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Integration of Teaching Factory in Enhancing Employability and Entrepreneurship of Vocational High School Graduates

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Abstract
Vocational education plays a strategic role in preparing skilled human resources ready to enter the workforce. However, many graduates of Vocational High Schools (SMK) in Indonesia still face difficulties in obtaining job opportunities and developing entrepreneurial careers due to the gap between school-based learning and industry demands. This study aims to analyze the integration of the Teaching Factory model in enhancing employability and entrepreneurship competencies among students of SMK Muhammadiyah Sungai Bahar Muaro Jambi. The research uses a qualitative approach with a case study design to gain an in-depth understanding of the implementation of the Teaching Factory in vocational education. Data were collected through in-depth interviews, observations, and document analysis involving teachers, students, and school management. Data analysis used an interactive model consisting of data reduction, data presentation, and conclusion drawing. Findings show that the implementation of the Teaching Factory at SMK Muhammadiyah Sungai Bahar Muaro Jambi provides contextual learning experiences resembling real industrial environments. Students are directly involved in production processes, quality control, work planning, and customer service, which significantly improves technical competencies as well as soft skills such as teamwork, communication, and problem-solving. Furthermore, participation in business-oriented activities within the Teaching Factory fosters entrepreneurial awareness and practical understanding of business operations. The study concludes that the integration of the Teaching Factory significantly contributes to strengthening the employability and entrepreneurial readiness of SMK Muhammadiyah Sungai Bahar Muaro Jambi graduates. Therefore, strengthening collaboration between schools and industry partners is important to optimize the implementation of the Teaching Factory in vocational education.

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1. Introduction

Vocational education plays a strategic role in preparing skilled human resources capable of supporting economic development and enhancing global industrial competitiveness. From the perspective of human capital development, vocational education functions not only as an educational medium but also as a key instrument to increase labor productivity and promote skill-based economic growth. Therefore, the effectiveness of vocational education is largely determined by the extent to which the learning system produces graduates aligned with the ever-evolving needs of industry. Vocational High Schools (SMK) are specifically designed to produce graduates with competencies relevant to the workforce through practical-based approaches and mastery of technical skills. The orientation of vocational education is no longer limited to knowledge transfer alone but focuses on the formation of applicable and contextual work competencies. As such, vocational education serves as a crucial link between the

education system and the dynamic labor market, requiring alignment between curriculum, learning processes, and industry demands (UNESCO, 2021; OECD, 2020) [37, 26]. Despite its strategic role, the vocational education system still faces challenges in aligning learning outcomes with industry needs. Studies indicate a gap between competencies taught in educational institutions and the skills required in the workforce. This mismatch suggests that learning processes are not fully responsive to the evolving dynamics and demands of industry.

More specifically, reports from international organizations highlight the phenomenon of skills mismatch, i.e., the misalignment between graduates' competencies and employers' expectations. This gap can occur as horizontal mismatch (inappropriate field of expertise) or vertical mismatch (inappropriate qualification level). Such conditions reduce the relevance of graduates in the labor market, thereby decreasing their chances of optimal employment. Furthermore, the impact of this skills gap is reflected in the low absorption of vocational graduates and high open unemployment rates, especially among SMK graduates compared to general education graduates. This phenomenon indicates inefficiencies in the vocational education system and raises critical questions about the effectiveness of current learning models in preparing job-ready graduates. Therefore, innovative efforts are needed to improve the alignment between vocational education and industry requirements (World Bank, 2020; ILO, 2021) [39, 15].

