Integrating Teaching Factory Learning Management for Sustainable Entrepreneurial Competence Development

Nanik Hindaryatiningsih [1], Jafar Ahiri [2], Fina Amalia Masri [3], Wa Ode Reni [4], Sabrin Sabrin [1], Yuniyarti Ahiri [2], Wulan Safitri Aguspin [1]

[1] *Department of Accounting Education, Halu Oleo University, Kendari, Indonesia,*
[2] *Department of Economic Education, Halu Oleo University, Kendari, Indonesia*
[3] *Department of Languange and Literature, Halu Oleo University, Kendari, Indonesia*
[4] *Department of Citizenship Education, Halu Oleo University, Kendari, Indonesia*

Abstract **– This study aims to analyze the management of teaching factory (TeFa) learning in enhancing the entrepreneurial competence of Fashion Design students at SMK Negeri 3 Kendari. Using a mixed methods (quantitative and qualitative), data were collected through observation, questionnaires, interviews, and documentation involving the vice principal for curriculum, head department, teachers, industry partners (DUDI), and grade XI students. The data were analyzed using the Likert scale with SPSS support and processed, which includes data reduction, display, and verification, while validity was tested through technical and source triangulation. The results indicate that teaching factory learning management is generally in the good category. The planning component achieved an average score of 3.85, organizing 3.89, implementation 3.98, and evaluation 3.81. These findings suggest that effective teaching factory management covering planning, organization, implementation, and evaluation successfully bridges the gap between theoretical learning and industrial practice, thereby improving students' entrepreneurial competence.**

DOI: 10.18421/TEM153-73
https://doi.org/10.18421/TEM153-73

Corresponding author: Nanik Hindaryatiningsih,
Department of Accounting Education, Halu Oleo University, Kendari, Indonesia
Email: nanik.hindaryatiningsih@uho.ac.id

Received: 11 November 2025.
Revised: 06 February 2026.
Accepted: 30 March 2026.
Published: 27 August 2026.

Keywords **–Teaching factory, learning management, vocational education, entrepreneurial competence.**

1. Introduction

Vocational high schools (VHS) are secondary education institutions specifically designed to prepare students for employment in specific occupational fields. Graduates of these institutions are expected to become mid-level workers equipped with skills and competencies that align with contemporary industrial demands, ready to enter both business and industrial environments. The primary focus of learning in vocational schools is to equip students with the competencies required for successful employment [1]. Given the rapid advancement of industry and technology, vocational education plays a pivotal role in preparing a skilled workforce capable of contributing to national development, economic growth, and global competitiveness [2].

However, vocational schools face persistent challenges, particularly the low skill alignment between graduates and the needs of the labor market. The lack of collaboration between schools and industries often results in a curriculum and learning process that are insufficiently integrated with real-world industry demands. In classroom practices, teachers tend to adopt conventional teaching methods where knowledge transfer is one-directional, leading to passive student engagement [3]. Effective innovation in vocational education is difficult to achieve without teachers possessing relevant industrial experience, competence, and networks [4]. Consequently, graduates who should be work-ready often contribute instead to the unemployment rate [5].

To address these challenges, the government has initiated policies to enhance human resource quality through education, instill entrepreneurship at all levels of learning, and expand employment opportunities.

One of the strategic programs introduced is the teaching factory (TeFa) in vocational schools [6].

A vocational institution must therefore be managed not only as an educational environment but also as an industrial entity that fosters the development of professional, methodological, social, and personal competencies among students [7]. The teaching factory concept provides a platform for schools and industries to collaboratively create authentic learning environments, enabling students to integrate theoretical knowledge with practical skills relevant to industrial contexts [8].

The term "factory" in teaching factory does not refer to a literal production site but rather to a pedagogical approach in which learning occurs in practice-based environments simulating real industrial conditions. This model integrates learning and working processes seamlessly, eliminating the traditional separation between theoretical and practical learning [9], [10]. According to [11], the concept of teaching factory emerged due to three primary reasons: (1) Traditional classroom learning is inadequate, (2) Students require hands-on learning experiences, and (3) Teamwork-based learning involving students, educators, and industries fosters mutual benefit.

The teaching factory paradigm seeks to integrate education, research, and innovation through effective collaboration between academia and industry. It emphasizes the alignment of curricula, instructional design, and industrial engagement to create a cohesive and industry-relevant learning system [10], [12]. In this regard, learning within the teaching factory framework is carried out in environments closely resembling real work settings.

