin optimal.

Kata Kunci: *Laboratorium Kimia; Manajemen; Sekolah Menengah Atas*

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INTRODUCTION

National education plays a strategic role in preparing the nation's generation to face various globalization challenges. These challenges include rapid social, economic, and technological changes (Hidayat & Nurmila, 2024). Through quality education, Indonesia is expected not only to survive but also to compete globally. Globalization presents great opportunities but also demands the ability to adapt and innovate (Suryani et al., 2024). Optimizing learning in various fields, including chemistry and natural sciences, becomes crucial in this context. This learning is designed to develop students' cognitive aspects and affective and psychomotor aspects simultaneously (Kardoyo et al., 2020). This shows that education is the key to shaping a resilient and adaptive generation in response to global developments.

Chemistry and natural science learning requires an integrated learning design to develop all three educational domains: cognitive, affective, and psychomotor. The affective domain includes attitudes, interests, and values that support learning, while the psychomotor domain involves practical skills that enable students to apply knowledge directly (Limbu, 2024). However, the development of affective and psychomotor domains cannot be fully achieved through theoretical classroom learning (Tarso et al., 2024). Therefore, out-of-class learning, such as project activities, practical work, or experiments, is essential. These activities are typically carried out in laboratories, which serve as practice spaces to support the theories taught in class. In addition to laboratories, other practice spaces, such as studios, workshops, or experimental fields, can also be used to meet the needs of project-based learning. This approach allows students to gain more prosperous and meaningful learning experiences (Putri & Siswanto, 2024).

School laboratories play a central role in supporting effective learning and determining the quality of student learning outcomes. The learning process in the laboratory provides real-life experiences that cannot be replaced by other teaching methods (Pisriwati et al., 2024). However, support from various elements is needed for laboratory learning to run smoothly, such as competent laboratory personnel, adequate equipment, and systematic management. Laboratory management often faces significant challenges, particularly regarding laboratory personnel's lack of knowledge and experience (Caesaria et al., 2024; Hatmoko et al., 2024). These personnel include laboratory heads, lab assistants, technicians, and teachers responsible for managing laboratory activities. These shortcomings can hinder the effectiveness of the laboratory as a learning facility, thus requiring strategic solutions to address these issues.

Training and competency development for personnel, particularly laboratory heads, is essential to resolve various problems in laboratory management. The laboratory head plays a key role in ensuring effective management, including in aspects such as planning, organizing, implementing, and evaluating (Weng et al., 2022). The responsibilities of the laboratory head include managing personnel, equipment, materials, laboratory facilities, and infrastructure. Good management supports laboratory learning and significantly develops students' affective and psychomotor skills (Siswanto & Fatimah, 2024). Therefore, proper training for laboratory heads can be a solution to improve the quality of learning. This training should cover technical and managerial aspects so that the laboratory head can optimally perform their duties.

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Chemical laboratory management involves a series of key functions: planning, organizing, implementing, and supervising. Management is a process to achieve organizational goals through effective and efficient resource management (Goodson et al., 2023). In the laboratory context, management includes preparing work programs relevant to learning needs, organizing personnel to carry out tasks effectively, implementing planned laboratory activities, and continuous supervision and evaluation. With structured management, laboratories can function optimally and benefit students and teachers (Ardiansah et al., 2022). This emphasizes the importance of a systematic approach in laboratory management to support the overall learning process.

Chemistry teachers need to understand the basic principles of laboratory management, even if laboratory assistants or technicians are available at the school. This understanding allows teachers to actively manage the laboratory and ensure that learning activities run according to the expected objectives (Paramole & Adeoye, 2024). Effective laboratory management supports the learning process and is an important tool in shaping students' character. Through practical activities in the laboratory, students can develop skills, teamwork, and responsibility (Hanama et al., 2024; Suryatama et al., 2024). Therefore, research on chemistry laboratory management is highly relevant for improving the quality of education in schools. With a good understanding, teachers can contribute more to creating a conducive learning environment.

This study aims to describe the chemistry laboratory management at SMA Dr. Wahidin, Sleman Regency. The research focuses on various aspects of laboratory management, such as work program planning, organizing laboratory personnel, conducting practical activities, and regular supervision and evaluation. The study also seeks to identify supporting and inhibiting factors affecting the effectiveness of chemistry laboratory management. Thus, this research is expected to provide a comprehensive overview of the laboratory's condition and potential for future development. The research findings are expected to serve as a reference for other laboratory managers to improve the quality of their management. The results of this research are expected to contribute theoretically to the development of educational administration management science, which is related explicitly to chemistry laboratory management.