This is supported by the 2023/2025 Tracer Study at SMK Muhammadiyah Sungai Bahar Muaro Jambi, which found: 25% of graduates work in businesses and industries aligned with their competencies, 35% work in areas not aligned with their skills, 15% continue to higher education, and 25% become entrepreneurs. To understand the root of this issue, it is important to examine in depth the learning processes occurring within Vocational High Schools, especially at SMK Muhammadiyah Sungai Bahar Muaro Jambi. The learning process is a key factor determining the quality of graduates' competencies, as it involves knowledge transfer, skill development, and internalization of work attitudes. Therefore, the mismatch between educational outcomes and industry needs cannot be separated from how learning is designed and implemented in the vocational context. One main factor contributing to this gap is the dominance of theory-oriented learning approaches that remain teacher-centered. In addition, limited student access to practical experience in real industrial settings is also a significant constraint. The lack of effective partnerships between schools and industry means that students do not gain sufficient exposure to real work situations. Consequently, learning becomes less contextual and fails to represent actual work conditions.

This situation limits students' opportunities to develop authentic work experience, which is a vital component of vocational education. Without direct involvement in real work environments, students tend to be less trained in problem-solving, decision-making, and adaptability to the complex dynamics of professional workplaces. Ultimately, this reinforces the gap between graduates' competencies and industry requirements, highlighting the need for a transformation toward experience- and context-based learning approaches (Billett, 2011; Raelin, 2008) [5, 30]. Recognizing this gap between learning outcomes and industry needs, various innovations in vocational learning models have been developed to enhance relevance and effectiveness. These efforts focus on stronger integrationbetween educational processes and industrial practice, enabling students to acquire not only theoretical knowledge but also contextual work experience. Such approaches are crucial in meeting the increasingly complex and dynamic demands of the workforce. One approach gaining attention in vocational education development is the Teaching Factory model. This model is seen as a strategic solution to bridge the gap between education and industry through the integration of real work-based learning. The Teaching Factory functions not only as a learning method but also as a system that combines education, production, and business in a structured unit.

Conceptually, the Teaching Factory is a learning model that integrates educational activities with real production or service processes conducted within the school, following industry standards. In this model, learning is no longer purely simulational but based on real production activities involving direct interaction with customers and adherence to quality standards consistent with industry practices. Thus, students gain authentic and relevant learning experiences, effectively enhancing work readiness (Chryssolouris et al., 2016; Rentzos et al., 2014) [7, 32].

2. Literature Review and Conceptual Framework

2.1. Concept of Teaching Factory

The concept of the Teaching Factory (TF) emerged as a response to the urgent need to bridge the persistent gap between academic theory and industrial practice. In many vocational education systems, there is a challenge in ensuring that knowledge gained in the classroom can be directly applied in real work contexts. Therefore, TF was developed as an approach that systematically and structurally integrates learning processes with industrial realities (Chryssolouris et al., 2016; Abele et al., 2017) [7, 1].

Philosophically, the Teaching Factory is rooted in the work-integrated learning approach, which positions work experience as a core part of the educational process. In this approach, learning is understood not only as knowledge transfer but also as a process of knowledge construction through direct engagement in work activities. Students thus learn not only "about" work but also "in" and "through" work (Boud & Solomon, 2001; Billett, 2011) [5].

Furthermore, the Teaching Factory is designed to replicate industrial production environments within schools. This includes implementing operational standards, production systems, and quality control mechanisms similar to industry practices. In this way, students are exposed to work conditions that closely resemble professional reality, thereby significantly minimizing the gap between learning and the workforce. Theoretically, the Teaching Factory also reflects the principle of situated learning proposed by Lave and Wenger. This theory emphasizes that learning is more effective when individuals are situated in authentic social and situational contexts. By placing students in work environments resembling the industry, learning becomes more contextual, meaningful, and relevant to practical needs (Lave & Wenger, 1991).

In practice, student involvement in production systems enables them to understand standard operating procedures (SOPs), industrial workflow, and productivity and efficiency demands directly. This experience not only strengthens technical skills but also develops work discipline, accuracy,

and professional responsibility, which are crucial in the modern workforce (Hadlock et al., 2008; Sudira, 2016) [14, 34]. Beyond technical aspects, the Teaching Factory also contributes to the development of transversal non-technical skills. Students learn not only how to complete production tasks but also how to work under time pressure, adapt to changes, and collaborate within teams. This makes the learning process more comprehensive, encompassing cognitive, psychomotor, and affective dimensions simultaneously.

