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Management of Teaching Factory (TEFA) for Achieving Vocational School Graduate Competencies

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ABSTRACT

This study aims to analyse the implementation of Teaching Factory (TEFA) management to achieve graduate competencies at vocational schools. Teaching Factory (TEFA) is a production and service-based learning model that integrates school learning with the needs of the industrial world. This approach aims to produce graduates who are competent, work-ready, and possess skills according to industry standards. The results of this study indicate that the implementation of TEFA management at schools, encompassing planning, organising, implementation, evaluation, and follow-up, has been carried out effectively. The research used a descriptive method with a qualitative approach, involving observation, interviews, and documentation. The findings reveal that TEFA management implementation in schools includes planning based on industry needs, integrating learning with real-world projects, and evaluating outcomes based on work performance. Supporting factors for TEFA's success include close cooperation between schools and industries, the availability of supporting facilities, competent teachers, and effective follow-up management. However, this study also identified several obstacles, including limited facilities, a lack of continuous teacher training, and challenges in meeting the evolving needs of industry. Through optimal management, the Teaching Factory is expected to enhance the competitiveness of graduates and address labour market needs.

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INTRODUCTION

Indonesia is currently entering a demographic bonus period, which is predicted to peak between 2030 and 2045, with 69.25% of the population in the productive age group (Syahputri, 2025). This demographic transition presents a unique opportunity for the country's economic development, as a high-quality

and competitive workforce is the key to sustaining growth (Kusnanto et al., 2023; Setiawan, 2025). However, Indonesia faces challenges in maximizing this potential (Anam, 2024; Sari 2024). The low quality of human resources, evidenced by Indonesia's Human Capital Index (HCI) of 0.54 in 2020, below the ASEAN average, remains a significant issue. Additionally, the 2018 PISA score, which was under 400, and the 64th place ranking in the World Economic Forum's Global Human Capital Report further highlight the challenges facing the nation's workforce. These factors emphasize the need for an educational reform that focuses on improving human capital to maintain the country's economic competitiveness in the global market.

The issue of workforce quality is also linked to the education system, particularly in Vocational High Schools (SMK), which are meant to provide students with specialized skills to meet the demands of the labor market. Despite this, SMK graduates still face high unemployment rates compared to their peers from general high schools. According to BPS data, the Open Unemployment Rate (TPT) for SMK graduates stood at 10.38%, while the rate for SMA graduates was only 8.35%. This disparity stems from a mismatch between the skills SMK students acquire and the competencies demanded by the industry. The lack of alignment between vocational education and labor market needs has led to the underperformance of SMK graduates, making it difficult for them to secure employment and contributing to high unemployment rates among this group.

Previous research has identified several key factors contributing to the mismatch between vocational education and labor market needs (Kovalchuk et al., 2022; Aljohani et al., 2022). Studies suggest that the curriculum in many SMKs is outdated, not reflecting the rapid developments in industry. Furthermore, the lack of effective partnerships between schools and industries limits students' exposure to real-world practices. The implementation of Teaching Factories (TEFA), an industrial-standard learning model that integrates theoretical knowledge with practical skills, has been seen as a potential solution to these issues. The goal of TEFA is to bridge the gap between what students learn in school and the skills employers need. However, research has shown that the implementation of TEFA is often suboptimal due to a lack of shared understanding among stakeholders about its management and purpose.

Several studies have highlighted that the implementation of TEFA in SMKs faces significant challenges, including inadequate teacher readiness, limited infrastructure, and insufficient industrial partnerships. Research by Anderson et al. (2022) and Wijanarka et al. (2023) indicates that while some schools have adopted TEFA, the implementation is still not optimal, with varying

interpretations and inconsistent application across schools. Moreover, studies by Wijanarka et al. (2023) and Rotty et al. (2025) have shown that while some schools manage to align their curricula with industrial standards, many others fail due to poor management practices in production, organizing, and supervising the TEFA model. These gaps in research emphasize the need for further investigation into the effectiveness of TEFA and how its implementation can be improved in the context of vocational education in Indonesia.

The novelty of this research lies in its exploration of the management practices within the TEFA model at two SMKs: SMK Negeri 1 Cijulang and SMK Negeri 1 Pangandaran. This study aims to fill the existing research gap by examining how the TEFA management model is applied in these schools and identifying the specific challenges they face. The research will provide valuable insights into how TEFA can be managed more effectively to meet the needs of both students and the industry. This research is crucial as it will contribute to the development of a more effective vocational education system that aligns better with industry expectations, enhancing the employability of SMK graduates and supporting national economic growth.