This study can guide SMA Dr. Wahidin in understanding the concepts and practices of effective laboratory management. By improving the competencies and performance of laboratory personnel, it is hoped that the laboratory can function optimally as a supporting tool for chemistry learning. This will also impact the overall improvement of the quality of education at the school. This contribution includes both technical and pedagogical aspects, which affect the development of students' skills. Practically, the results of this study can provide input for SMA Dr. Wahidin to enhance responsibility in laboratory management. This responsibility includes providing adequate equipment, maintaining equipment regularly, repairing damaged facilities, and offering more intensive guidance and supervision for laboratory personnel. These steps are expected to improve student's learning experiences through structured practical activities that support the development of practical skills relevant to future workforce needs. With better management, laboratories can become an important asset for the school in producing a quality generation.

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LITERATURE REVIEW

Laboratory Management

Laboratory management is crucial in supporting the effectiveness of learning and research, particularly in educational settings. It encompasses the planning, organizing, implementing, and supervising of various laboratory resources, including equipment, materials, personnel, and work procedures (Asmarany et al., 2024). Proper management ensures that the laboratory supports academic activities and experiments optimally. Additionally, safety regulations are a key component of laboratory management, aimed at minimizing the risk of accidents and ensuring compliance with applicable standard operating procedures (Hailing et al., 2023).

Regarding organization, laboratory management involves dividing tasks and responsibilities among the laboratory head, technicians, laboratory assistants, and instructors who utilize the laboratory facilities. Laboratories with a clear organizational structure tend to be more effective in managing resources and distributing responsibilities (Mohzana et al., 2023). Furthermore, good coordination between the involved parties enhances operational efficiency. However, a common challenge in laboratory management is the lack of communication and coordination, which can hinder the smooth execution of laboratory activities (Syah et al., 2024).

Evaluation and supervision are essential to ensure that the laboratory operates according to the established standards. Laboratories with periodic evaluation mechanisms can identify problems and implement continuous improvements (Yang et al., 2025). Evaluation includes aspects such as equipment maintenance, adherence to safety procedures, and the effectiveness of the laboratory in supporting learning. With a well-established evaluation system, laboratories can continuously evolve and provide optimal benefits to their users.

High School Laboratory

The laboratory in Senior High Schools plays a strategic role in supporting science education based on practical experience. It serves as a medium to integrate the students' cognitive, affective, and psychomotor aspects through experimental activities. In science learning, such as chemistry, physics, and biology, the laboratory becomes a place for students to develop scientific skills, such as observation, data analysis, and problem-solving (Rathnayaka et al., 2024). Additionally, the laboratory enables students to understand abstract concepts complex to explain through classroom theory (Lestari et al., 2023).

Good laboratory management is crucial in determining its effectiveness in supporting learning. Laboratory management includes planning, organizing, implementing, and evaluating (Ahmed et al., 2021). The laboratory head manages the facilities, personnel, and materials required for practical work. However, laboratory management in Senior High Schools often faces challenges such as limited budgets, lack of equipment, and insufficient training for laboratory staff, which can hinder optimizing its functions (Liubarets & Vasylieva, 2021).

Furthermore, workplace safety in the laboratory is an important concern. A lack of understanding among students and educators regarding safety procedures can increase the

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risk of accidents during practical activities (Tarso et al., 2025). Therefore, safety training and implementing Standard Operating Procedures (SOPs) are crucial to creating a safe laboratory environment. With proper management, the laboratory becomes a supporting facility for learning and a means to enhance students' practical skills relevant to the workforce and global challenges (Tarso et al., 2024).

Chemistry Laboratory

The chemistry laboratory plays an important role in science education, particularly in understanding abstract concepts through practical experiments. The chemistry laboratory allows students to develop scientific skills, such as observation, data collection, and analysis of experimental results (Han & Yang, 2024). The laboratory-based learning process also provides authentic experiences for students, enabling them to connect the theories learned in class with their practical applications. Furthermore, chemistry laboratory activities help students enhance their critical thinking and creativity in solving scientific problems (Sailaubay et al., 2024).