From a social learning perspective, the Teaching Factory can be understood as a form of communities of practice, where learning occurs through interactions between students, instructors, and industry partners. In these communities, knowledge is not merely transferred in a one- way fashion but constructed through active participation in shared activities. Such interaction creates a dynamic, collaborative learning environment based on real experience (Wenger, 1998). Furthermore, the presence of a community of practice within the Teaching Factory allows for legitimate peripheral participation, where students gradually move from simple initial participation to more complex involvement in production activities. This process helps students internalize knowledge and skills progressively according to their level of experience in the work environment.

Finally, integrating the Teaching Factory into vocational curricula also plays an important role in accelerating the transfer of learning from educational settings to real-world work. One of the main challenges in vocational education is the low transferability of skills from the classroom to industry. By providing authentic work experience, the Teaching Factory reduces this gap and improves graduates' work readiness more effectively (Eraut, 2004; Smith, 2013) [9, 33].

2.2. Employability in Vocational Education

Employability is a multidimensional construct that goes beyond merely mastering technical skills. It includes a set of abilities that enable individuals to obtain, retain, and develop employment across dynamic work contexts. In contemporary perspectives, employability is understood not only as an educational outcome but as a continuous process related to individuals' adaptability to changing work environments (Yorke, 2006; Frost et al., 2008) [40]. Key dimensions of employability include understanding broader work contexts, such as organizational dynamics, work culture, and technological and labor market changes. Therefore, employability cannot be reduced to technical aspects alone but also encompasses cognitive and social skills that allow individuals to function effectively in complex work environments.

Moreover, employability is closely linked to lifelong learning the ability and willingness to continue learning throughout life. In a workforce marked by technological disruption and industrial restructuring, the ability to update knowledge and skills continuously is a critical factor for career success. Consequently, employability is dynamic and evolves with labor market demands. In vocational education, the focus is on developing work competencies relevant to industry needs. Vocational education aims not only to produce job-ready graduates but also to cultivate individuals who can adapt and thrive in competitive work environments. Therefore, vocational curricula must reflect the actual needs of industry. Competencies developed in vocational education include core technical skills specific to fields of expertise andmeta-skills that are cross-contextual. These meta-skills include creativity, communication, collaboration, problem- solving, and critical thinking. The combination of both types of skills forms the foundation for highly employable individuals (Andrews & Higson, 2008; Jackson, 2014) [2, 16]. Longitudinal studies show that graduates with real work experience tend to have better employability outcomes than those with classroom-only experience. They secure jobs more quickly, maintain employment longer, and demonstrate more stable career growth in the long term (Hillage & Pollard, 1998; Yorke & Knight, 2006).

Authentic work experience strengthens the connection between theory and practice. In this context, learning models like the Teaching Factory are relevant because they provide an environment that resembles real work. Through direct involvement in production or services, students gain experiences that cannot be fully replicated in conventional classroom learning. Informal learning in real work contexts often has a stronger impact on work readiness than formal classroom learning because it is contextual, problem-based, and experience-driven. In these situations, students learn through direct action and social interaction in the workplace. Eraut (2004) emphasizes that most workplace learning is incidental it occurs unstructured but is highly meaningful. This experience allows individuals to develop professional competencies directly relevant to industry demands. Therefore, workplace learning is strategically valuable in shaping genuine employability. Furthermore, integrating experiential learning, as proposed by Kolb (1984, 2015), provides a strong conceptual framework for understanding competency development. The learning cycle consisting of concrete experience, reflection, conceptualization, and active experimentation enables students to continuously refine their understanding and skills.

Through this process, students also develop reflection- in-action skills the ability to evaluate and adjust actions in real time when faced with work situations. This is crucial in modern workplaces characterized by uncertainty, complexity, and rapid change. Experiential learning thus forms an important foundation for adaptive and sustainable employability.

