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Management Of Biology Laboratory Administration At SMA N 7 Bengkulu Utara

Pengelolaan Administrasi Laboratorium Biologi SMA N 7 Bengkulu Utara

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ABSTRACT

Purpose-Laboratories play a crucial role in supporting science learning in senior high schools by facilitating practical activities that enhance students' scientific skills, critical thinking, and conceptual understanding. This study aims to describe the management of a biology laboratory at SMA Negeri 7 Bengkulu Utara and to identify challenges encountered in its implementation. Design/methods/approach-This study employed a qualitative descriptive approach. Data were collected through semi-structured interviews with biology teachers and the head of the biology laboratory. The data were analyzed based on management functions, including planning, organizing, implementation, supervision, and evaluation. Findings-The findings indicate that biology laboratory management has been implemented in accordance with basic management functions. However, its implementation has not been optimal. Planning and practical activities are constrained by limited laboratory equipment, materials, budget allocation, availability of laboratory personnel, and restricted instructional time. In addition, laboratory evaluation has not been conducted systematically or supported by standardized assessment instruments. Research implications/limitations-This study is limited to a single school context and relies solely on interview data, which may affect the generalizability of the findings. Nevertheless, the results provide practical insights for schools and education stakeholders to improve biology laboratory management, particularly in optimizing existing resources and strengthening systematic evaluation practices.

Keywords: *Biology Laboratory Management; Science Learning; Senior High School; Laboratory Facilities; Qualitative Study*

ABSTRAK

Tujuan - Laboratorium memainkan peran penting dalam mendukung pembelajaran sains di sekolah menengah atas dengan memfasilitasi kegiatan praktik yang meningkatkan keterampilan ilmiah, berpikir kritis, dan pemahaman konseptual siswa. Studi ini bertujuan untuk mendeskripsikan pengelolaan laboratorium biologi di SMA Negeri 7 Bengkulu Utara dan mengidentifikasi tantangan yang dihadapi dalam implementasinya. Desain/metode/pendekatan - Studi ini menggunakan pendekatan deskriptif kualitatif. Data dikumpulkan melalui wawancara semi-terstruktur dengan guru biologi dan kepala laboratorium biologi. Data dianalisis berdasarkan fungsi manajemen, termasuk perencanaan, pengorganisasian, implementasi, pengawasan, dan evaluasi. Temuan - Temuan menunjukkan bahwa pengelolaan laboratorium biologi telah diimplementasikan sesuai dengan fungsi manajemen dasar. Namun, implementasinya belum optimal. Perencanaan dan kegiatan praktik dibatasi oleh keterbatasan peralatan laboratorium, bahan, alokasi anggaran, ketersediaan personel laboratorium, dan waktu pembelajaran yang terbatas. Selain itu, evaluasi laboratorium belum dilakukan secara sistematis atau didukung oleh instrumen penilaian standar. Implikasi/keterbatasan penelitian - Studi ini terbatas pada konteks sekolah tunggal dan hanya bergantung pada data wawancara, yang dapat memengaruhi generalisasi temuan. Meskipun demikian, hasil penelitian ini memberikan wawasan praktis bagi sekolah dan pemangku kepentingan pendidikan untuk meningkatkan manajemen laboratorium biologi, khususnya dalam mengoptimalkan sumber daya yang ada dan memperkuat praktik evaluasi sistematis.

Kata kunci: Manajemen Laboratorium Biologi; Pembelajaran Sains; Sekolah Menengah Atas; Fasilitas Laboratorium; Studi Kualitatif

1. Introduction

The availability of adequate facilities and infrastructure, such as laboratories, is essential to support learning activities in schools. A laboratory is a place for conducting experiments, investigations, or scientific activities and serves as a supporting facility in the learning process. In the laboratory, students not only learn conceptual understanding but also develop process skills and scientific attitudes as practitioners. This experiential learning approach aligns with science education principles that emphasize learning by doing. Laboratory activities can also foster and enhance students' curiosity toward physical phenomena (Meilina *et al*., 2025, Sari *et al*., 2022)

One of the most important facilities supporting science learning at the senior high school level is the biology laboratory. Practical activities enable students to improve their critical thinking skills, deepen their understanding of biological concepts, and enhance overall conceptual comprehension. Previous studies indicate that laboratory-based learning significantly contributes to higher-order thinking skills in science education (Abrahams & Reiss, 2012). Therefore, the presence of a well-managed laboratory is a key factor in creating effective and meaningful biology learning (Ramadhan *et al.*, 2021).