Effective chemistry laboratory management is essential to support the learning process. Managing a chemistry laboratory includes planning the use of materials and equipment, organizing laboratory staff, implementing practical activities, and evaluating the results of the experiments (Pauzi, 2024). Unfortunately, many chemistry laboratories in senior high schools face limited facilities, a lack of training for laboratory staff, and insufficient budget allocation (Wati et al., 2024). Therefore, well-organized management can enhance the effectiveness of the laboratory's use in teaching.

In addition to management, workplace safety in the chemistry laboratory is also crucial. Using hazardous chemicals and complex equipment requires a thorough understanding of safety procedures (Abedsoltan et al., 2024). The risk of accidents in the chemistry laboratory increases without adequate safety protocols. Therefore, regular safety training for students and educators and the application of Standard Operating Procedures (SOPs) in each practical activity are necessary. With good management and safety practices, the chemistry laboratory can become an optimal learning tool to enhance students' competence in science.

METHODS

This research was conducted from October to November 2024 using a qualitative descriptive approach aimed at describing the process, rather than just the results, to understand the objective conditions in the study. The research subjects consist of informants with active involvement and in-depth knowledge of chemistry laboratory management, such as the principal, laboratory head, laboratory assistants, technicians, and chemistry teachers at SMA Dr. Wahidin. Data collection techniques include observation, interviews, and documentation. Observations were carried out directly and indirectly to systematically record emerging phenomena, providing insights into the social world and non-verbal behavior.

Data analysis in this study is carried out qualitatively through four interacting stages: data collection, data reduction, data presentation, and conclusion drawing and verification. The data collected from various sources are then reduced to summarize and filter relevant

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information following the research focus. This process aims to organize the data to make it easier to understand and analyze. Data presentation is conducted through narrative descriptions that facilitate a deeper understanding of the research findings.

The last phase involves drawing conclusions and verifying that the research findings accurately answer the research questions. This step is carried out by reviewing all the analyzed and verified data to ensure reliable results (Sanmarchi et al., 2024). This process allows the researcher to thoroughly understand chemistry laboratory management, including the various factors that impact the effectiveness of its management and execution. The outcomes of this study are anticipated to support the improvement of laboratory management practices in schools.

RESULTS AND DISCUSSION

Result

The work program planning for the chemistry laboratory at SMA Dr. Wahidin has been well-organized and systematic. The work plan is also written and standardized to achieve the desired goals. There is good coordination and collaboration between the principal, the infrastructure division, the head of the laboratory, and the subject teachers in preparing both short-term and long-term work programs. The chemistry laboratory at this school also has a clear vision, mission, and goals, supported by funds to complete the necessary equipment and materials. However, laboratory safety planning has not been developed for the four existing chemistry laboratories.

A structure has been established in terms of laboratory organization, although it is not displayed in a visible location. This structure is only written for the knowledge of the subject teachers. The principal also determines the laboratory personnel at the beginning of each academic year. The personnel involved in this organization include the principal as the responsible party, the head of the laboratory as the executor and manager, and the students. The head of the laboratory has also created administrative records related to equipment cards and materials, proposed lists of equipment and materials, and inventory lists of tools and materials.

The implementation of the chemistry laboratory's work program shows that administrative activities, such as creating material stock cards, filling out stock cards, labelling tools and materials, and preparing borrowing/usage forms for tools and materials, are carried out by the head of the laboratory. However, there are no officially prepared practical modules in the laboratory, meaning that teachers must prepare these modules independently for the experiments. Although chemical tools and materials are available for experiments, the laboratory still lacks laboratory assistants and technicians who could assist the head of the laboratory in managing activities, and there are no fire extinguishers or personal protective equipment for safety.

The principal supervises and evaluates the chemistry laboratory work program. However, the principal does not impose formal sanctions if laboratory personnel fail to carry out their tasks properly; only light reprimands are given to remind teachers to work better. This supervision is carried out twice a year. However, there is no deeper oversight of the head of the laboratory's duties and overall laboratory management.

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Supporting factors in managing the chemistry laboratory at SMA Dr. Wahidin include the availability of the laboratory, tools, and chemicals obtained from provincial and central government assistance for the practical work. Students are also highly motivated to conduct experiments, and funding from the Bantuan Operasional Sekolah (BOS) program supports this activity. However, some obstacles faced in managing the chemistry laboratory include the absence of technicians and laboratory assistants, which forces the head of the laboratory to carry out these tasks independently.

