Developing Teaching Factory Laboratory for Vocational Education: Case Study from Bachelor of Applied Culinary Arts

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ABSTRACT

This study aims to develop a Teaching Factory (TEFA) laboratory framework for the Bachelor of Applied Culinary Arts program at Surabaya State University, utilizing the TF-6M Model and the ADDIE Model. The primary objective is to bridge the gap between vocational education and industry needs by creating a realistic learning environment that simulates industrial processes. The research employs a qualitative approach, involving needs analysis through interviews and surveys with industry representatives, faculty, and students. The findings indicate a significant demand for a TEFA laboratory, with 80% of respondents highlighting the necessity for practical skills training. The developed framework consists of six key steps: Receiving Orders, Analyzing Orders, Stating Readiness to Execute Orders, Executing Orders, Conducting Quality Control, and Delivering Orders. Evaluation results demonstrate high satisfaction with the teaching materials and simulations, although improvements in quality control procedures are recommended. This research contributes to enhancing students' job readiness and aligns vocational education with industry standards, showcasing the novelty of integrating practical experiences into the curriculum.

INTRODUCTION

Vocational education plays a crucial role in achieving the Sustainable Development Goals (SDGs), particularly Goal 4, which emphasizes the importance of inclusive and quality education as well as lifelong learning opportunities for all (Saini et al., 2023). In the context of the Fourth Industrial Revolution, vocational education is essential for equipping learners with the relevant skills demanded by industries, including digital competencies, analytical abilities, and strong soft skills (Borrageiro & Mennega, 2023). One of the initiatives to achieve this goal is the development of Teaching Factory (TEFA), which serve as an educational model that integrates theory and practice within real work environments (Casmudi, C., Sugianto, S., & Maulida, 2022).

The TEFA model bridges the gap between education and the workforce by creating a learning environment that simulates real working conditions (Endang & Kuat, 2023). In addition to developing technical skills, TEFA also hones essential management, communication, and collaboration abilities that are vital in the workplace. The presence of TEFA supports the sustainable development agenda by fostering education that is responsive to the ever-evolving demands of the labor market (Filho et al., 2024). Through problem-based learning experiences, students can engage in experimentation, innovation, and continuous decision-making. Furthermore, the development of TEFA in vocational education institutions aligns with the principles of lifelong learning (Thwe & Kálmán, 2024).

At Surabaya State University, the Bachelor of Applied Culinary Arts program within the Vocational Faculty is currently focused on developing the TEFA concept. The primary aim of this TEFA development in the program is to implement a project-based learning model while fostering an entrepreneurial spirit among students. This approach not only provides students with a more contextual and practical learning experience but also enables them to understand and master the entire industrial process. It is anticipated that this will enhance their readiness to effectively tackle challenges in the workforce.

One of the concepts currently widely used to develop TEFA in vocational education is the TF-6M Model. This model is particularly appealing and frequently implemented due to its ability to integrate various management aspects that are crucial for the operational success and learning outcomes in vocational settings. Its effectiveness can be measured by several previous studies. For instance, Saputro (Saputro, 2024) explored the development of a TEFA learning model based on a Green Campus that supports the SDGs, where the TF-6M Model plays a role in waste management and enhancing student competencies. Similarly, Agus (Agus, 2023) applied the TF-6M Model at VHS 3 Selong to boost student interest and learning outcomes, reporting a 37% increase in interest and a 15.18% improvement in academic performance.

Meanwhile, Utami and Supardi (Utami & Supardi, 2022) found that entrepreneurship education and the TF-6M Model significantly impact the entrepreneurial competencies of students at VHS PGRI Subang, contributing 75.8% to their development. In the context of evaluation, Rukmana et al. (Rukmana et al., 2021) assessed the implementation of the Teaching Factory assistance program at VHS Jakarta Pusat 1, although they did not directly link it to the TF-6M Model. Lastly, Asriati (Asriati, 2019) examined the effectiveness of the TF-6M and 4D Models at VHS 6 Pontianak in the face of the Fourth Industrial Revolution, demonstrating an improvement in entrepreneurial learning outcomes. Overall, these studies affirm the effectiveness of the TF-6M Model in enhancing the competencies and skills of students across various vocational education contexts.

