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Optimizing the Management of Facilities and Infrastructure to Improve the Quality of Student Learning

Prianto*, Ita Nurmalasari, Akhmad Shaiful Bakri
Institut Agama Islam An-Nawawi Purworejo, Indonesia
Email: priy39190@gmail.com

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****Corresponding Author***

ABSTRACT

Quality education is vital for advancing societal progress, and the management of educational facilities and infrastructure plays a key role in enhancing learning outcomes. This study investigates the management and optimization of facilities at SMK Ma'arif NU 02 Kemiri Purworejo, focusing on its impact on student learning quality. The research aims to examine the processes of planning, utilization, maintenance, and optimization of educational facilities in a vocational setting. A qualitative approach was used, with data collected through structured interviews, direct observations, and document analysis. The findings reveal that while the school has made progress in managing its facilities, issues such as uneven facility utilization, limited funding, and reactive maintenance persist. The optimization efforts, including priority-based facility allocation and resource rotation, align well with educational needs. However, challenges in needs-based planning and equitable facility distribution require improvement. This research contributes to the academic literature by emphasizing the strategic role of facility management in vocational education, offering practical insights for improving learning environments. Future studies could explore broader institutional contexts and incorporate quantitative methods to strengthen the findings.

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INTRODUCTION

Quality education is a key factor in advancing the civilization of a nation (AL Melweth et al., 2024; Palah et al., 2022; Timotheou et al., 2023). In this context, educational facilities and infrastructure play a crucial role in supporting the learning process. The availability of adequate facilities can create an effective and efficient learning environment, ultimately improving the quality of student outcomes (Moslimany et al., 2024; Najiburrahman et al., 2025). Therefore,

research on the management of educational facilities and infrastructure is highly relevant, as it can help formulate management strategies that enhance learning quality in educational institutions (Fawaid et al., 2025; Sugandi et al., 2025). The optimization of educational facilities usage cannot be ignored in the process of continuous improvement in the quality of education.

A major issue faced by society in this context is the suboptimal management of educational facilities in many institutions. Although most schools and universities provide adequate facilities, many are still unable to optimize the use of these facilities effectively (Novianti et al., 2024). This can be seen in the low quality of the learning process in many educational institutions, despite the availability of modern facilities. This issue serves as a significant reason for conducting research on educational facility management, especially in relation to improving student learning quality (Kew & Tasir, 2022; Peterson et al., 2011; Trabelsi et al., 2023).

In practice, the phenomenon often observed is that, although schools have good facilities such as classrooms, laboratories, and learning media, many students fail to benefit fully from these facilities (Irwin, 2024; Moslimany et al., 2024; Palah et al., 2022). Some schools even lack clear procedures for managing and maintaining these facilities, which leads to the underutilization of these resources. This can hinder the achievement of the true educational goals, which is to enhance the quality of student learning.

Previous research highlights the importance of managing educational facilities, yet there are still gaps in examining the direct relationship between facility management and student learning quality. Studies such as Alavi (2024) state that facility management can affect academic achievement but do not focus on overall learning quality (Alavi et al., 2024). Similarly, research by Hasanah (2023) suggests that facility management contributes to improving the learning process but does not directly link this management with the overall enhancement of student learning quality (Hasanah, 2023; Khaidir Fadil et al., 2023; Novianti et al., 2024). These gaps underscore the need for further investigation into how optimizing educational facility management can directly impact learning quality.

The novelty of this study lies in its focus on positioning the optimization of educational facilities and infrastructure management as a managerial strategy directly linked to improving student learning quality. Unlike previous studies, this research not only examines the availability and utilization of educational

facilities but also systematically analyzes the processes of planning, utilization, and optimization of facilities and infrastructure and their implications for learning quality in vocational education. This approach is crucial to bridge the gap in existing research and contribute to a deeper understanding of how facility management can enhance the learning experience.