2.3. Entrepreneurship Education in Vocational High Schools

Entrepreneurship education plays a crucial role in shaping an entrepreneurial mindset in individuals, particularly within vocational education. This mindset includes opportunity orientation, risk tolerance, innovation ability, and proactivity in facing and solving problems. Thus, entrepreneurship education focuses not only on business knowledge but also on developing adaptive entrepreneurial thinking and behavior (Neck & Greene, 2011; Fayolle & Gailly, 2015) [24, 10]. In the context of Vocational High Schools (SMK), entrepreneurship education serves as a strategic catalyst to broaden students' career orientation. Students are not only guided to become part of the formal workforce but are also encouraged to consider careers as job creators. This transformation is important given limited labor market absorption and the increasing need for creating new jobs (Gibb, 2002; Nabi et al., 2017) [11, 23].

Effective entrepreneurship education is generally experience-based, involving students directly in activities that resemble or replicate real business practices. These activities may

include business simulations, student enterprise practice, or managing production units within a Teaching Factory. Through this approach, students not only learn theoretical concepts of entrepreneurship but also experience the dynamics of business management firsthand. Participation in real business activities exposes students to various uncertainties characteristic of the business world. In this context, students must make strategic decisions, manage limited resources, and respond to customer needs directly. This process develops essential adaptation and problem-solving skills critical for entrepreneurial competency (Lackéus, 2015; Fang et al., 2020) [20].

Moreover, experience-based learning contributes to strengthening self-efficacy the individual's belief in their ability to plan and execute actions necessary to achieve goals. In entrepreneurship, self-efficacy is a key psychological factor influencing intention and success in starting a business. Direct experience in business activities reinforces students' confidence in their abilities to operate a venture (Bandura, 1997; Zhao et al., 2005) [3]. Additionally, literature shows that real business experience plays a significant role in enhancing opportunity recognition skills the capacity to identify business opportunities arising from the surrounding environment. In entrepreneurship, opportunity recognition is a core competency that differentiates those with mere business ideas from individuals capable of developing actual ventures (Ardichvili et al., 2003; Baron, 2006). Learning in authentic contexts provides students with rich, contextual information that cannot be fully acquired through classroom theory. Direct interaction with customers, production processes, and market dynamics allows students to understand how entrepreneurial concepts are applied in real situations. This strengthens the connection between theory and practice authentically. In conclusion, direct experience in entrepreneurship activities, particularly through models like the Teaching Factory, enhances business technical skills while developing essential cognitive and psychological competencies. Integrating experience-based learning with real business contexts makes entrepreneurship education more effective in producing individuals ready not only to enter the workforce but also to create their own ventures.

2.4. Teaching Factory and Entrepreneurship Learning

The integration of the Teaching Factory (TF) with entrepreneurship education represents an innovative curriculum approach in vocational education aimed at broadening graduates' competency orientation. While traditional vocational education tends to focus on industrial work skills, integration with entrepreneurship extends this scope toward developing entrepreneurial competence. Therefore, this approach prepares students not only as workforce participants but also as prospective entrepreneurs capable of creating economic opportunities.

In practice, the Teaching Factory often operates as a mini-enterprise within schools. This concept enables schools to function as production units conducting real business activities according to industry standards. Students participate not only as learners but also as members of an actual production and business system. Student involvement in the Teaching Factory encompasses the entire business cycle, including production, quality control, marketing, and customer service. This comprehensive participation provides holistic learning experiences as students understand how each element in the business system is interconnected. It also strengthens systemic understanding of overall business processes (Hadlock et al., 2008; Chryssolouris et al., 2016) [14, 7].

From an entrepreneurship education perspective, these experiences give students opportunities to develop decision-making skills based on data and real conditions. They not only learn business theory but are also faced with situations requiring analysis, evaluation, and rapid operational responses. This is critical for developing adaptive, reality-based entrepreneurial competence. Empirical evidence from Okoye et al. (2020) indicates that student involvement in the Teaching Factory contributes to improved work readiness while enhancing self-confidence in managing business activities. This suggests that production-based work experience impacts not only technical skills but also psychological aspects such as self-confidence and entrepreneurial intention [27].