A key goal of the teaching factory program is to cultivate entrepreneurial competencies among students while providing them with real production experiences [10]. The concept of entrepreneurship has evolved from being merely self-employment with unstable income to embodying creativity, innovation, and resilience in business development [13]. As emphasized by [14], teaching factory aims to ensure that the learning process extends beyond textbook knowledge, promoting deeper understanding and practical application.

The successful implementation of teaching factory relies heavily on effective learning management, adequate facilities, and professional human resources [15]. According to [16], learning management involves systematic planning, organizing, implementing, and evaluating learning activities to achieve educational objectives effectively and efficiently. In the context of teaching factory, structured management ensures alignment between learning outcomes and industrial requirements.

This study focuses on teaching factory learning management as a means of enhancing students' entrepreneurial competencies. The novelty of this research lies in its focus on how effective management practices in teaching factory implementation can bridge the gap between theoretical instruction and practical industry needs. Previous studies [17], [18] have demonstrated that well-managed teaching factory programs significantly improve students' entrepreneurial skills, there remains a research gap in understanding how management strategies can be optimized in specific vocational disciplines, such as fashion design, to overcome contextual challenges.

Preliminary observations at SMK Negeri 3 Kendari, particularly in the fashion design department, revealed several challenges in implementing the teaching factory model. These include insufficient facilities (e.g., inadequate fabric cutting tools and limited access to equipment on a 1:1 ratio), which hinder practical learning efficiency. Additionally, student learning outcomes remain below the minimum mastery criteria (KKM). These issues highlight the need for improved learning management and resource optimization to ensure that the teaching factory model can effectively enhance both technical and entrepreneurial competencies among vocational students. The distribution of students' entrepreneurship learning outcomes based on the KKM is presented in Table 1.

Table 1. Data on the value of entrepreneurship learning outcomes for class X BS 1 students based on KKM

Value		Present (%)	Information
≥ 70	19	61%	MOH 70
≤ 70	12	39%	
Sum	31	100%	

Based on the data presented in Table 1, it can be observed that a significant number of students still achieve scores below the school's established minimum mastery criteria of 70. According to information obtained from the fashion design teachers, the primary reason for the students' low academic performance is their limited understanding of the instructional material. This issue arises mainly from the monotonous teaching methods currently employed, which lead to student disengagement, lack of motivation, and reduced learning outcomes.

In light of the problems identified in the preceding background section, it is necessary to conduct a study focusing on the management of teaching factory-based learning as a means to enhance students' entrepreneurial competence at SMK Negeri 3 Kendari. This research seeks to explore and describe how the teaching factory learning management is implemented in terms of planning, organizing, implementing, and evaluating learning activities.

The primary objective of this study is to analyze and elaborate on the effectiveness of teaching factory learning management in improving entrepreneurial competencies among fashion design students at SMK Negeri 3 Kendari.

2. Methodology

This study uses mixed methods (quantitative and qualitative) which explain in detail and depth according to the data and facts obtained in full in the field. The data collection technique in this study was carried out using observation methods, interviews, questionnaires, and documentation. The informants in this study are the principal, the Deputy Principal for Curriculum, the Deputy Principal for Facilities and Infrastructure, and the vice president for hub affairs. There is also industry/community vice president for student affairs, head of the fashion department, and teachers involved in the learning management of the teaching factory in the Fashion Design Department, grade XI students of the Fashion Department (SMKN 3) Kendari and DUDI. With a total of 63 participants.

This study employs both quantitative and qualitative data analysis techniques. Quantitative data were analyzed using a Likert scale and processed with SPSS for Windows version 25.0 to generate descriptive statistics, including the frequency distribution of respondents' responses. Qualitative data were analyzed following the Miles and Huberman interactive model. To ensure data validity, both technique triangulation and source triangulation were applied. The classification of qualitative average percentage categories was based on the indicators presented in Table 2.

Table 2. Average score (answer score)

No.	Average Score Answer	Meaning/Category	Score
1.	1,00-1,80	Very Bad	1
2.	1.81-2,60	Bad	2
3.	2,61-3,40	Not Good	3
4.	3,41-4,20	Good	4
5.	4,21-5,00	Excellent	5

Source: [19].

3. Results

This section presents the findings from the evaluation of the implementation of the TeFa learning model at SMK Negeri 3 Kendari, focusing on its impact on improving students' entrepreneurial competencies. The data, gathered through questionnaires and interviews with key stakeholders including school leadership, teachers, and industry partners, are analyzed to assess the effectiveness of TeFa in bridging the gap between theoretical knowledge and practical skills, as well as its alignment with industry standards.