Based on several previous studies, it is evident that the implementation of TEFA is currently more prevalent at the vocational high school level, while research focusing on higher education remains limited. Furthermore, the existing studies primarily concentrate on the aspects of implementation and its impact on student competencies, without delving deeper into the models or frameworks used to develop Teaching Factory laboratories in the culinary field. This highlights the need to explore the comprehensive development process of TEFA in the context of higher vocational education.

Therefore, the primary objective of this study is to demonstrate how the TF-6M Model can be applied in the development of TEFA laboratories within the Bachelor of Applied Culinary Arts program at the Vocational Faculty of Surabaya State University. Through this case study, it is anticipated that deeper insights will be gained regarding the effective development process of TEFA that aligns with industry needs, as well as making a meaningful contribution to the advancement of vocational learning models in Indonesia.

RESEARCH METHOD

This type of research is a development study with a qualitative approach. The aim of this study is to develop a conceptual framework for Teaching Factory laboratories using the ADDIE Model and the TF-6M concept. The ADDIE Model was chosen for its ability to provide a systematic structure for planning, developing, and evaluating curricula or educational programs. The research process follows the five main stages of the ADDIE Model: Analysis, Design, Development, Implementation, and Evaluation.

During the **Analysis stage**, the needs identification and goal setting for the development of the TEFA laboratory are conducted. This phase includes an analysis of industry needs and stakeholder expectations, as well as an assessment of the competencies required in the context of culinary education. Data is collected through interviews with industry representatives, surveys of faculty and students, and relevant literature reviews to ensure a comprehensive understanding of the needs and expectations.

Next, in the **Design stage**, the conceptual framework for the TEFA laboratory is developed based on the analysis results. This design involves creating planning documents that outline the order acceptance process, order analysis, readiness statement for execution, order fulfillment, quality control, and order delivery in accordance with the TF-6M model. The design also considers the integration of project-based learning elements and hands-on practice to ensure relevance and effectiveness in the context of culinary education. The **Development stage** involves creating the necessary materials, modules, and tools to support the implementation of the conceptual framework. A prototype of the TEFA laboratory is developed and initially tested to ensure its alignment with the designed curriculum. This activity ensures that all elements required for the laboratory's operation are ready and functioning properly.

During the **Implementation stage**, the developed conceptual framework is applied in a simulated TEFA laboratory. This activity includes conducting teaching sessions, training, and initial evaluations to assess the effectiveness of the conceptual framework. Implementation is carried out through faculty training and trials with students to test the readiness and feasibility of the designed framework. Finally, in the **Evaluation stage**, an assessment is conducted on the effectiveness and efficiency of the applied conceptual framework. The data analysis techniques used include qualitative analysis of feedback from faculty, students, and industry stakeholders, as well as evaluations of the documents and teaching materials used during the implementation phase. Data is collected through surveys, interviews, and direct observations. This evaluation aims to refine and enhance the conceptual framework based on the feedback received and the needs identified during the implementation process.

RESULTS AND DISCUSSION

Analysis

The analysis results indicate a significant need for a Teaching Factory laboratory within the Bachelor of Applied Culinary Arts program. Data collected from interviews with industry representatives, as well as surveys of faculty and students, reveal a gap between the skills possessed by students and the requirements of the industry. Out of a total of 50 respondents, 80% expressed the necessity for a laboratory that can realistically simulate industrial processes.

Table 1. Presents the Survey Results Regarding the Need for A Laboratory.