Moreover, students engaged in the Teaching Factory gain deeper understanding of business processes, including production planning, resource management, and marketing strategies. Such understanding forms a crucial foundation for developing entrepreneurship skills that are both operational and applied, not merely conceptual (Fayolle & Gailly, 2015; Neck & Greene, 2011) [10, 24]. Beyond technical and managerial aspects, experience in the Teaching Factory strengthens students' ability to manage customer relationships. Direct interaction with customers enables students to understand market needs, receive feedback, and adjust products or services accordingly. This is essential in market-based entrepreneurship.

Pedagogically, Raelin (2008) emphasizes that practice- based learning fosters reflective practitioners—individuals capable of reflecting on work experiences to improve future performance. Reflective ability is particularly important in business and industry contexts characterized by uncertainty and rapid change. Through reflection, individuals can continually adjust strategies and approaches based on prior experience, enhancing adaptability and competitiveness. Thus, the Teaching Factory functions not only as a technical learning platform but also as a learning environment that simultaneously develops entrepreneurial attitudes, values, and skills. This integration creates a more realistic learning ecosystem aligned with modern labor market needs. Ultimately, the integration of the Teaching Factory in vocational education provides a holistic educational foundation. The model simultaneously strengthens employability and entrepreneurship competencies, both of which are crucial for SMK graduates to adapt to modern work environments and create their own business opportunities (Billett, 2011; Smith, 2013; Okoye et al., 2020) [5, 33, 27].

3. Conceptual Framework

The conceptual framework of this study assumes that the Teaching Factory (TF) learning model can function as an effective pedagogical mechanism to bridge the gap between school learning and industrial practice. In vocational education, the persistent mismatch between theoretical learning in schools and workforce demands has long been recognized as a key factor influencing graduates' work readiness and employment opportunities. The Teaching Factory model addresses this issue by integrating authentic production or service activities into the learning process, allowing students to experience a work environment

resembling actual industry conditions within the school context. Through this authentic involvement, students are expected to develop not only technical competencies but also social skills and practical understanding of business processes relevant to contemporary work. This study builds its conceptual foundation on three complementary theoretical perspectives: experiential learning, situated learning, and entrepreneurial learning. Together, these perspectives explain how integrated learning experiences within the Teaching Factory environment can foster employability and entrepreneurship competencies in vocational students.
First, Kolb's experiential learning theory emphasizes that effective learning occurs through a cycle involving concrete experience, reflective observation, abstract conceptualization, and active experimentation. In the Teaching Factory context, students are directly involved in production or service activities resembling real industry practices. This involvement provides concrete learning experiences that encourage reflection and deeper conceptual understanding, enabling the application of theoretical knowledge in real professional contexts.
Second, this framework also refers to the situated learning perspective introduced by Lave and Wenger, which states that learning is more meaningful when it occurs within authentic social and cultural contexts. Knowledge is constructed through participation in specific social activities rather than being detached from practice. The Teaching Factory can be understood as a community of practice where students learn through interactions with teachers, peers, and industry partners. These interactions facilitate gradual internalization of professional norms, industry standards, and work values such as discipline, responsibility, collaboration, and efficiency, making learning more contextual and embedded in relevant social practice.
Third, the framework integrates the entrepreneurial learning perspective, emphasizing the importance of direct experience in developing entrepreneurship competencies.
Entrepreneurial learning occurs when individuals engage directly in business activities involving uncertainty, opportunity recognition, and decision-making. In the Teaching Factory model, students not only engage in technical production processes but also participate in business activities such as product marketing, customer interaction, and resource management. These experiences provide a deeper understanding of market dynamics and organizational processes, contributing to the development of entrepreneurial thinking and competencies.
Based on these three theoretical perspectives, this study assumes that implementing the Teaching Factory can contribute to two primary vocational education outcomes: enhancing employability and strengthening students' entrepreneurship competencies. Practice-based, authentic work learning experiences allow students to develop the range of skills required in modern labor markets. Participation in Teaching Factory activities enables students to develop technical competencies aligned with industry needs while also strengthening generic (soft) skills such as communication, teamwork, adaptability, and problem-solving. In addition, student involvement in production and business management activities provides a comprehensive understanding of market mechanisms, organizational processes, and value creation. These experiences are expected to foster entrepreneurial awareness and opportunity recognition skills, essential for individuals who are not only job seekers but also job creators.
Within this conceptual framework, the Teaching Factory is positioned as the primary variable influencing student learning outcomes. The pedagogical mechanism bridging this influence is conceptualized as experiential industry-based learning, allowing students to engage directly in work activities resembling real industry environments. Through this mechanism, Teaching Factory learning experiences are expected to produce two main learning outcomes: employability skills and entrepreneurial competence. Consequently, this study views the Teaching Factory as an integrative vocational pedagogy model that not only enhances students' work readiness but also strengthens their capacity to create new economic opportunities. By combining experience-based learning, social participation in professional practice, and exposure to business processes, the Teaching Factory model has the potential to prepare vocational education graduates who are not only ready to enter the workforce but also capable of acting as innovation and entrepreneurship agents in a dynamic labor market.