The management of biology laboratories does not merely involve the provision of facilities and equipment, but also includes planning, implementation, supervision, and evaluation of practical activities. In this context, the role of laboratory personnel is crucial, as they are responsible for the readiness of tools and materials, laboratory safety, and the smooth implementation of student practicum activities (Suryani & Hidayat, 2021). According to Terry and Rue (2014), effective management requires coordination of human resources to achieve organizational goals efficiently. Effective laboratory management enables laboratory personnel to support biology teachers in creating more interactive and contextual learning experiences.

SMA Negeri 7 Bengkulu Utara, as one of the senior secondary education institutions, has a biology laboratory that supports science learning activities. However, in practice, laboratory management often faces various challenges, including limited facilities, suboptimal coordination between teachers and laboratory personnel, and underdeveloped laboratory administration systems. Similar challenges have been reported in secondary schools, particularly related to laboratory utilization and administrative management (OECD, 2019) These conditions may affect the effectiveness of biology learning and the achievement of student competencies. Therefore, an in-depth study on the management of the biology laboratory at SMA Negeri 7 Bengkulu Utara is necessary to examine the extent to which management functions, roles, and effectiveness have been implemented. This study is expected to provide a comprehensive overview of biology laboratory management practices and serve as an evaluative reference for schools in improving the quality of biology learning in the future.

Biology laboratory management at the senior high school level plays a vital role in ensuring the effectiveness of science learning processes. However, in practice, many laboratories are still not optimally managed in terms of planning, implementation, and evaluation of practicum activities (Putri *et al*., 2024). Ineffective laboratory management may reduce opportunities for meaningful student engagement in scientific inquiry. Based on these conditions (Ardela Noviati Muhlis *et al.*, 2025), the research problem of this study is formulated as follows: How is the management of biology laboratory personnel in senior high schools in supporting the effectiveness of biology learning?

The purpose of this study is to describe and analyze the management of biology laboratories, including aspects of laboratory activity planning, organization of laboratory personnel roles and responsibilities, implementation of practicum activities, and evaluation of laboratory management effectiveness. Through this analysis, the study aims to determine the extent of the role of laboratory personnel in improving the quality of biology learning in schools (Suryani & Hidayat, 2021).

Theoretically, this study contributes to the development of educational management knowledge, particularly in the management of science laboratories at the secondary school level. Practically, the findings are expected to assist schools in improving the performance of laboratory personnel, enhancing laboratory facilities and infrastructure management, and formulating policies that support effective biology practicum implementation (Hamidah1, 2022) Such evidence-based improvements are essential for strengthening school capacity and learning (Bush, 2020) quality Thus, this research not only strengthens educational management theory but also provides practical implications for improving the quality of biology learning in senior high schools.

2. Method

This study employed a qualitative approach with descriptive analysis. The research subjects consisted of the head of the biology laboratory and biology teachers at SMA Negeri 7 Bengkulu Utara, an A-accredited senior high school. Data were collected through observation, interviews, and documentation (Musdalifa & Faridah, 2021) (Sugiyono, 2019). Observations focused on four main components of laboratory management, namely planning, organizing, implementation, and supervision. These observations were followed by structured interviews with the head of the laboratory and biology teachers. The interview guidelines were validated by an appointed expert prior to data collection to ensure the validity of the research instruments. In addition, documentation techniques were used to collect supporting data, including laboratory administrative records, activity schedules, organizational structures, and laboratory regulations (Rukajat, 2018).

