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IMPLEMENTATION OF TEACHING FACTORY MANAGEMENT IN IMPROVING STUDENTS' HARD SKILLS

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Abstrak. Vocational high schools are expected to produce graduates who are ready to enter the workforce; however, the high unemployment rate among graduates indicates insufficient work readiness. This study aims to analyze the implementation of teaching factory management in improving students' hard skills. This research employed a qualitative descriptive approach, with data collected through interviews, observations, and documentation. The results show that teaching factory management is implemented through planning, organizing, actuating, and controlling functions. Nevertheless, students' involvement in the production process is still limited and largely dominated by experts. Despite this limitation, the implementation of teaching factories has contributed to improving students' hard skills, particularly in graphic design technology, technical abilities, and understanding of production processes. These findings imply the need to increase students' direct involvement in production activities to optimize learning outcomes and better align them with industry demands.

Kata Kunci: Teaching Factory; Management; Hard Skills; Vocational Education; Students

I. INTRODUCTION

Background of the Study

Vocational high schools are expected to produce graduates who are ready to enter the workforce and meet the demands of the industry. However, in reality, the unemployment rate among vocational school graduates remains relatively high, indicating a gap between the competencies acquired in school and the needs of the labor market (Putranto, et al., 2024). This issue reflects that students' hard skills and work readiness are not yet optimally developed, which becomes a significant challenge in vocational education.

In response to this problem, the concept of teaching factory has emerged as an industry-based learning approach that integrates theoretical knowledge with real production activities in a school setting. Teaching factory is designed to simulate industrial environments, allowing students to gain hands-on experience, improve technical competencies, and understand actual work processes (Wolf, et al., 2025). Previous studies such as Jing, et al., (2025) and Sutianah, et al., (2024) have highlighted that teaching factory contribute to enhancing students' skills, creativity, and employability, as well as bridging the gap between education and industry.

Nevertheless, the effectiveness of teaching factory implementation is highly dependent on how it is managed. Management plays a crucial role in ensuring that all processes, including planning, organizing, actuating, and controlling, are carried out systematically and effectively. Without proper management, teaching factory activities may not achieve their intended outcomes. Therefore, examining the implementation of teaching factory management is essential to understand its contribution to improving students' hard skills.

Problem of the Study

Despite the growing adoption of teaching factories in vocational education, several challenges still persist in its implementation. One of the main issues is the limited involvement of students in the actual production process,

where activities are often dominated by teachers or external experts. This condition reduces students' opportunities to fully develop their technical competencies through direct experience.

Furthermore, inconsistencies in the management of teaching factory programs, including unclear planning, limited coordination among stakeholders, and insufficient supervision, may affect the quality of learning outcomes. These challenges indicate that the success of a teaching factory is not solely determined by its presence as a learning model, but also by how well it is managed within the educational institution. Therefore, it is necessary to investigate the management practices of teaching factories and their impact on students' hard skill development.

Research's State of the Art

Teaching Factory has been widely implemented as an industry-based learning approach in vocational education to bridge the gap between school learning and industrial demands. Previous studies highlight that the mismatch between graduates' competencies and labor market needs remains a significant issue, contributing to the high unemployment rate among vocational school graduates (Setiadi et al., 2025; Nalapraya & Helmawati, 2025).

The implementation of Teaching Factory enables students to engage in production-based learning that simulates real industrial environments. Through this approach, students are able to apply theoretical knowledge in practical contexts, which improves their technical competence and work readiness (Perwita et al., 2025; Setiadi et al., 2025). In addition, experiential learning models such as learning factory have been shown to enhance students' understanding, learning motivation, and retention of knowledge through direct involvement in real production activities (Maarof & Bohari, 2023).

Teaching Factory also contributes to the development of both hard skills and soft skills. Hard skills are developed through technical activities such as operating machines and managing production processes, while soft skills such as communication, teamwork, and responsibility are formed through collaborative and real work interactions (Sutrisno, 2025). These competencies are increasingly important in the modern workforce, where technological advancements demand continuous skill adaptation and higher technical proficiency (Babashahi et al., 2024).