Discussion

Planning the SMA Dr. Wahidin Chemistry Laboratory Work Program

The research results revealed that the chemistry laboratory's planning at SMA Dr. Wahidin has been well-structured and organized within a work program that includes a clear and measurable vision, mission, and goals. This work program was carefully prepared by the head of the laboratory and subsequently approved by the principal as a commitment to the successful management of the laboratory. The program was then socialized in an initial meeting at the beginning of the academic year to ensure that all relevant parties understood and supported the plan. This demonstrates seriousness and professionalism in planning the activities to be carried out in the laboratory, with the expectation that all the established goals will be optimally achieved.

The vision represents a forward-looking view that outlines the direction to be achieved (Siswanto, 2025). The vision for the chemistry laboratory at SMA, Dr. Wahidin, is to become a laboratory that remains relevant, anticipatory, and innovative in facing the developments of the times. This vision was formulated by considering the actual conditions in the field and making realistic calculations so it presents a challenge that is achievable by all involved parties. The laboratory's mission can then be defined, which will serve as the foundation for formulating more specific, detailed, and objectively measurable goals, ensuring continuous progress.

Planning is an essential and fundamental process in management. Without careful planning, no goals can be achieved effectively and efficiently. Without a clear plan, implementing activities will lack direction and may waste resources, such as time, energy, and costs (Avelar et al., 2023). Planning also serves as the basis for control because, without a well-structured plan, monitoring the activities being carried out will not proceed smoothly, potentially reducing the quality of the results. Therefore, with meticulous planning, managing all available resources, including human resources, energy, and finances, will be more directed, controlled, and effective in achieving the set goals.

Overall, Dr. Wahidin's planning for managing the chemistry laboratory at SMA is essential to ensure that every activity has a strong foundation and clear direction. The planning process must be conducted carefully, considering the many factors that need attention, such as the availability of resources, time, and other needs that support the smooth implementation of activities. With good planning, each step taken will be more organized, efficient, and capable of achieving optimal results (Siswanto & Fatimah, 2024).

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In the context of the chemistry laboratory, this planning not only includes determining goals and strategies but also considers the steps that must be followed and the methods used to achieve those goals. Considering the available resources, the planning process should be systematic, analytical, and logical (Putri et al., 2025). Therefore, good planning will ensure that all activities conducted in the laboratory can run effectively and efficiently, ultimately achieving the established goals with optimal results.

Organizing SMA Dr. Wahidin Chemistry Laboratory

The determination of personnel in the organization of the chemistry laboratory is carried out systematically during a meeting held at the beginning of the new academic year or school year. This meeting aims to decide who will be involved in the management of the laboratory for the duration of the academic period. Those directly involved in the management of the chemistry laboratory include the principal, the laboratory head, and the chemistry subject teachers. Each has a clear role and responsibility in achieving the goals of laboratory management that have been previously set, with their involvement supporting one another to ensure the smooth operation of the laboratory.

The organization of the chemistry laboratory is a system of collaboration involving groups of people, materials, and specific units within the laboratory to achieve common objectives (Mohzana et al., 2023). In this context, organizing the chemistry laboratory means arranging groups of people or officers responsible for implementing the plans or work programs previously outlined. A well-structured organization is crucial to ensure that each team member knows their task and understands how their contribution will support achieving the established goals. Every member involved in the laboratory should have a clear understanding of their roles and responsibilities and an effective way of working to support the smooth running of laboratory activities.

Additionally, an organization can be defined as a consciously coordinated social entity consisting of two or more people with identifiable boundaries. The primary objective of this organization is to achieve a set of shared goals that have been previously determined, which is done continuously (Pinheiro & Alves, 2024). The management of the chemistry laboratory includes precise task distribution and coordination between the laboratory head, the principal, and the chemistry teachers. A structured division of labor and efficient coordination is essential to ensure that all aspects of laboratory management proceed systematically and effectively, ultimately supporting achieving the laboratory's objectives and operational success.

Thus, the organization of the chemistry laboratory at SMA Dr. Wahidin involves close collaboration among various parties with different responsibilities. This organization's individuals play an important role in supporting the laboratory's goals. An effective organization will ensure the smoothness of all processes, whether in preparation, the execution of experiments, the management of materials and equipment, or the maintenance of laboratory facilities so that the chemistry laboratory can function optimally in supporting the learning activities.