3. Result and Discussion

This study aims to describe the management of biology laboratory operations at SMA Negeri 7 Bengkulu Utara. The data were obtained through interviews with biology teachers and the head of the biology laboratory. The analysis of research findings was organized based on management functions, including planning, organizing, implementation, supervision and evaluation, as well as the constraints and solutions in managing the biology laboratory. The research findings are mapped into a conceptual framework based on the management functions of the biology laboratory.

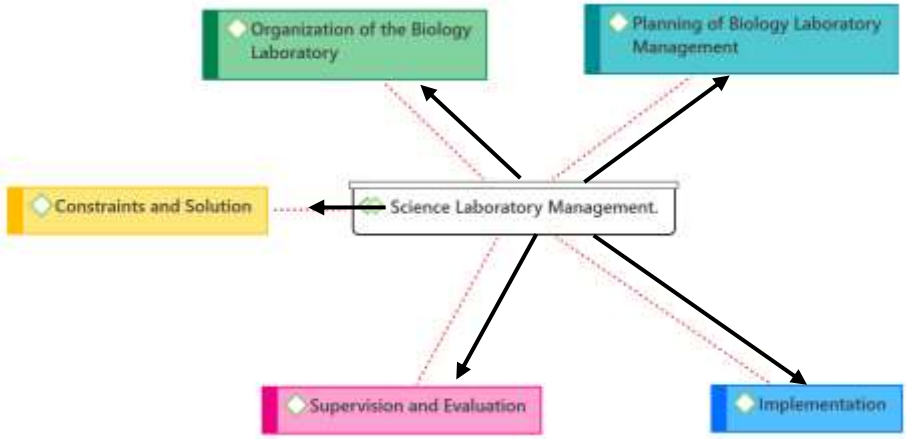

Figure 1. Conceptual framework of biology laboratory management based on planning, organization, implementation, supervision and evaluation, as well as constraints and solutions.

1. Planning of Biology Laboratory Management
   The results of the study indicate that planning for biology laboratory management is conducted at the beginning of each academic year. Planning activities include identifying

laboratory needs, preparing annual practicum programs, and aligning practicum activities with the biology curriculum. This planning process is coordinated by the head of the laboratory in collaboration with biology teachers. Interview quotation:

"At the beginning of the academic year, as the head of the laboratory, I ask teachers about the laboratory needs required for upcoming learning activities. Teachers also prepare practicum programs for one academic year." (Head of laboratory)

However, the study also found that procurement planning is constrained by the availability of school funding, particularly BOS funds, resulting in several practicum activities being adjusted to existing laboratory facilities.

2. Organization of the Biology Laboratory

The findings show that the organizational structure of the biology laboratory involves the principal, vice principal for curriculum affairs, head of the laboratory, laboratory assistant, and biology teachers. Roles and responsibilities are formally assigned at the beginning of the semester. Interview quotation:

"The division of laboratory duties has been determined since the beginning of the semester, including laboratory coordinators, laboratory assistants, and teachers, following the task allocation set by the curriculum division." (Head of laboratory,). My duties usually include preparing tools and materials before and after practicum activities, as well as checking damaged tools and materials. Damaged items are stored in the warehouse and recorded, including items that are insufficient or damaged, so they can be reported to supervisors. I then coordinate with Mr. E as the biology laboratory coordinator, who forwards the report to higher authorities." . (Laboratory assistant)

Despite having a laboratory assistant, the limited number of laboratory personnel requires biology teachers to assist in laboratory preparation and practicum activities.

3. Implementation of Biology Laboratory Management

The implementation of biology laboratory management includes practicum activities, preparation and maintenance of tools and materials, and laboratory administration. The results indicate that biology practicum activities have been carried out; however, laboratory utilization remains limited. Interview quotation:

"The laboratory assistant helps teachers prepare tools and materials, sometimes accompanies practicum activities, and checks the equipment after practicum sessions." (Head of laboratory). During laboratory practicum activities, I am usually assisted by the laboratory assistant. Prior to the practicum, I as a teacher inform the laboratory assistant about the planned practicum. The laboratory assistant then prepares the tools and materials and helps supervise students during the practicum." (Biology Teacher)

Limited instructional time and the need for extensive practicum preparation were identified as the main factors affecting the frequency of laboratory use. In addition, laboratory administrative records such as inventory books and equipment usage logs have not been managed optimally.