Aspect	Percentage of Respondents (%)
Practical Skills	80
Job Readiness	70
Industry Integration	75
Training Quality	85

Design

The designed conceptual framework consists of six main steps in accordance with the TF-6M Model. Each step is detailed in the planning documents as follows:

a. **Receiving Orders:** This process involves registering orders and understanding the needs of industry clients. Registration forms and order analysis templates have been developed.
b. **Analyzing Orders:** This stage includes a thorough evaluation of the received orders, encompassing product specifications and completion timelines. Order analysis documents are prepared to include key parameters.
c. **Stating Readiness to Execute Orders:** This involves a declaration of the team's and facilities' readiness. Readiness documents and verification checklists are prepared.
d. **Executing Orders:** This is the production or fulfillment process that adheres to established standards. Standard Operating Procedures (SOPs) are developed.
e. **Conducting Quality Control:** This stage includes quality checks to ensure that the products meet the established standards. Quality control guidelines are created.
f. **Delivering Orders:** The delivery process encompasses documentation and feedback. Delivery forms and customer satisfaction surveys are designed.

Development

In the development stage, a prototype of the Teaching Factory laboratory and teaching materials are produced. The details of the development outcomes are as follows:

a. **Teaching Materials:** Modules and training materials are created for each step in the TF-6M Model.
b. **Laboratory Prototype:** Tools and equipment for simulating industrial processes are prepared, including workstations and simulation software.

Table 2. Details of Developed Tools and Equipment

Tool/Equipment	Description
Workstation	Contains production equipment
Simulation Software	Order management simulation
Training Modules	Materials for each stage of TF-6M

Implementation

The implementation is carried out through simulations in the laboratory. Training for faculty and students is conducted using the developed conceptual framework. Initial evaluations indicate positive results, with participant satisfaction levels as follows:

Table 3. Participant Satisfaction Evaluation Results

Evaluation Aspect	Average Score (1-5)
Quality of Teaching Materials	4.5
Relevance of Simulation	4.7
Facility Readiness	4.6
Faculty Training	4.8

Evaluation

The evaluation is conducted to assess the effectiveness of the conceptual framework. Feedback data indicates that this framework effectively meets the needs of both students and the industry. However, several areas require improvement, including enhancements to the quality control procedures and adjustments to the order analysis documents.

Table 4. Feedback Analysis Results

Feedback Aspect	Identified Issues	Proposed Solutions
Quality Control Procedures	Lack of detail	Addition of guidelines and checklists
Order Analysis Documents	Insufficient specificity	Revision of format and parameters

The research findings indicate that the application of the TF-6M Model in the development of the Teaching Factory laboratory provides a clear structure for industry-based learning processes. The TF-6M Model, which includes steps such as Receiving Orders, Analyzing Orders, Stating Readiness to Execute Orders, Executing Orders, Conducting Quality Control, and Delivering Orders, ensures that every aspect of the production process is systematically addressed. The implementation of this model aligns with previous findings that structured models can enhance teaching effectiveness by integrating practical industry elements into the educational curriculum.

The results from each stage of the research indicate that the developed conceptual framework is effective in meeting the needs of both industry and education. This aligns with the findings of Anwar et al. (Anwar et al., 2023), which suggest that integrating industry practices into vocational education curricula can enhance students' job readiness. Evaluations from the simulations and participant feedback demonstrate high satisfaction with the teaching materials and the relevance of the simulations, supporting the assertion that practical experiences related to the industry are crucial for effective learning (O'Neill & Short, 2023).

However, several aspects require improvement, such as the quality control procedures and the order analysis documents. Previous research has shown that well-defined quality control procedures are essential to ensure that production outcomes meet the necessary quality standards (Aggarwal et al., 2019). Therefore, adding guidelines and checklists for quality control can help enhance accuracy and consistency in the laboratory's production processes. Additionally, revising the order analysis documents can improve the clarity of specifications and parameters, which is key to avoiding errors and ensuring alignment between industry demands and production outcomes.

CONCLUSION

This research successfully developed a conceptual framework for the Teaching Factory laboratory in the Bachelor of Applied Culinary Arts program using the TF-6M Model and the ADDIE Model. This framework effectively organizes industry-based learning, encompassing steps from order reception to order delivery. Evaluation results indicate high satisfaction with the teaching materials and the relevance of the simulations, although improvements are needed in the quality control procedures and order analysis documents to enhance consistency and effectiveness. Overall, the combination of the TF-6M Model and the ADDIE Model has proven to be an effective method for developing a Teaching Factory laboratory that meets industry demands, thereby improving students' job readiness in the culinary field.

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