From a management perspective, the effectiveness of Teaching Factory depends on the implementation of proper management functions, including planning, organizing, implementation, and evaluation (Nalapraya & Helmawati, 2025). However, several challenges remain, such as limited facilities, insufficient teacher competencies, and weak industry collaboration, which may reduce the effectiveness of the program (Perwita et al., 2025; Maarof & Bohari, 2023).

Although previous studies have confirmed the benefits of Teaching Factory, most of them focus on learning outcomes rather than examining the management processes comprehensively. Therefore, further research is needed to analyze Teaching Factory from a managerial perspective, particularly in relation to improving students' hard skills.

Gap Study and Objective

Previous studies on Teaching Factory have primarily focused on its effectiveness in improving students' competencies, employability, and learning outcomes (Rifai, et al., 2026; Tanjung et al., 2025;). Other research has examined experiential learning and student engagement in production-based environments (Das, 2026; Harbes et al., 2024). However, these studies tend to emphasize outcomes rather than the underlying management processes.

In addition, although some studies acknowledge the importance of management functions such as planning, organizing, implementation, and evaluation, they do not comprehensively analyze how these functions are implemented in an integrated manner within Teaching Factory programs (Husaini, et al.,, 2026). As a result, there is still limited understanding of how management practices influence the development of students' hard skills.

Furthermore, the relationship between Teaching Factory management and students' technical skill development has not been sufficiently explored in specific institutional contexts. Considering the increasing demand for technical competencies in the modern workforce (Muzam, 2023), this issue becomes increasingly relevant.

Therefore, this study aims to analyze the implementation of Teaching Factory management in improving students' hard skills. This research is expected to provide a more comprehensive understanding of how management functions contribute to learning outcomes and to offer practical insights for improving the effectiveness of Teaching Factory in vocational education.

II. METHOD

Type and Design

This study employed a qualitative approach with a descriptive research design to analyze the implementation of Teaching Factory management in improving students' hard skills. The qualitative method was chosen to obtain an in-depth understanding of management processes and learning activities within the Teaching Factory program. The research was conducted at SMK Plus NU Sidoarjo, a vocational high school that implements the Teaching Factory model.

Data and Data Sources

The data used in this study consisted of qualitative data in the form of words, actions, and documents related to the implementation of Teaching Factory management. The data sources included primary and secondary data. Primary data were obtained from key informants consisting of the school principal, Teaching Factory teachers, and students who were directly involved in the program. These informants were selected using purposive sampling based on their roles and active involvement in Teaching Factory activities. Secondary data were collected from school documents, reports, and other relevant records that support the research findings.

Data Collection Technique

Data were collected through interviews, observations, and documentation. Interviews were conducted with the school principal, teachers, and students to obtain detailed information regarding the planning, organizing, implementation, and evaluation of the Teaching Factory program. Observations were carried out to examine the actual learning and production processes within the Teaching Factory environment. Documentation was used to collect supporting data such as program records, reports, and other relevant materials.

Data Analysis

Data analysis was conducted using an interactive model consisting of data reduction, data display, and conclusion drawing. In the data reduction stage, relevant data were selected and simplified. The data were then organized and presented systematically in the data display stage to facilitate interpretation. Finally, conclusions were drawn based on patterns and relationships identified in the data. To ensure data validity, triangulation techniques were applied by comparing data from different sources and collection methods.

III. RESULTS

Planning of Teaching Factory

The planning of the Teaching Factory program at SMK Plus NU Sidoarjo was conducted through a systematic and structured process that integrates curriculum objectives, student competencies, and industry demands. The school designed Teaching Factory activities not only as part of learning but also as a preparation for real working conditions.

Based on the findings, planning activities were carried out through coordination meetings involving school management and teachers. These meetings aimed to align the program with industry needs while considering available resources. The school principal stated: "The Teaching Factory program is planned based on industry demands and adjusted to the school's capacity, so students can learn according to real work situations." (P1)

This indicates that planning was oriented toward relevance and practicality. Teachers further explained that lesson plans were developed using project-based approaches that simulate real production systems: "We prepare teaching plans based on real projects, so students can understand how work is actually done in industry." (T1)

However, despite the structured planning, several constraints were identified. Limited facilities and equipment influenced the scope of activities that could be implemented. In addition, not all industry standards could be fully adopted due to resource limitations. This suggests that while planning was conceptually aligned with industry needs, its implementation was still partially constrained.