4. Supervision and Evaluation of Biology Laboratory Management

The study found that supervision of biology laboratory management is carried out by the principal and the vice principal for curriculum affairs through monitoring laboratory use and reviewing reports submitted by the head of the laboratory. Evaluation activities are generally conducted at the end of the semester or during school meetings. However, the evaluation of laboratory management has not been implemented systematically and is not well documented. The evaluation process remains general in nature and has not yet utilized specific assessment instruments for laboratory management performance. This condition is supported by the following interview statement:

"Evaluation does exist, but it is incidental and not systematically planned." (Head of laboratory)

Overall, evaluation is mostly conducted through informal discussions rather than structured procedures, indicating that supervision and evaluation of biology laboratory management have not yet been supported by standardized evaluation instruments.

5. Constraints and Solutions in Biology Laboratory Management
   The biology laboratory faces constraints such as limited instructional time, few personnel, budget limitations, and underutilization. One teacher explained:
   "Laboratory utilization is still minimal, not because of a lack of equipment, but due to limited learning time and the time required for practicum preparation." (Head of laboratory)
   To address this, the school optimizes available equipment, conducts simple practicum activities, proposes gradual facility procurement through BOS funds, and strengthens collaboration among teachers and laboratory staff. Supervision is carried out by the principal and vice principal for curriculum affairs through monitoring and report reviews.

Discussion

Planning of Biology Laboratory Management

Planning is a fundamental management function that serves as the basis for the implementation of all laboratory activities. Effective planning determines the optimal use of facilities and infrastructure in supporting the learning process. (Ardiansyah *et al.*, 2023) states that educational facilities and infrastructure planning must be aligned with instructional needs to ensure that teaching and learning activities run effectively and efficiently. This view is in line with management theory which emphasizes planning as a strategic step in achieving organizational goals (Hendrawan *et al*., 2021). The findings of this study indicate that the planning of biology laboratory management at SMA Negeri 7 Bengkulu Utara has been systematically arranged; however, it is still constrained by limited budget availability. Budget constraints are a common challenge in school laboratory planning, particularly in public schools. This condition is consistent with the Regulation of the Minister of National Education (Permendiknas) Number 24 of 2007, which emphasizes that laboratory planning must meet educational facilities and infrastructure standards to enable practical activities to be conducted optimally. Research has also shown that many schools still face gaps between the standards of laboratory facilities required and the actual budgetary support available, which can hinder the ability to fully implement practical learning activities and maintain infrastructure to standard levels (Niswaty & Saleh, 2024) .

Organization of Biology Laboratory Management

Organizing aims to clearly distribute tasks, authority, and responsibilities so that laboratory activities can be carried out effectively. In the context of laboratory management, defining roles and responsibilities through a structured organizational framework is essential to support efficient and safe laboratory operations, ensuring that each member understands their duties within the laboratory structure (Niswaty & Saleh, 2024) .Effective organizing in educational settings includes determining an appropriate organizational structure, dividing tasks, and allocating authority to human resources so that all components within the school can work together harmoniously toward achieving educational goals. (Pratiwi & Mulyono, 2025) Furthermore, research on laboratory management highlights that a clearly established organizational structure including laboratory heads, assistants, and technical staff contributes to the optimal functioning of the laboratory and supports the implementation of practical learning activities effectively (Mulyono, 2023). The results of this study show that although the organizational structure of the biology laboratory has been established, the limited number of laboratory personnel has resulted in an excessive workload that cannot be handled professionally. This condition reflects weak human resource allocation, which may reduce organizational effectiveness (Hasibuan & Prastowo, 2019) This condition affects the effectiveness of laboratory management and indicates that the organizing function still requires improvement.