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Implementation of the SMA Dr. Wahidin Chemistry Laboratory Work Program

Implementation is an essential function in management that focuses on efforts to direct and give orders to ensure that all plans that have been developed can be executed effectively. Through effective implementation, deviations from the plan can be minimized, making it easier for management to evaluate the entire process that has been carried out. Directing is the effort to ensure that everything planned can proceed as expected. In this context, implementation ensures that every step does not deviate from the established goals (George et al., 2023).

The research findings show that the laboratory head has conducted an inventory of the laboratory equipment and materials. However, this inventory process is still limited to reporting the condition of the facilities and equipment in the chemistry laboratory without a more in-depth management approach. This indicates an effort to maintain the laboratory's condition and ensure it can support the learning activities. However, there is still a need to improve the management and utilization of the available tools and materials in a more structured manner.

Implementation is an effort to move group members to be willing and determined to achieve the established goals (Georgiou & Ioannou, 2021). This means that all group members must be motivated and committed to working together toward the agreed-upon goals during implementation. In this case, implementing the chemistry laboratory's work program includes several essential aspects, such as the procurement of laboratory equipment, organizing and administering those tools, and reporting laboratory finances. All of these activities aim to support the smooth operation and success of the laboratory in assisting the learning process.

Supervision and Evaluation of the Implementation of the SMA Dr. Wahidin Chemistry Laboratory Work Program

Based on the research findings, it was discovered that the supervision and evaluation process at SMA Dr. Wahidin is conducted only once a year, and the lack of clear sanctions for violations may affect the achievement of the desired goals. Additionally, interviews with the school principal found that the supervision and evaluation followed regulations, although they were more spontaneous and verbally executed. This suggests room for improvement in the supervision system, and it is recommended that the principal develop a program and documented schedule for supervision to ensure that the evaluation process is more controlled, structured, and runs smoothly.

In supervision, three main functions are crucial for effective implementation. The first function is to improve the quality of learning, which includes continuous improvements in the teaching process in both the classroom and the laboratory. The second function is to trigger positive change in the elements involved in the learning process, whether students, teachers, or learning facilities. The third function is to lead and guide the learning process so that the learning objectives can be optimally achieved. These functions must be well implemented to ensure that every process aligns with the established goals, especially in the chemistry laboratory. Thus, supervision serves as a control tool and a means to motivate and support ongoing improvements (Siswanto et al., 2024).

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Adequate supervision must also follow a structured problem-solving procedure. This procedure includes steps to identify problems and their causes, design corrective actions, implement improvements, check the results of these improvements, and prevent the recurrence of the same issues in the future. This approach clarifies the actions to be taken when problems arise, ensuring that supervision is reactive and proactive. Being proactive in supervision means preventing more significant issues from arising in the future and continuously improving to create a better learning environment (Suryani et al., 2024).

The duties of supervisors and the school principal also involve a deep understanding of the field and the competencies that need to be carried out in school supervision and development. This aligns with academic and managerial supervision competency standards, which emphasize the importance of supervision based on precise standards. Adequate supervision involves direct observation of the teaching process and includes playing an active role in establishing implementation standards, designing feedback information systems, and comparing actual activities with the previously set standards. Therefore, the supervision will be more focused, systematic, and aimed at improving the overall quality of education (Syah et al., 2024).

Supporting and Inhibiting Factors in the Management of SMA Dr. Wahidin Chemistry Laboratory

The absence of laboratory assistants is one of the obstacles in managing the chemistry laboratory at SMA Dr. Wahidin. This is because the tasks and functions of laboratory assistants must be indirectly carried out by the laboratory head and the chemistry subject teachers, particularly during practical activities. This situation highlights the importance of having trained laboratory assistants to support the smooth operation of the laboratory so that the laboratory head and teachers are not burdened with additional tasks that should be the responsibility of the assistants. A lack of knowledge and experience among laboratory personnel often hinders laboratory management (Aniqoh et al., 2022). Therefore, specialized training and workshops are necessary to produce competent laboratory staff, especially for the laboratory head, who plays a crucial role in the smooth management of the chemistry laboratory.

The laboratory head plays a central role in laboratory management, which aligns with their primary duties and functions. The laboratory head must manage all aspects of the laboratory, from personnel, equipment, and materials to facilities and activities conducted within the laboratory. In this regard, the laboratory head's role is not limited to administrative aspects. It also includes supervising and coordinating all laboratory activities to ensure they run smoothly and meet the expected goals. Given the importance of this role, the laboratory head must possess strong managerial skills, in-depth knowledge, and expertise in laboratory management so that the laboratory can function optimally to support the learning process.

