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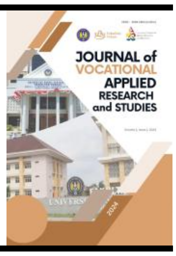

DEVELOPMENT OF TEACHING FACTORY MODEL IN VOCATIONAL HIGHER EDUCATION

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ABSTRACT

The increasing demand for skilled workers in the industry encourages vocational higher education institutions to align their curricula with real-world practices. One way to bridge the gap between academic learning and industry needs is through the implementation of the Teaching Factory (TEFA) model. This study presents the development of a comprehensive Teaching Factory model within vocational higher education. The research employed primary data collection methods, including Focus Group Discussions (FGD) and interviews, to explore the insights and experiences of stakeholders involved in the development of TEFA. The results provide a framework for integrating industry requirements and academic competencies to enhance the competitiveness of graduates from vocational education institutions.

1. Introduction

The rapidly evolving industrial landscape, driven by technological advances, has heightened the need for vocational education institutions to produce graduates equipped with practical skills relevant to the workforce. Vocational higher education plays a crucial role in preparing students for careers across various industries, making it essential for academic programs to align closely with industry demands. One approach that has garnered significant attention is the Teaching Factory (TEFA) model, which integrates real-world industrial practices into the learning process.

Teaching Factory, an adaptation of the industrial work environment within an educational setting, enables students to engage in production or service activities as part of their learning experience. This model not only enhances students' skills but also allows them to experience the dynamics of a real workplace before entering the labor market. However, its success requires close collaboration between academics who design the curriculum and industry practitioners who provide real-world context.

The objective of this study is to develop a Teaching Factory implementation model in vocational higher education from both academic and practitioner perspectives. This research aims to explore the alignment between educational goals and industry expectations, as well as provide insights into

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how vocational institutions can integrate teaching and industry needs to create job-ready graduates.

The Teaching Factory (TEFA) concept is rooted in the synergy among academia, industry, and government, often referred to as the Triple Helix innovation model. Each stakeholder plays a vital role in the successful implementation and sustainability of TEFA, contributing unique strengths to the collaboration (see Figure 1).

The government acts as a facilitator, responsible for creating a supportive environment through policies and regulations that encourage alignment between education and industry needs. By establishing regulatory frameworks and quality standards, the government ensures that vocational education institutions, particularly those implementing TEFA, are prepared to provide relevant and industry-aligned training. Additionally, the government monitors and supervises to ensure institutions meet national education standards and adapt to the evolving labor market demands. Through funding, incentives, and infrastructure development, the government can also provide critical resources that enable the establishment of advanced laboratories and industry-standard facilities within educational institutions.

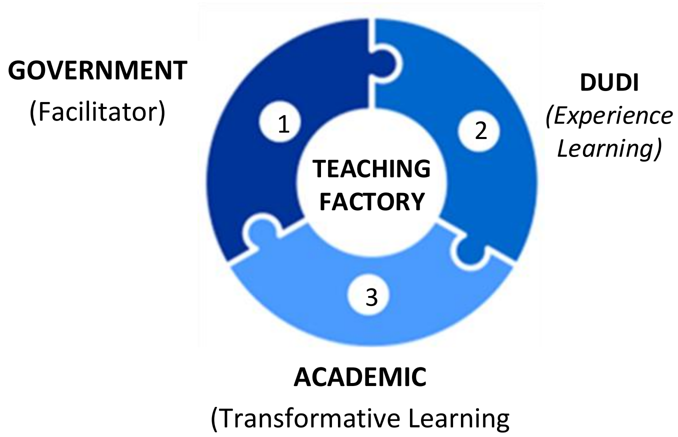

Fig. 1. Triple Helix: Academia-Industry-Government

On the other hand, academia plays a crucial role in transforming traditional learning models into more practical and hands-on approaches that prepare students to face real-world challenges. In the context of Teaching Factory (TEFA), this transformation involves integrating theoretical knowledge with practical application, enabling students to engage in production processes or service activities that reflect actual industry practices. The success of TEFA within academic institutions depends on several key factors: management commitment to fostering collaboration with industry, adaptive curriculum design aligned with industry trends, availability of adequate laboratories and technical resources, and active student involvement in real production or service environments [3]. By integrating industry-based tasks into the curriculum, academic institutions create a learning environment that not only strengthens students' technical skills but also encourages critical thinking, problem-solving, and teamwork.