The central problem addressed by this research is the suboptimal implementation of the TEFA management model in Vocational High Schools, particularly in SMK Negeri 1 Cijulang and SMK Negeri 1 Pangandaran. This research aims to answer the question: How can TEFA management practices be improved to better align vocational education with industry needs? Based on the current state of TEFA implementation, this research argues that better planning, organizing, and supervision are key to improving the quality of vocational education and closing the skills gap. By identifying best practices and overcoming existing barriers, the research will contribute to the optimization of TEFA in Indonesian SMKs, fostering a workforce that is more equipped to compete in the global market.

In conclusion, the implementation of TEFA in SMKs is critical for improving the quality and competitiveness of Indonesia's workforce. The findings of this study will offer practical recommendations for better TEFA management, providing a blueprint for schools to enhance their partnerships with industry, update curricula, and improve their overall management practices. This research will contribute to bridging the gap between vocational education and labor market demands, helping Indonesia take full advantage of its demographic bonus and ensure sustainable economic growth in the future.

RESEARCH METHOD

This research uses a qualitative research design with a case study approach to analyze the management of Teaching Factory (TEFA) at SMK Negeri 1 Cijulang and SMK Negeri 1 Pangandaran, Pangandaran Regency, West Java. The selection of these two schools was based on their active implementation of TEFA as part of work-based learning strategies. The research location was chosen because these schools have actively involved industries in the TEFA program, making it relevant to explore how TEFA management can support the achievement of graduates' competencies in line with labor market demands. This research is expected to provide an in-depth understanding of TEFA management practices and how their implementation can improve vocational education quality.

Data collection was conducted through in-depth interviews with various informants directly related to the implementation of TEFA in both schools, including the principals, vice principals for curriculum and industrial relations, heads of study programs, vocational teachers, and industry partners. In addition to interviews, this research also relied on direct observation of TEFA implementation in the field and a study of documentation, including syllabi, work programs, activity reports, and Memorandums of Understanding (MoUs) with industry partners. Source and technique triangulation were used to strengthen data validity and ensure the diversity of the information collected.

The collected data were analyzed qualitatively using the stages proposed by Miles and Huberman, namely data condensation, data reduction, data display, and data verification. Data condensation was carried out by selecting relevant information and eliminating unrelated data. Afterward, the selected data were displayed in an easily understandable format to facilitate further analysis. Data verification was performed through source triangulation and member checks with informants to ensure the accuracy of the findings. Thus, this data analysis aims to provide a comprehensive understanding of TEFA management and its contribution to achieving graduates' competencies that meet industry needs.

RESULT AND DISCUSSION

Result

Implementation of Planning in the Teaching Factory (TEFA) Model

In planning the TEFA model at SMK Negeri 1 Cijulang and SMK Negeri 1 Pangandaran, professionalism is crucial, as good planning leads to good results. Planning for the Teaching Factory model in these schools has been well-executed,

with cooperation established among principals, department heads, and teaching factory mentors. Planning covers scheduling activities, selecting teams, allocating resources, organizing, evaluating, and following up on TEFA implementation. According to Hasibuan (2005), planning is a fundamental management function and must be structurally organized since organizing, direction, and control depend on prior planning. Planning is dynamic and can be adjusted as conditions change.

In addition to the structured planning process, the schools also emphasize the importance of continuous communication and coordination among all involved parties. This ensures that all aspects of the TEFA model are aligned and that each team member is aware of their responsibilities. Regular meetings and updates allow for timely adjustments and improvements, ensuring that the TEFA program remains relevant to both students and industry needs. The collaborative approach between school leaders, teachers, and mentors has contributed significantly to the successful implementation of the TEFA model, fostering a learning environment where students can develop both technical skills and practical experience. This dynamic planning and execution process is key to bridging the gap between academic learning and industry expectations, providing students with real-world applications of their education.

Implementation of Organizing in the Teaching Factory (TEFA) Model

Organizing the Teaching Factory model at both schools has been systematic and effective. The process adheres to established procedures, with coordinators and mentors protected by school policies, including official appointment letters and activity reports submitted to the provincial education office. The organizational structure is well-defined, and roles and responsibilities are clearly delegated among team members. The head of the vocational program coordinates with teachers to ensure proper guidance and supervision in practical learning, supported by task descriptions and regular reporting to the department head and principal for feedback and follow-up.