Organizing of Teaching Factory

The organizing function was implemented through the division of roles and responsibilities among teachers, students, and external stakeholders. Students were grouped into teams based on their competencies, and each team was assigned specific tasks within the production process.

A teacher explained: "Students are divided into groups, and each group has a role such as design, production planning, or finishing." (T2). Students confirmed that this system helped them understand teamwork and responsibility: "We have our own roles in the group, so we learn how to work together like in a company." (S1)

This structure reflects an effort to simulate real industrial organization systems. The involvement of teachers as supervisors ensured that students were guided throughout the process. In some cases, industry practitioners were involved as external mentors.

However, the study found that the involvement of industry partners was not consistent. Their participation depended on availability and collaboration agreements. As a result, students did not always receive direct exposure to industry professionals. This indicates that while organizing functions were implemented, external collaboration still needs to be strengthened.

Implementation of Teaching Factory

The implementation of Teaching Factory activities was carried out through production-based learning, where students were engaged in real or simulated production processes. The learning activities included design, planning, and limited production stages.

Students were actively involved in the design phase, where they created products based on given specifications. A student explained: "We are involved in designing the product, choosing materials, and planning how it will be made." (S2)

However, the findings revealed that student involvement in the actual production stage was still limited. Teachers explained that this limitation was due to quality control and customer expectations: "Production is often handled by experts because we must maintain product quality for customers." (T3)

This indicates a gap between the ideal concept of Teaching Factory and its actual implementation. Although the model emphasizes full student participation, in practice, certain constraints limit their involvement. Despite this limitation, students still gained valuable learning experiences. They were able to understand production workflows, problem-solving processes, and the importance of quality standards. Therefore, even partial involvement contributed to skill development.

Evaluation of Teaching Factory

The evaluation process was conducted through both academic and program-based assessments. Students were evaluated based on their participation, technical skills, teamwork, and project outcomes.

A teacher stated: "We evaluate students based on their performance, how they work in teams, and the final product they produce." (T1). In addition to academic evaluation, financial evaluation was also conducted. The school monitored income and expenses related to production activities to ensure program sustainability. This dual evaluation system reflects the integration of educational and industrial aspects in the Teaching Factory program. However, the study found that evaluation still focused more on outcomes rather than process improvement. This suggests the need for a more comprehensive evaluation system.

Discussions

The findings of this study indicate that the implementation of Teaching Factory management at SMK Plus NU Sidoarjo has followed the four fundamental management functions: planning, organizing, implementation, and evaluation. This structured approach demonstrates that the school has attempted to institutionalize Teaching Factory as a systematic learning model rather than merely an additional activity. This finding reinforces the argument of Wijanarka, et al., (2023), who emphasize that effective management is a key determinant of successful Teaching Factory implementation.

In the planning stage, the integration of industry needs into the curriculum reflects a strategic effort to reduce the gap between vocational education and labor market demands. This aligns with Li et al. (2024), who argue that industry-oriented planning is essential to improve students' employability. However, this study also reveals that planning is still constrained by limited resources, particularly in terms of facilities and equipment. This suggests that while the conceptual framework of Teaching Factory is well understood, its practical implementation is still influenced by institutional capacity.

The organizing process highlights the use of group-based learning with clear task distribution, which simulates real industrial work structures. This supports Haldar (2024), who emphasizes that collaborative work environments play a significant role in developing both technical and interpersonal skills. The assignment of roles allows students

to experience responsibility and accountability, which are essential competencies in the workplace. However, the limited involvement of industry practitioners suggests that the collaboration between schools and industry partners remains suboptimal.