4. Research Methodology

This study employs a qualitative research design with a case study approach. The case study method allows the researcher to examine complex educational practices in real contexts and gain an in-depth understanding of the implementation of the Teaching Factory in vocational high schools.
A qualitative approach is used to explore the experiences, perceptions, and interpretations of participants regarding the Teaching Factory learning model. This approach is suitable for understanding educational processes and social interactions occurring within the learning environment. Data were collected using multiple techniques:

1. In-depth interviews with teachers, school management, and students involved in the Teaching Factory program.
2. Observations of production activities, learning processes, and student interactions within the Teaching Factory environment.
3. Document analysis including curriculum documents, production reports, and institutional policies related to the implementation of the Teaching Factory.

The use of multiple data sources allows for triangulation to enhance the study's validity. Data analysis employed the interactive model developed by Matthew B. Miles, A. Michael Huberman, and Johnny Saldaña. This model emphasizes that qualitative data analysis occurs cyclically and interactively through three main stages: data reduction, data display, and conclusion drawing and verification. These components interact continuously throughout the research process, from data collection to obtaining findings that are scientifically accountable.
The first stage, data reduction, involves selecting, focusing, simplifying, and organizing raw data obtained from the field to make it relevant to the research focus. In this stage, interview, observation, and documentation data are first transcribed and systematically compiled. Coding is then conducted to identify key themes related to the implementation of the Teaching Factory and its impact on student competency development. Data are grouped into thematic categories such as industry-based learning experiences, technical skills development, enhancement of generic skills like communication and teamwork, and

students' understanding of business and entrepreneurship.

This reduction process simplifies complex information into a more structured and relevant format for the study.

The second stage, data display, involves organizing the reduced data systematically to allow the researcher to understand patterns, relationships, and trends emerging from the research. In this study, data were displayed through thematic matrices, analytical tables, and narrative descriptions. Thematic matrices map relationships between Teaching Factory activities and student learning experiences as well as their impact on employability and entrepreneurship competencies. Additionally, data are presented in analytical narratives describing student and teacher experiences during Teaching Factory-based learning. Systematic data display enables the identification of patterns linking learning practices in the Teaching Factory to student competency development.

The third stage, conclusion drawing and verification, involves interpreting the meaning of the analyzed data and ensuring the validity of research findings. Researchers identify patterns and relationships emerging from the data, particularly regarding how Teaching Factory implementation influences students' employability and entrepreneurial competency development. Conclusions are not based on a single data source but are verified through triangulation by comparing information from interviews, field observations, and documentation. Verification also includes analytical reflection to ensure interpretations are consistent with empirical data collected in the field.