The research problem of this study is to examine how educational institutions, specifically SMK Ma'arif NU 02 Kemiri in Purworejo, optimize their facility management and how this optimization contributes to improving student learning quality. This study argues that the optimization of facilities management is a critical managerial strategy for enhancing learning quality, which has been insufficiently explored in the context of vocational education.

Thus, this research contributes to both the academic literature and practical approaches to facility management in educational institutions. It provides a deeper understanding of how well-managed facilities can directly influence the learning process, offering a more comprehensive approach to improving the quality of education.

RESEARCH METHOD

This study adopts a qualitative research design with a descriptive approach. The primary aim of this approach is to obtain an in-depth understanding of the management and optimization of educational facilities and infrastructure in improving the quality of learning at SMK Ma'arif NU 02 Kemiri Purworejo. A qualitative design was chosen due to the natural setting of the study, where the researcher acts as the primary instrument in data collection and analysis. This design allows for a comprehensive exploration of the phenomena under investigation, providing rich insights into the context and processes involved.

The research is conducted at SMK Ma'arif NU 02 Kemiri Purworejo, a vocational school in Purworejo, Central Java, Indonesia. The choice of this location is based on the school's relatively adequate facilities and infrastructure, which provide an opportunity to explore the optimization of these resources in enhancing the quality of learning. The school's setting offers a relevant context for examining how facility management influences educational outcomes, particularly in a vocational education setting.

Data collection in this study involves multiple techniques, including structured interviews, direct observation, and documentation. Structured interviews were conducted with the vice principal in charge of facilities and infrastructure, as well as teachers, to gain insights into the current management practices, challenges, and strategies for optimizing facilities. Direct observation was carried out to assess the actual conditions and utilization of the educational facilities and infrastructure. Additionally, school documents, archives, books, and relevant scientific journals related to the management of educational facilities were examined as secondary data sources.

The data analysis process follows a systematic approach, including data condensation, data reduction, data display, and verification. Data condensation involves selecting, focusing, and simplifying the data collected to facilitate deeper understanding. Data reduction is the process of organizing and sorting the data to ensure relevance to the research question. Data display refers to organizing the data in a way that allows for easy interpretation and pattern identification. Finally, data verification ensures the reliability and validity of the findings by cross-checking and confirming the data through multiple sources and methods.

To ensure the validity of the data, this study employs triangulation techniques, including source triangulation and method triangulation. Source triangulation involves comparing data from different sources, such as interviews, observations, and documentation, to enhance credibility. Method triangulation entails comparing data obtained through different methods (e.g., interviews and observations) to ensure the consistency and accuracy of the findings. This rigorous approach ensures that the results of the study are both reliable and scientifically accountable.

RESULT AND DISCUSSION

Result

The findings of this study indicate that the management of facilities and infrastructure at SMK Ma'arif NU 02 Kemiri Purworejo has been implemented through planning, utilization, maintenance, and inventory control stages, involving the principal, vice principal, teachers, and the school committee. Although the school possesses relatively adequate facilities, their utilization is uneven, with some vocational practice facilities being overused while others remain underutilized. Maintenance is reactive, lacking a systematic program,

and evaluations are primarily administrative rather than focused on learning outcomes. Despite these limitations, the appropriate use of facilities, particularly in vocational practical learning, positively impacts students' motivation, participation, and conceptual understanding. Interviews with key stakeholders revealed that planning is participatory, but challenges include limited funding and uneven access to facilities like computer labs. The study concludes that while the management of facilities and infrastructure is collaborative, issues in needs-based planning, equitable facility distribution, preventive maintenance, and evaluation mechanisms need further improvement to enhance learning quality.

Optimization

The optimization of educational facilities and infrastructure is a strategic effort aimed at maximizing the potential of available resources to improve students' learning quality. According to the Indonesian Dictionary, optimization refers to the process of seeking the best possible condition to achieve specific objectives (Jmari et al., 2025). In the context of education, it involves not just the availability of facilities, but also their effective management and utilization in line with instructional needs (Irfan et al., 2023; Jmari et al., 2025).