However, apart from human resources, another factor that must be considered is the physical condition of the laboratory itself. Currently, the chemistry laboratory at SMA Dr. Wahidin still uses a layout that does not fully meet the minimum standards for laboratories. The room, which resembles a regular classroom, and the absence of running water inside the laboratory are some of the issues faced. Additionally, having only one entrance and exit could pose a

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safety risk, especially in emergencies such as fires or minor accidents. These conditions can hinder the smooth conduct of learning and increase safety risks for both students and teachers in the laboratory.

The laboratory building's layout must adhere to various regulations developed by international bodies or governments to ensure the safety and comfort of its users (Niza et al., 2023). Some aspects that should be considered in planning a chemistry laboratory building include building layout, room requirements, spatial arrangement of equipment and benches, emergency exits, storage requirements, waste management systems, access control, security features, lighting, and ventilation. One crucial factor is ensuring that the laboratory has two doors, one for entry and one for exit, to anticipate accidents.

CONCLUSION

The general conclusion of this study is that Dr. Wahidin, the management of the chemistry laboratory at SMA, has generally adhered to the applicable regulations. However, there are still some aspects that need improvement. Specifically, this study provides several conclusions. First, the laboratory work program is planned and formalized by the laboratory head in coordination with other personnel and approved by the school principal. This work program includes the objectives, vision, and mission, as well as long-term and short-term programs prepared at the beginning of each academic year. However, plans to enhance the professionalism of the laboratory, such as appointing laboratory assistants and technicians who have received training, need to be realized. Additionally, coordination between laboratory managers and users during the implementation of the work program should be improved for smoother operation. Second, the laboratory's organizational structure is in place, although it has not been documented or displayed in the laboratory room. The school principal involves the laboratory coordinator, head of the laboratory, laboratory in-charge, and laboratory users in this organization. The selection and placement of personnel are based on their abilities. However, the lack of laboratory assistants and technicians forces the laboratory head to handle all the tasks that should be the responsibility of these roles. The laboratory work program has been implemented according to the planned activities, and its administration meets the laboratory management standards. The school principal conducts supervision and evaluation through supervision sessions, although these are not documented in written reports, and there are no written sanctions for violations. Supportive factors in laboratory management include assistance from the government with laboratory equipment and funding from the school’s RAPBS (School Budget Plan). At the same time, the main obstacle is the lack of laboratory assistants or technicians.

AUTHOR'S NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The author confirms that the data and content of the article are free from plagiarism.

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REFERENCES

Abedsoltan, H., Abedsoltan, A., & Zoghi, Z. (2024). Future of process safety: Insights, approaches, and potential developments. *Process Safety and Environmental Protection*, *185*(March), 684-707.

Ahmed, S., Taqi, H. M. M., Farabi, Y. I., Sarker, M., Ali, S. M., & Sankaranarayanan, B. (2021). Evaluation of flexible strategies to manage the COVID-19 pandemic in the education sector. *Global Journal of Flexible Systems Management*, *22*(s2), 81-105.

Aniqoh, S., Putri, H., & Rahma, W. (2022). School principal leadership strategies in improving academic quality in high schools. *ANP Journal of Social Sciences and Humanities*, *3*(1), 48-53.

Ardiansah, A., Komara, D. A., & Halimah, L. (2022). Evaluation of the library management program as a learning resources with discrepancy model. *Curricula: Journal of Curriculum Development*, *1*(1), 87-100.

Asmarany, A. I., Djunaedi, Hakim, A. A., Saefudin, A., & Judijanto, L. (2024). Effective laboratory management: Efforts to improve science education management in Islamic boarding schools. *Jurnal Penelitian Pendidikan IPA*, *10*(8), 5673-5680.

Avelar, A. B. A., da Silva Oliveira, K. D., & Farina, M. C. (2023). The integration of the sustainable development goals into curricula, research and partnerships in higher education. *International Review of Education*, *69*(3), 299-325.

Caesaria, N. Z., Saputra, Y. D., & Siswanto, D. H. (2024). Implementasi pembelajaran Matematika berdiferensiasi di sekolah dasar pada kurikulum merdeka. *Murabbi*, *3*(2), 92-100.

George, G., Haas, M. R., McGahan, A. M., Schillebeeckx, S. J. D., & Tracey, P. (2023). Purpose in the for-profit firm: A review and framework for management research. *Journal of Management*, *49*(6), 1841-1869.