Meanwhile, industry plays a dual role within the TEFA framework. First, industry serves as a provider of experiential learning opportunities by sharing expertise, best practices, and the latest technological advancements with students. Industry partners often contribute to curriculum content design [4], ensuring that the skills and competencies taught align with current market demands. This involvement may include industry experts participating in teaching or mentoring, providing the latest tools and materials, or organizing internships that allow students to experience the workplace firsthand. Second, industry is the recipient of services offered by the Teaching Factory. In some cases, educational institutions produce goods or services through TEFA that meet the operational needs of local businesses, thereby creating mutually beneficial relationships.

Industry also benefits from TEFA by employing skilled and job-ready graduates familiar with their specific processes and technologies.

Collaboration among academia, industry, and government forms an ecosystem where innovation and knowledge transfer thrive. By aligning educational goals with industry needs and supported by a conducive regulatory environment, TEFA enhances graduate competitiveness, drives technological advancement, and contributes to regional economic development. Ongoing interaction among these stakeholders ensures that vocational education remains dynamic and responsive to changes in the global labor market landscape.

2. Method

The method used in this study involved a literature review of relevant references and research findings, followed by Focus Group Discussions (FGD). Relevant references included policies, studies, and articles on the concept and implementation of the Teaching Factory. Meanwhile, the review of related research encompassed previous studies concerning the teaching factory instructional model in higher vocational education.

2.1. Literature Review

Teaching Factory (TEFA) is a pedagogical approach that combines classroom-based theoretical learning with direct industrial practice. The concept of TEFA emerged as an innovative solution to bridge the longstanding gap between vocational education and industry needs. TEFA creates an environment where students can apply their academic knowledge in real production processes, thereby enhancing their problem-solving skills, technical expertise, and job readiness [5].

Several studies have examined the impact of TEFA on student learning outcomes. Imran et al. found that students involved in TEFA programs had better job placement rates thanks to the practical skills they developed [6]. Additionally, TEFA enables educational institutions to collaborate with industry partners, ensuring that the training provided remains up-to-date with the latest technological and industrial advancements.

Meanwhile, some researchers have developed TEFA models from their respective perspectives. Riwayani et al. developed the effective Teaching Factory 6M model to enhance student creativity. This model includes practical activities ranging from pre-ordering, pre-production, production, post-production, packaging, to order delivery, integrating both soft skills and hard skills [7]. Moreover, Kautsar et al. developed a conceptual Teaching Factory model considering aspects such as information technology, worksheets, products/services, workshops, industry partnerships, and management [8]. Additionally, Diwangkoro and Soenarto stated in their model that Teaching Factory encompasses management, production processes, marketing processes, and evaluation. The Teaching Factory is attached to business units developed within schools [9].

2.2. Focus Group Discussion

FGD participants consisted of stakeholders from academic and industry practitioner backgrounds. Academics are human resources actively involved in developing the Teaching Factory at higher education institutions, in this case, lecturers. Meanwhile, industry practitioners are professionals engaged in business and directly involved in Teaching Factory development. From the FGD results, four main pillars at higher education institutions need attention to realize the Teaching Factory: (1) Management; (2) Curriculum; (3) Laboratory; and (4) Students. The curriculum developed to support the Teaching Factory employs case method learning, team-based project learning, and project-based learning. Accordingly, the preparation of a Semester Learning Plan (RPS) that supports the project-based learning model is necessary.

3. Results and Discussion

3.1. Results

Based on the results of the FGD and interviews, Figure 2 presents the formulation of the conceptual model of the Teaching Factory. According to Figure 2, the Teaching Factory consists of several key components, namely (1) the institutional framework and resources of the Teaching Factory; (2) the Teaching Factory processes; and (3) collaboration and networking. The institutional framework and resources include the institutional status with an organizational structure responsible for managing Teaching Factory activities. Resources encompass lecturers, students, laboratories, and their facilities. Meanwhile, the processes in the Teaching Factory cover the business processes starting from upstream to downstream, beginning with approaches to industry to seek partners or clients, and continuing through the manufacturing of proven products. Regarding collaboration and networking, the vocational higher education institution, in this case the Teaching Factory, must actively collaborate with industry and network with various stakeholders, including industry players, other higher education institutions, and government agencies.