3.1. Teaching Factory Learning Planning in Improving Entrepreneurial Competence in Students of SMK Negeri 3 Kendari

Effective teaching factory learning planning is achieved when teachers are able to design and implement learning processes that optimally support students' skill development and enable the attainment of learning objectives. This includes minimizing potential obstacles that may disrupt the learning process, managing classroom facilities effectively, organizing students appropriately, and structuring learning activities that accommodate students' individual characteristics and learning conditions [20], [21], [22].

Questionnaires were distributed to the vice principal, head of the Fashion Department, fashion educators, DUDI representatives, and Grade XI students. Interviews were also conducted with these stakeholders. The data collected are summarized in Table 3.

Table 3. Respondent answers (teaching factory learning planning indicators)

Item/indicator	Frequency (f) and Percentage (%)											
	STS (1)		TS (2)		RR (3)		S (4)		SS (5)		Mean	Category
	F	%	f	%	f	%	F	%	F	%	Items	
TeFa Learning Program (X1)	3	4,8	7	11,1	8	12,7	26	41,3	19	30,2	3,81	Good
Tefa Learning Guide (X2)	3	4,8	7	11,1	9	14,3	26	41,3	18	28,6	3,78	Good
Preparation of RPP (X3)	1	1,6	3	4,8	14	22,2	26	41,3	19	30,2	3,94	Good
HR (X4)	5	7,9	4	6,3	13	20,6	27	42,9	14	22,2	3,65	Good
Facilities & Infrastructure (X5)	3	4,8	5	7,9	13	20,6	30	47,6	12	19,0	3,68	Good
DUDI Cooperation (X6)	3	4,8	2	3,2	15	23,8	22	34,9	21	33,3	3,89	Good
Determination of Product/Service (X7)	1	1,6	3	4,8	7	11,1	21	33,3	31	49,2	4,24	Excellent
Average Indicator	3	**4**	4	**7**	11	**18**	25	**40**	20	**31**	**3,85**	**Good**
Average Planning Indicators (x)												

The description of the respondents' answers presented in Table 3, is known to have an average value (mean) obtained on the planning indicator of 3.85, which can be categorized as *Good*. Figure 1 illustrates the average percentage of indicators:

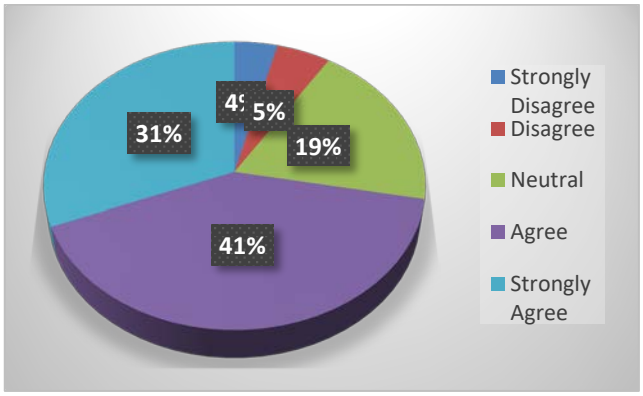

Figure 1. Planning percentage

Based on the above data on teaching factory learning planning, it shows that 31% of students choose Strongly Agree, 40% of students choose Agree, 18% of students choose Doubtful, 7% of students choose Disagree and 4% of students choose Strongly Disagree.

From the results obtained, there are 7 activity items in teaching factory learning planning that are implemented at SMK Negeri 3 Kendari, as stated in the interview results.

a. Teaching factory learning program:

According to Table 3, the average value (mean) obtained in the TeFa learning program indicator (X1) is 3.81, which can be categorized as Good. As the results of the interview with the informant stated that:*"Yes, the teaching factory program is implemented in this school, especially in the fashion department." (WU/WKS/W/04/11/2024)*

"Yes, there is, and this teaching factory learning has existed since 2017."(H/WW/W/05/11/2024)

The above statement is strengthened by the results of the observation of the learning program (MS/KJ/O/08/11/2024) which is listed in the documentation of the *teaching factory* learning guide and school accreditation which is rated B that is categorized as Good. It can be concluded that the teaching factory *learning program* already exists at SMK Negeri 3 Kendari and has been implemented well even though there are still shortcomings, especially in the facilities used, but the program is carried out in accordance with the standards and procedures applicable in the industry, therefore, it is hoped that with the activities that have been carried out well, students can improve their skills and competencies.