In addition to the clearly defined roles, the organizing process also emphasizes the importance of maintaining strong partnerships with industry stakeholders. These partnerships are critical in ensuring that the TEFA model is aligned with current industry standards and trends. The schools have established effective communication channels with their industry partners, which helps to ensure that students are exposed to real-world challenges and that their learning outcomes are relevant to the job market. This collaboration not only enhances the quality of the teaching process but also fosters opportunities for internships,

project-based learning, and potential employment for graduates.

Furthermore, the schools have implemented a monitoring and evaluation system within their organizational structure to ensure that the TEFA model runs smoothly. Regular assessments of both the administrative and teaching processes are conducted to identify potential areas for improvement. Feedback loops, such as meetings with mentors and industry partners, allow for timely adjustments and refinements to the program. This continuous evaluation and willingness to make improvements demonstrate the schools' commitment to maintaining high standards and improving the effectiveness of the TEFA model in producing skilled, employable graduates.

Implementation of TEFA Model in Learning Activities

Generally, the necessary facilities and infrastructure for implementing TEFA at both schools are adequate and in good condition. The mentors are qualified, and students are well-guided in producing designs ordered by stakeholders. This ensures smooth implementation of TEFA, supported by comfortable practice spaces and competent instructors. Although occasional challenges arise, such as in guiding modeling and design projects, these are typically manageable and do not disrupt the overall process. Several key factors contribute to the successful implementation of the Teaching Factory (TEFA) model, each playing a crucial role in ensuring the program's effectiveness and alignment with industry needs.

First, human resources are a fundamental element in the success of TEFA. The quality of instructors directly influences the quality of student outputs. According to educational regulations, educators are responsible for planning, conducting, and assessing learning, as well as providing guidance and engaging in research and community service. High professionalism from instructors is evident in the successful implementation of TEFA, where students benefit from competent mentors who equip them with both practical and theoretical knowledge. These instructors play a vital role in bridging the gap between academic learning and industry expectations, ensuring that students are well-prepared for the workforce.

Second, partnerships are crucial for the successful implementation of the TEFA model. TEFA requires active collaboration with relevant industries, businesses, and other educational institutions. These partnerships not only provide essential resources but also ensure that the curriculum is aligned with the needs of the job market. The collaboration between SMK and industry partners is integral, as it allows for real-world applications of the skills students

learn in the classroom. Both SMK Negeri 1 Cijulang and SMK Negeri 1 Pangandaran have established strong relationships with national industries and local businesses, creating a mutually beneficial system that enhances students' employability and provides industries with skilled workers.

Lastly, facilities and infrastructure are critical components of the TEFA model. Adequate and well-maintained facilities ensure that students have access to the tools and spaces they need to engage in hands-on learning. Both SMK Negeri 1 Cijulang and SMK Negeri 1 Pangandaran have invested in comfortable practice spaces and state-of-the-art equipment for modeling and information design, in line with industrial standards. This investment in infrastructure allows students to work with equipment and materials that closely mimic what they will encounter in their future careers, ensuring that their education is as practical and relevant as possible. With these factors in place, the TEFA model can provide students with a comprehensive learning experience that prepares them for the demands of the modern job market.

Implementation of Evaluation in the Teaching Factory (TEFA) Model

Evaluation of TEFA activities at SMK Negeri 1 Cijulang and SMK Negeri 1 Pangandaran focuses on analyzing the current potential and conditions to inform future planning. The evaluation is formative, as the TEFA program is ongoing and not yet completed. The evaluation aims to describe planning processes, assess implementation and organization, identify strengths and weaknesses, and develop follow-up actions.

Findings indicate that planning, implementation, organization, evaluation, and follow-up for TEFA at both schools have generally been successful. Learning activities are conducted based on real work procedures and emphasize problem-solving, with student-centered learning and active engagement. Teaching is supplemented by practical experience and collaboration, with a focus on achieving both hard and soft skills—intellectual, emotional, spiritual, and social intelligence.

Implementation of Follow-Up in the Teaching Factory (TEFA) Model

Follow-up actions in TEFA are essential for sustainability and relevance. At SMK Negeri 1 Cijulang, follow-up includes curriculum adjustments and independent production unit development to align with local industry needs. At SMK Negeri 1 Pangandaran, the focus is on strengthening quality management by implementing SOPs modeled after industry partners. The process includes evaluation with teachers, students, and industry partners to identify

achievements and obstacles, followed by planning, organizing, implementing, evaluating, and determining follow-up measures.