At SMK Ma'arif NU 02 Kemiri Purworejo, the optimization of facilities and infrastructure management is focused on aligning facility availability with students' learning needs, particularly in practice-based vocational learning. Despite financial limitations, the school strives to optimize existing resources through priority-based facility allocation, rotational use of learning spaces and equipment, and integrating technology into teaching activities. This approach ensures that resources are used effectively to meet educational goals.

These efforts reflect the essence of optimization, which emphasizes achieving the best outcomes through efficient resource management. The optimization of facilities and infrastructure contributes to the creation of more relevant and supportive learning environments, which ultimately enhance students' learning quality by making educational resources more accessible, engaging, and aligned with the needs of vocational education.

Facilities and Infrastructure

Facilities and infrastructure management refers to the process of effectively utilizing resources to achieve predetermined goals (Fadli Hidayat et

al., 2024; Khaidir Fadil et al., 2023). According to the Indonesian Dictionary, management is defined as the process of using resources optimally to accomplish specific goals (Khomairotusshiyama et al., 2023). In the educational context, this includes planning, procurement, inventory control, distribution, utilization, maintenance, and disposal of educational facilities. These processes ensure that all facilities function optimally to support learning activities (Hakim & Rozi, 2024; Hidayah, 2021). Facilities management is essential for organizing and preparing equipment and materials for school activities, directly or indirectly supporting teaching and learning. Educational facilities, such as classrooms, desks, chairs, instructional media, and learning technologies, play a crucial role in ensuring the smooth operation of educational activities (Azzahra, 2024).

Infrastructure, on the other hand, refers to fundamental, permanent facilities that support various activities, such as school buildings, classrooms, laboratories, libraries, and information systems. Adequate infrastructure serves as the foundation for efficient and sustainable performance within educational institutions. Proper infrastructure management is key to improving institutional performance and service quality, reflecting professionalism and a commitment to providing optimal educational services (Dalimunthe et al., 2025). Infrastructure, therefore, not only supports physical operations but also serves as an indicator of institutional capacity and progress. This is reinforced by the Regulation of the Minister of National Education Number 24 of 2007, which distinguishes facilities as movable instructional equipment and infrastructure as permanent physical facilities essential to school operations (Zaqiah et al., 2024).

Facilities and infrastructure are complementary components that play a strategic role in supporting educational activities. While facilities are directly related to teaching and learning, infrastructure provides the necessary foundation for educational operations to run effectively. Sustainable maintenance of both components contributes to a comfortable, efficient, and effective learning environment, making them not just physical assets but indicators of institutional quality and advancement (Arum, 2024; Nurmayuli, 2022). Proper management of these resources ensures that educational institutions can achieve their goals and provide quality education (Purnamaningsih & Purbangkara, 2022).

In the case of SMK Ma'arif NU 02 Kemiri Purworejo, facilities and infrastructure management is carried out through integrated planning,

utilization, and maintenance stages within the school's framework. This approach helps create a conducive learning environment, enhances student motivation, and supports vocational practical learning. These findings highlight the importance of well-planned and sustainable facilities management in improving learning quality, not only through the provision of physical resources but also as a key strategic element in enhancing vocational secondary education (Anjani et al., 2025).

Discussion

The findings of this study regarding the management of facilities and infrastructure at SMK Ma'arif NU 02 Kemiri Purworejo reveal both strengths and areas needing improvement. The school follows a structured approach to facilities management, which includes planning, utilization, maintenance, and inventory control. However, this study aligns with previous research, such as that by Azzahra (2024), which emphasizes the importance of well-maintained and effectively utilized facilities in supporting the learning process. The school's use of facilities is consistent with the literature, which suggests that facilities management should be integrated with instructional needs to improve learning quality. However, a significant difference is observed in the lack of a comprehensive evaluation system, as highlighted by Zaqiah (2024), where evaluations tend to be administrative rather than focused on the impact of facilities on learning outcomes (Zaqiah et al., 2024). This gap points to a need for further integration of evaluative mechanisms into facility management.