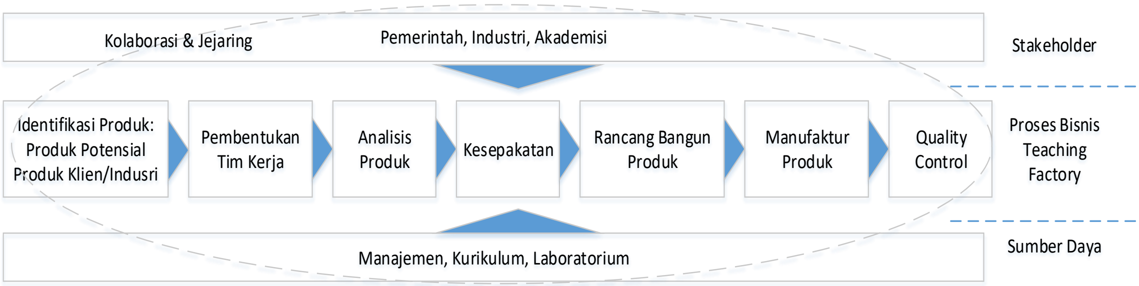

Fig. 2. Conceptual Model of Teaching Factory

Figure 2 presents the conceptual model of the Teaching Factory proposed by the researchers. This model is adapted from previous models developed by Yondri et al. [10] and Kautsar et al. [8]. From the perspective of workflow or business processes, the stages of the Teaching Factory begin with the industry's desire to produce a product, leading the industry to seek a partner university capable of realizing the technological product. On the other hand, this offer can come either from the industry or from the university actively seeking industrial clients, preferably products aligned with the Teaching Factory's research roadmap. Typically, industries have specific product specifications expected to be realized by the university.

Lecturers and students involved in the Teaching Factory discuss and analyze the products desired by the industry. This activity can be conducted through meetings with the industry to discuss product customization requirements. Subsequently, a team is formed to handle the product. This team consists of the project manager, supervising lecturers, laboratory technicians, and students involved in the Teaching Factory. Additionally, the stages, implementation timeline, equipment, materials, project costs, and involvement of courses—which will later be converted into Teaching Factory work—are also determined.

After reaching an agreement with the industry, the next stage is product design and development. This activity is carried out by the designated students and conducted in the laboratory. Supervision is performed periodically by supervising lecturers to monitor the progress of the activities. Once the prototype is completed, testing is conducted to evaluate product performance. If the technological product is declared proven, it proceeds to the manufacturing stage. The final product must pass quality control before being delivered to the client. Emphasis on quality control is critical to ensure no defective products are handed over to the industry.

During the project execution, students document their work and maintain a logbook as a daily report, recording daily activities that will be recognized as part of the course grading.

3.2. Discussion

Academic stakeholders highlighted several key aspects of the Teaching Factory model. They emphasized the importance of designing a sufficiently flexible curriculum to accommodate industry input while maintaining academic rigor. Vocational higher education needs to provide students with a strong theoretical foundation while equipping them with hands-on experience in industry-standard technologies.

Academics also identified challenges in aligning academic schedules with the rapidly evolving demands of the industry. To address this, curriculum updates should be conducted regularly based on feedback from industry partners, along with the involvement of industry experts in curriculum development committees.

Practitioners provided valuable insights on how collaboration between industry and vocational higher education institutions can be enhanced through the Teaching Factory model. Industry benefits from participating in TEFA programs by gaining access to well-trained prospective workforce. Additionally, industry representatives stressed that students should not only possess technical skills but also soft skills. However, some practitioners remain skeptical about integrating production processes within educational settings, such as ensuring that student work meets industry standards. Therefore, strict supervision and continuous quality control are necessary.

On the other hand, students gain numerous benefits from participating in the Teaching Factory. One of these is the growth of creativity and innovation among students. Creativity is the ability to create or innovate; it can also be defined as the latest and original creation produced, as creativity is a unique mental process to generate something new and different from what already exists [10]. This is because in the Teaching Factory, students are encouraged to generate various ideas, test them, develop them, and refine them to realize products according to client demands. The innovation design process involves several stages: understanding user problems, defining the problem, generating as many ideas as possible, creating prototypes, and testing prototypes with users [11].

Based on the findings from FGDs and interviews, this study proposes a Teaching Factory development model in vocational higher education consisting of three key elements: (1) **Curriculum Integration** – a flexible curriculum that allows for continuous input from industry standards and practices. Regular curriculum updates are necessary to reflect technological advancements and industry needs. (2) **Industry Engagement** – strong partnerships with industry, including joint supervision of student projects, involvement of industry experts in teaching, and access to real production environments for students as part of their learning. (3) **Student Assessment** – evaluation methods that assess not only technical competence but also soft skills, teamwork, and problem-solving abilities. This includes academic and industry-based assessments to ensure students meet the dual expectations of educators and employers.

4. Conclusions

The development of the Teaching Factory model in vocational higher education requires close collaboration between academics and the business and industrial sectors (DUDI). Both perspectives are crucial in creating a learning environment that prepares students for labor market demands. By integrating production/manufacturing experience into the academic curriculum, vocational education institutions can enhance the competitiveness of their graduates while addressing the skills gap in the industry. This study provides a framework for developing a Teaching Factory model that balances academic rigor with industry relevance, ensuring that vocational education institutions remain responsive to the evolving workforce needs.

Conflict of interest

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analysis, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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