Georgiou, Y., & Ioannou, A. (2021). Developing, enacting and evaluating a learning experience design for technology-enhanced embodied learning in math classrooms. *TechTrends*, *65*(1), 38-50.

Goodson, B. M., Ge, Q., & Wang, L. (2023). Development and implementation of a two-level inquiry- and project-based modular approach to teaching a second-semester physical chemistry laboratory course. *Journal of Chemical Education*, *100*(5), 1885-1894.

Hailing, Y., Xuehu, X., Huimin, Z., City, T., & City, T. (2023). Construction and practice of safety management system in University Laboratories. *Adult and Higher Education*, *5*(19), 97-104.

Han, J., & Yang, Y. (2024). Exploration of student-centered polymer chemistry laboratory teaching model. *Curriculum and Teaching Methodology*, *7*(1), 1-7.

Hanama, A., Kristiawan, Y., Siswanto, D. H., & Syah, A. B. P. D. A. F. (2024). Program market day sebagai stimulus untuk mengembangkan karakter kewirausahaan murid sekolah dasar. *Murabbi*, *3*(2), 62-70.

Hatmoko, F. T., Rochmat, S., Siswanto, D. H., & Atwano, S. (2024). Integrasi teknologi dalam pendidikan sekolah dasar sebagai upaya peningkatkan literasi. *Murabbi*, *3*(2), 112-124.

Hidayat, A. S., & Nurmila, I. S. (2024). Development of strategic planning to create an

https://doi.org/10.17509/curricula.v4i1.80139

effective school. *Pustaka: Jurnal Bahasa dan Pendidikan*, *4*(2), 155-169.

Kardoyo, Nurkhin, A., Muhsin, & Pramusinto, H. (2020). Problem-based learning strategy: Its impact on students' critical and creative thinking skills. *European Journal of Educational Research*, *9*(3), 1141-1150.

Lestari, D. P., Supahar, Paidi, P., Suwarjo, S., & Herianto, H. (2023). Effect of science virtual laboratory combination with demonstration methods on lower-secondary school students' scientific literacy ability in a science course. *Education and Information Technologies*, *28*(12), 16153-16175.

Limbu, S. (2024). Fostering peer evaluation and Cognitive, Affective, and Psychomotor (CAP) domains in school level science education: A critical reflection on the steam approach. *International Journal of Research in Education and Science*, *10*(2), 446-472.

Liubarets, V., & Vasylieva, H. (2021). Educational workers methodological competence formation in the conditions of inclusive learning. *Paradigm of Knowledge*, *1*(45).

Mohzana, M., Murcahyanto, H., Fahrurrozi, M., & Supriadi, Y. N. (2023). Optimization of management of laboratory facilities in the process of learning science at high school. *Jurnal Penelitian Pendidikan IPA*, *9*(10), 8226-8234.

Niza, I. L., Bueno, A. M., & Broday, E. E. (2023). Indoor Environmental Quality (IEQ) and Sustainable Development Goals (SDGs): Technological advances, impacts and challenges in the management of healthy and sustainable environments. *Urban Science*, *7*(3), 1-26.

Paramole, O. C., & Adeoye, M. A. (2024). Reassessing standardized tests: Evaluating their effectiveness in school performance measurement. *Curricula: Journal of Curriculum Development*, *3*(2), 217-234.

Pauzi. (2024). Critical thinking in learning perspectives on educational philosophy. *El-Ghiroh: Jurnal Studi Keislaman*, *22*(1), 1-17.

Pinheiro, G., & Alves, J. M. (2024). Organizational learning within the context of the functioning of educational teams: The progressive emergence of a professional metamorphosis. *Education Sciences*, *14*(3), 1-24.

Pisriwati, S. A., Hardi, Y., & Siswanto, D. H. (2024). Enhancing organizational development through principal leadership to improve teacher and staff work discipline. *Journal of Organizational and Human Resource Development Strategies*, *1*(1), 52-62.

Putri, H. A., & Siswanto, D. H. (2024). Teaching at The Right Level (TaRL) as an implementation of new education concepts in the insights of Ki Hajar Dewantara. *Indonesian Journal of Educational Science and Technology (Nurture)*, *3*(2), 89-100.