In terms of optimization, the school's approach reflects the essence of what Jmari (2025) describes as optimization in the educational context maximizing the potential of available resources to meet instructional needs (Jmari et al., 2025; Putri et al., 2024). Despite limited financial resources, SMK Ma'arif NU 02 Kemiri Purworejo effectively employs priority-based facility allocation and rotational use of learning spaces, which resonates with the concept of optimizing available resources for the best educational outcomes. This approach mirrors the strategies proposed by Wan et al. (2025), who emphasize the importance of strategic resource management in education (Wan et al., 2025). The study's findings underline the practical application of optimization in a resource-constrained environment, where thoughtful allocation and use of facilities can still foster an environment conducive to learning, especially in vocational education.

However the study also identifies areas where the school's management practices diverge from the theoretical expectations laid out in the literature. For instance, while the school uses facilities effectively in vocational practical learning, the uneven distribution of facilities, such as underutilized computer labs, deviates from what is recommended in the literature. According to Obani (2025), sustainable and equitable distribution of facilities is essential for ensuring that all aspects of the learning process are equally supported (Obani & Izu-Obani, 2025; Simorangkir et al., 2024). The lack of a structured scheduling system for facility usage, as mentioned in the study, limits the full potential of the available resources and prevents a more equitable utilization of facilities.

From a theoretical perspective, this study contributes to the ongoing debate on how educational facilities management should be structured to maximize the learning outcomes. The findings support the notion that well-managed and strategically utilized facilities can have a significant impact on the learning experience, particularly in vocational education. The study confirms the theoretical position that educational facilities and infrastructure are not just physical assets but integral components that shape the learning environment. Theoretical implications of this study suggest that further exploration into how facility management can be linked directly to learning outcomes is necessary, particularly in vocational settings where practical learning plays a key role.

Practically, the study emphasizes the importance of a more structured and needs-based approach to facilities management. While the school has made significant strides in utilizing available resources, there is room for improvement in the areas of planning and maintenance. The practical implication of these findings is that educational institutions, particularly vocational schools, should prioritize preventive maintenance programs and more systematic scheduling for facility usage. Moreover, integrating a more evaluative approach that focuses on learning outcomes rather than administrative tasks could further enhance the effectiveness of facility management. Ultimately, these improvements would help create a more efficient and supportive learning environment, thereby enhancing the overall quality of education at SMK Ma'arif NU 02 Kemiri Purworejo.

CONCLUSION

The most significant finding of this study is that while the management of facilities and infrastructure at SMK Ma'arif NU 02 Kemiri Purworejo has made considerable progress, there are critical areas that require improvement, particularly in needs-based planning, equitable facility distribution, and preventive maintenance. The school employs a collaborative approach, but challenges such as limited funding, reactive maintenance, and uneven facility utilization hinder the full optimization of resources. The study emphasizes the importance of aligning facility management with instructional needs, especially in vocational education, where practical learning plays a crucial role in student success. The key lesson learned is that effective facility management is integral to improving students' learning quality, but it requires more strategic planning and evaluation mechanisms to be impactful.

This research contributes significantly to the academic discourse on educational facility and infrastructure management, especially in vocational schools. It highlights the need for a more systematic, needs-based approach to managing educational resources and provides valuable insights into how strategic management of physical resources can enhance learning quality. However, the study has limitations, such as focusing on a single vocational school, which may limit the generalizability of the findings. Future research could address this by including a broader range of schools and using more quantitative methods to analyze the relationship between facility management and learning outcomes. Further investigation into the impact of specific facilities, like computer labs or vocational training equipment, would also help provide more targeted recommendations.

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