This limitation in industry collaboration is particularly significant because Teaching Factory is fundamentally designed as an industry-based learning model. Without strong and consistent industry involvement, the authenticity of the learning experience may be reduced. This finding indicates that strengthening partnerships with industry stakeholders is not only beneficial but necessary for achieving the intended outcomes of Teaching Factory programs.

A major issue identified in this study is the limited involvement of students in actual production activities. While students actively participate in the design and planning stages, their role in production is often restricted due to quality control requirements and customer expectations. This finding contrasts with Perwita et al. (2025), who argue that direct involvement in production processes is crucial for maximizing skill acquisition.

This discrepancy highlights a fundamental tension in Teaching Factory implementation. On one hand, the model aims to provide authentic, hands-on learning experiences. On the other hand, the need to maintain product quality and meet customer demands imposes constraints on student participation. This creates a dilemma between educational objectives and production requirements, which is a common challenge in vocational education.

From a broader perspective, this issue reflects the need for innovative strategies that balance learning and production functions. Schools must develop mechanisms that allow students to participate more actively in production without compromising quality. For example, gradual involvement strategies or supervised production systems could be implemented to address this challenge. In terms of evaluation, this study finds that assessment practices are primarily focused on student performance and final outputs. While this approach provides measurable indicators of learning outcomes, it does not fully capture the learning process. This suggests that evaluation systems need to be expanded to include process-based assessment and continuous feedback mechanisms. Such an approach would allow for a more comprehensive understanding of student learning and program effectiveness.

The novelty of this study lies in its emphasis on the management dimension of Teaching Factory implementation. While previous studies have predominantly focused on learning outcomes, this research highlights the role of management functions in shaping those outcomes. By analyzing planning, organizing, implementation, and evaluation processes, this study provides a more holistic understanding of how Teaching Factory contributes to the development of students' hard skills.

Furthermore, this study contributes to the literature by identifying practical challenges in Teaching Factory implementation, particularly in relation to student participation and industry collaboration. These findings provide valuable insights for both researchers and practitioners in the field of vocational education. However, this study has several limitations. First, it is based on a single case study, which may limit the generalizability of the findings. Second, the use of qualitative methods, while providing in-depth insights, may not capture the measurable impact of Teaching Factory on student competencies. Therefore, future research should involve multiple institutions and employ mixed-method approaches to provide more comprehensive evidence.

Finally, the findings of this study have important implications for vocational education. Schools need to enhance student involvement in production activities to optimize skill development. Strengthening collaboration with industry partners is also essential to ensure that Teaching Factory programs reflect real industrial practices. In addition, the development of more comprehensive evaluation systems is necessary to support continuous improvement and ensure the sustainability of Teaching Factory programs.

IV. CONCLUSION

This study aimed to analyze the implementation of Teaching Factory management in improving students' hard skills in vocational education. The findings show that the Teaching Factory program at SMK Plus NU Sidoarjo has been implemented through the four fundamental management functions: planning, organizing, implementation, and evaluation. These functions have been carried out in a structured manner and have contributed to the development of students' technical competencies, particularly in understanding production processes, design activities, and workflow systems. However, the study also reveals that student involvement in the actual production stage remains limited due to quality control requirements and the need to meet customer expectations.

The results of this study indicate that while Teaching Factory has the potential to bridge the gap between education and industry, its effectiveness is highly dependent on how it is managed. The limitation in student participation highlights the need to balance educational objectives with industrial standards. This finding provides an

important contribution to the existing body of knowledge by emphasizing that the success of Teaching Factory is not only determined by its implementation as a learning model, but also by the effectiveness of its management practices. Therefore, this study extends previous research by offering a more comprehensive perspective that integrates both managerial and pedagogical dimensions.

In addition, this study implies that improving Teaching Factory implementation requires stronger collaboration with industry partners, better resource allocation, and more comprehensive evaluation systems that focus not only on outcomes but also on learning processes. Future research is expected to explore strategies that can increase student involvement in production activities without compromising product quality. Furthermore, studies involving multiple institutions and mixed-method approaches are needed to provide broader and more generalizable insights. Through these efforts, Teaching Factory can be further developed as an effective model for preparing students to meet the demands of the modern workforce.

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