Putri, H. A., Siswanto, D. H., & Suryatama, H. (2025). Development of student book as a means to instill social care, honesty, and responsibility to enhance academic achievement in elementary school. *International Journal of Learning Reformation in Elementary Education*, *4*(1), 1-17.

Rathnayaka, C. M., Ganapathi, J., Kickbusch, S., Dawes, L., & Brown, R. (2024). Preparative pre-laboratory online resources for effectively managing cognitive load of engineering students. *European Journal of Engineering Education*, *49*(1), 113-138.

Sailaubay, A., Myrzakhmetova, N., Tunçel, M., & Kishibayev, K. (2024). Analysis of the relationships between university students' laboratory self-efficacy beliefs, science

https://doi.org/10.17509/curricula.v4i1.80139

process skills and achievement in chemistry courses. *Journal of Curriculum Studies Research*, *6*(2), 36-51.

Sanmarchi, F., Bucci, A., Nuzzolese, A. G., Carullo, G., Toscano, F., Nante, N., & Golinelli, D. (2024). A step-by-step researcher's guide to the use of an AI-based transformer in epidemiology: An exploratory analysis of ChatGPT using the STROBE checklist for observational studies. *Journal of Public Health, 32*(9), 1761-1796.

Siswanto, D. H. (2025). The impact of a collaborative problem-based learning on performance in inverse matrix learning, critical thinking skills, and student anxiety. *Contemporary Education and Community Engagement*, *1*(2), 1-11.

Siswanto, D. H., & Fatimah, N. (2024). Pendekatan pengelolaan keuangan sekolah menengah atas dalam upaya meningkatkan mutu pendidikan. *Jurnal Lingkar Mutu Pendidikan*, *21*(1), 54-60.

Siswanto, D. H., Listyanti, F. S., Firmansyah, A. B. P. D. A., Pisriwati, S. A., & Setiawan, A. (2024). Enhancing teachers' competence in designing computer-based test questions through in house training. *Joeli: Journal of Educational and Learning Innovation*, *1*(1), 75-84.

Suryani, E. A., Siswanto, D. H., & Pisriwati, S. A. (2024). Strengthening teacher competence through differentiated instruction training as an implementation of the merdeka curriculum. *Joeli: Journal of Educational and Learning Innovation*, *1*(2), 137-146.

Suryatama, H., Saputra, S. A., Siswanto, D. H., & Kevin, E. (2024). Penerapan konsep segitiga restitusi untuk mengembangkan budaya positif di sekolah dasar. *Murabbi*, *3*(1), 70-78.

Syah, A. B. P. D. A. F., Rachmawati, L., & Siswanto, D. H. (2024). Validity and practicality of the game-based learning media for mathematical logic using the quiz whizzer application. *Joeli: Journal of Educational and Learning Innovation*, *1*(2), 107-118.

Syah, A. B. P. D. A. F., Suwarta, & Siswanto, D. H. (2024). Enhancing teacher self-management and skills in designing teaching materials through a merdeka curriculum workshop at Muhammadiyah 1 Sleman Vocational High School. *Jurnal Pengabdian Masyarakat Bestari (JPMB)*, *3*(9), 585-598.

Tarso, T., Siswanto, D. H., & Setiawan, A. (2025). Teacher qualifications in the implementation of the Kurikulum Merdeka and ISMUBA. *Curricula: Journal of Curriculum Development*, *4*(1), 13-28.

Tarso, T., Suryatama, H., Saputra, S. A., Hanama, A., & Siswanto, D. H. (2024). Unlocking potential with entrepreneurship training for vocational high school students. *JSCD: Journal of Social and Community Development*, *1*(02), 85-94.

Wati, P., Nusantara, T., & Utama, C. (2024). Efektivitas PjBL-STEM terhadap keterampilan berpikir kritis dan motivasi belajar siswa sekolah dasar. *Jurnal Ilmu Pendidikan*, *7*(2), 126-143.

Weng, X., Chiu, T. K. F., & Tsang, C. C. (2022). Promoting student creativity and entrepreneurship through real-world problem-based maker education. *Thinking Skills and Creativity*, *45*(1), 1-10.

Yang, M., Zhu, X., Yan, F., Huang, X., Wu, Z., Jiang, X., Huang, Y., & Li, Z. (2025). Digital-based emergency prevention and control system: Enhancing infection control in psychiatric hospitals. *BMC Medical Informatics and Decision Making*, *25*(1), 1-11.

https://doi.org/10.17509/curricula.v4i1.80139