Through this interactive analysis process, the study seeks to gain an in-depth understanding of the dynamics of Teaching Factory implementation in vocational education and its contribution to student competency development. This analytical approach allows researchers to link industry-based learning experiences with the enhancement of students' work skills and entrepreneurial competencies comprehensively. Consequently, the data analysis process not only provides a description of Teaching Factory implementation but also offers conceptual interpretation of its role in strengthening employability and entrepreneurship capacity among vocational graduates.

5. Findings

The study revealed three main themes emerging from the implementation of the Teaching Factory in vocational education.

5.1. Learning Pressure and Work Responsibility

Students involved in Teaching Factory activities experience work pressure because production activities must meet quality standards and customer expectations. Deadlines, product quality control, and customer satisfaction create a learning environment resembling real industrial conditions. This pressure encourages students to develop discipline, responsibility, and professional attitudes.

5.2. Experience-Based Learning and Skills Development

Teaching Factory provides opportunities for authentic experience-based learning. Students actively participate in various production stages, including planning, manufacturing processes, quality control, packaging, and service. Through these experiences, students develop both technical competencies and soft skills such as teamwork, communication, and problem-solving.

5.3. Entrepreneurial Strategy Development

Participation in the Teaching Factory program also introduces students to fundamental business management practices, such as cost calculation, marketing strategies, and customer interaction. These experiences allow students to understand how production activities relate to business sustainability and profitability. As a result, many students show increased interest in entrepreneurship as a career pathway.

6. Discussion

The study results indicate that the integration of the Teaching Factory in vocational education significantly contributes to enhancing employability and entrepreneurship competencies among SMK students. These findings are consistent with Kolb's experiential learning theory (1984, 2015) [18, 19], which emphasizes the importance of learning through real experiences. By directly engaging in production and service activities, students gain a deeper understanding compared to theoretical learning alone.

From an employability perspective, students' experiences managing production processes, quality control, and customer service enhance technical skills as well as soft skills such as communication, teamwork, discipline, and problem-solving. This aligns with studies by Billett (2011) and Okoye et al. (2020), which show that engagement in real industrial practice develops professional competencies relevant to labor market needs [5, 27]. Furthermore, experiences in the Teaching Factory foster students' entrepreneurial mindset, including the ability to recognize opportunities, make strategic decisions, and understand business management. These findings support previous literature by Neck & Greene (2011) and Fayolle & Gailly (2015), which assert that experience-based education improves entrepreneurship competencies and self-efficacy [24, 10].

Theoretically, this study contributes by emphasizing the dual role of the Teaching Factory: not only as a platform for employability development but also as an entrepreneurship education platform. The findings broaden understanding of holistic industrial learning models, where technical skills and entrepreneurial competencies can be developed simultaneously. Practically, the study implies the need to strengthen partnerships between schools and industry. Close collaboration ensures that Teaching Factory activities remain relevant to industry standards and technological developments, so that students' learning experiences remain authentic and marketable.

7. Conclusion

This study concludes that integrating the Teaching Factory in vocational education positively impacts employability and entrepreneurship competencies among SMK students. Specifically:

1. The Teaching Factory provides practice-based learning experiences resembling real industrial environments, enhancing students' technical skills and soft skills.
2. Student participation in business-oriented activities fosters entrepreneurial awareness and practical understanding of business management.
3. Integration of this model bridges the gap between theory and practice while strengthening students' readiness to enter the workforce or start their own businesses.

The contribution of this study lies in strengthening empirical

evidence regarding the dual role of the Teaching Factory as a learning model that simultaneously develops employability and entrepreneurship competencies.

8. Recommendations for future research include

1. Evaluating the long-term impact of the Teaching Factory on graduates' professional careers and entrepreneurial success.
2. Conducting quantitative studies to statistically measure the effectiveness of the Teaching Factory on employability indicators and entrepreneurial interest.
3. Developing a more integrated Teaching Factory model with Industry 4.0 technologies to prepare graduates who are adaptive to modern industrial developments.

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10. Conflict of Interest Statement

The authors declare that there is no conflict of interest related to the publication of this article. All data, analyses, and interpretations were produced independently without influence from any party.

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