To ensure TEFA activities stay on track, monitoring by school stakeholders is necessary. This includes measuring outcomes against established indicators and providing solutions for obstacles. The success of TEFA can be measured by seven standard parameters: management, practice site (workshop/lab), training model, marketing/promotion, products (goods/services), human resources, and industrial relations.

Discussion

The findings of this research align closely with the existing literature on the implementation of the Teaching Factory (TEFA) model, yet also highlight some key differences. In terms of planning, the study reveals that both SMK Negeri 1 Cijulang and SMK Negeri 1 Pangandaran have structured planning processes that involve collaboration among school leaders, mentors, and department heads. This confirms the importance of a well-organised planning stage, as outlined by Caniago (2024) and Klymenko (2024), who emphasise the need for clear organisational structures in achieving management success. However, the research also indicates that while planning is crucial, it remains a dynamic process that requires flexibility —a point that was less emphasised in previous studies. Effective planning ensures that all parties involved are on the same page; yet, the adaptability of this planning process is what allows these schools to respond effectively to changing industry demands.

Regarding organisation, the research findings align with Nurhikmah's (2024) concept of organising, which involves grouping activities to achieve objectives. Both schools have established a clear organisational structure, with defined roles and responsibilities for staff and mentors. This supports Khadija's (2022) argument that collaborative development between school managers and stakeholders is essential. However, the study also reveals that, despite organisational structures being in place, challenges persist in maintaining consistency across different teams and stakeholders, as reported by previous studies on TEFA implementation. This difference highlights an area for improvement in ensuring that all involved parties consistently follow established procedures.

In the implementation of TEFA in learning activities, the research confirms that adequate facilities, competent instructors, and effective partnerships are essential for successful outcomes, consistent with Real (2022). Both schools in this study have appropriate resources and partnerships with industries, as required

by the Minister of National Education Regulation No. 19/2007. However, the research also finds that limited student involvement and the need for continuous evaluation represent ongoing challenges. This finding is consistent with earlier research, which suggested that while some students benefit significantly from TEFA, others do not receive the same opportunities for hands-on experience, raising concerns about equitable access to quality education.

The evaluation process in this study reflects the formative evaluation model advocated by Rony et al. (2024), which involves ongoing assessments to inform future planning and execution. The study highlights that while evaluation practices are well-established at both schools, there is still a need for more rigorous follow-up actions to ensure consistent quality improvements. Hagos' (2023) views evaluation as a regular comparison of standards to outcomes, as both schools routinely evaluate their TEFA implementation. However, the research points to a gap in follow-up actions, particularly in addressing barriers to full student involvement, which suggests that the evaluation process itself needs to evolve to become more inclusive.

Lastly, the follow-up actions in this study, which include curriculum adjustments and the implementation of standard operating procedures (SOPs), align with the findings of Rotty et al. (2025), who emphasise the importance of continuous monitoring and adjustment for the success of TEFA. The research demonstrates that both schools are responsive to industry needs, but ongoing improvements are necessary, particularly in terms of industry engagement and student participation. These findings have both theoretical and practical implications: theoretically, they support the idea that a dynamic and responsive approach to TEFA can improve the relevance of vocational education, while practically, they suggest that schools must strengthen partnerships with industry and continuously evaluate and refine their practices to maintain the quality and relevance of their programs.

CONCLUSION

The most significant finding of this research is that the implementation of the Teaching Factory (TEFA) model at SMK Negeri 1 Cijulang and SMK Negeri 1 Pangandaran, despite facing certain challenges, has proven effective in enhancing graduates' competencies and preparing them for the labor market. The study highlights that effective planning, organizing, execution, evaluation, and follow-up processes are crucial in aligning educational practices with industry demands. The research also underscores the importance of strengthening industrial partnerships, improving facilities, and providing

continuous teacher training to ensure the long-term success and relevance of the TEFA model. These lessons point to the need for ongoing improvements and adaptations in vocational education to meet the evolving needs of industries.

This study contributes to the field by offering practical insights into how TEFA management can enhance vocational education and strengthen the link between schools and industries. The research provides valuable evidence on the importance of collaboration between educational institutions and industrial partners to create a more competitive and prepared workforce. However, this study has limitations, such as the focus on just two schools, which may not fully represent the broader challenges faced by other SMKs. Future research could expand the scope to include more schools and industries to provide a more comprehensive understanding of TEFA implementation across various contexts.

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