Implementation of Biology Laboratory Management

The implementation of laboratory management is closely related to the readiness of facilities, infrastructure, and human resources. (Wisla *et al.*, 2023)states that well-managed laboratories support active, contextual, and meaningful science learning. This is supported by constructivist learning theory, which emphasizes learning through direct experience and practice (Creswell & David, 2014). The findings reveal that limitations in equipment, materials, and instructional time have reduced the frequency of practical activities. Limited instructional time has also been identified as a barrier to laboratory-based learning in previous studies (Sugiyono, 2013). In addition, laboratory administration, such as inventory and borrowing records, has not been well organized, which may hinder the sustainable and effective utilization of the laboratory.

Supervision and Evaluation of Biology Laboratory Management

Supervision and evaluation are management functions intended to ensure that laboratory activities are conducted in accordance with planned objectives and established standards. (Nasution & Nasution, 2024) emphasizes that the evaluation of educational facilities and infrastructure should be conducted periodically, systematically, and measurably to serve as a basis for decision-making and improvement. Furthermore, systematic evaluation provides valid data for continuous improvement in educational management (Vokasi *et al*., 2019), highlighting how structured evaluation contributes to better alignment with standards and objectives in laboratory settings. Research on laboratory management also shows that without routine systematic supervisory instruments and evaluation protocols, data on activities and outcomes cannot be optimized for improvement processes in schools (Santoso *et al*., 2024). The findings indicate that the evaluation of biology laboratory management at SMA Negeri 7 Bengkulu Utara has not been carried out systematically and has not utilized specific evaluation instruments. Consequently, evaluation results have not been optimally used to improve laboratory management.

Constraints and Solutions in Biology Laboratory Management

Constraints in laboratory management are common issues faced by secondary schools. argue that limitations in facilities and resources can be addressed through strategies that optimize available resources. This approach aligns with the concept of school-based management, which encourages schools to creatively manage existing resources (Yunita *et al*., 2018). Efforts undertaken by the school, such as conducting simple practical activities and proposing gradual procurement of facilities through available funding schemes, represent realistic strategies in addressing existing limitations (Hanidar *et al.*, 2024). Incremental procurement is considered an effective solution in resource-limited educational institutions, as it enables schools to gradually improve facilities in accordance with available resources and priorities (Hamidah, 2022), strong commitment from school management is required to enhance support for laboratory management so that the laboratory can function optimally as an effective learning facility (Sudrajat & Rahmawati, 2025).

4. Conclusion

This study concludes that the management of the biology laboratory at SMA Negeri 7 Bengkulu Utara has been implemented based on the main management functions, namely planning, organizing, implementation, supervision, and evaluation. Laboratory planning has been carried out systematically at the beginning of the academic year and aligned with the biology curriculum; however, its implementation is still constrained by limited budget availability, which affects the completeness of laboratory facilities and practicum activities.

In terms of organization, the laboratory has an established organizational structure involving the principal, vice principal for curriculum, head of the laboratory, laboratory assistant,

and biology teachers. Nevertheless, the limited number of laboratory personnel has resulted in an uneven distribution of workload, thereby reducing the effectiveness of laboratory management. The implementation of laboratory activities, particularly biology practicums, has been conducted but remains limited in frequency due to constraints related to equipment, materials, time allocation, and laboratory administration systems that have not been optimally organized.

Supervision and evaluation of laboratory management are conducted by school leaders through monitoring and reporting mechanisms. However, the evaluation process has not been implemented systematically and lacks specific assessment instruments, limiting its usefulness as a basis for continuous improvement. The main constraints identified in this study include limited facilities and infrastructure, multifunctional use of laboratory space, insufficient laboratory personnel, limited funding, and restricted instructional time. To address these challenges, the school has implemented several strategies, such as optimizing available resources, conducting simple practicums, proposing gradual procurement of facilities, and strengthening collaboration among biology teachers. Overall, this study highlights the need for stronger institutional commitment, improved resource allocation, and systematic evaluation mechanisms to enhance the effectiveness of biology laboratory management and to support meaningful biology learning in senior high schools.

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