This is consistent with previous studies indicating that teaching factory learning is a product- or service-based learning concept in vocational schools that adheres to industry standards and procedures and is implemented in an industry-like environment [23].

b. Teaching factory learning guide:

One informant indicated that, to date, there is no specific guideline governing the implementation of the teaching factory. In the early stages of its implementation, teaching factory activities still relied on the 2013 Curriculum (K-13). However, although the curriculum has since shifted to the Independent Learning Curriculum, this policy transition has not been accompanied by the development of clear operational guidelines to support the implementation of the teaching factory within the new curriculum framework.

This situation reflects a significant gap between curriculum reform at the policy level and the availability of practical implementation guidelines at the institutional level.

"*Currently, we do not have a specific guideline. At the beginning of the teaching factory implementation, we still used the 2013 curriculum. Now the curriculum has changed to the independent learning curriculum, but guidelines for implementing the Teaching Factory under this new curriculum are not yet available." (SA/KUPW/04/11/2024)*

A similar concern was expressed by another informant, who emphasized that the transition from the revised K-13 curriculum to the Independent Learning Curriculum has not been followed by the development of structured teaching factory guidelines. This lack of guidance may create uncertainty in practice, as teachers are required to implement teaching factory without a clear pedagogical or operational framework aligned with the current curriculum.

"*There is still no specific guideline. The curriculum has changed from the revised K-13 to the independent learning curriculum, so for this new curriculum there is no teaching factory learning guideline yet." (HW/KPW/04/11/2024)*

The above statement is strengthened by the results of observations of *the teaching factory* learning guide (MS/KJ/O/11/11/2024) and the documentation of *the teaching factory* learning guide and school accreditation which is rated B as Good. It can be concluded that the teachers involved in *teaching factory* learning do not have *a teaching factory* learning guide, but the guide is owned and made by the head of the fashion department while implementing the *teaching factory learning guide* has been implemented properly and in accordance with the applicable curriculum in schools.

This is consistent with previous findings indicating that the teaching factory program integrates competency-based training (CBT) and production-based training (PBT), serving as a reference framework for designing and implementing learning activities that align with market and industry demands [24].

c. Preparation of learning program plans (RPP):

As presented in Table 3, the average value obtained in the indicator for the preparation of the learning program plan (RPP) (X3) is 3.94, which can be categorized as Good. As the results of the interview with the informant stated that:

"*We adjust it because the teaching factory we use here is about school uniforms, so we arrange it according to the practice of school uniforms, for teaching factory learning is related....." (SH/TT/W/04/11/2024).*

Another informant explained that the implementation of the teaching factory currently does not follow a specific teaching module. Previously, the learning process was guided by a lesson plan developed in 2016. However, as the curriculum and learning approach have evolved, the previous lesson plan is no longer considered fully relevant for supporting the current teaching factory practices.

"*We do not currently use a specific teaching factory module. Previously, the learning activities were guided by a lesson plan developed in 2016." (SU/GK/W/04/11/2024)*

The above statement is strengthened by the results of observations on the preparation of the RPP (MS/KJ/O/11/11/2024) and the documentation of the RPP and accreditation of schools that are rated B which are categorized as Good. It can be concluded that teachers in preparing RPP are quite good and in accordance with the curriculum that applies in the school, namely the independent curriculum and the teachers adopt the PJBL learning model where the learning model is more focused on students.

d. Human resources (HR) involved:

As indicated in Table 3, the average value (mean) obtained in the human resources (HR) indicator involved (X4) is 3.65 which can be categorized as Good. The results of the interview with the informant stated that:

"*Yes, it was prepared intelligently before the start of the teaching factory, some teachers were given internships, there were 5 interns out of a total of 10 teachers to improve the competence of the teachers....." (NM/WKE/W/04/11/2024)*

"*Yes, the school prepared it well where the teachers who will carry out this teaching factory learning were previously given training first....." (MKS/KS/W/04/11/2024)*

The above statement is strengthened by the results of the observation of the human resources (HR) involved (MS/KJ/O/11/11/2024) and documentation of the organizational structure and accreditation of schools that are rated B as Good. It can be concluded that the human resources involved in *teaching factory* learning are quite good and competent in their fields, because before implementing the program, teachers are given training first before going directly to teach students in *teaching factory learning*.

Previous guidelines highlight that effective human resource development in teaching factory implementation depends on a shared perception, mutual understanding, and collective commitment among all elements of the school, especially those directly involved [24].

e. Learning facilities and infrastructure:

As presented in Table 3, the mean value obtained in the learning facilities and infrastructure (X5) indicator is 3.68% which can be categorized as Good. As the results of the interview with the informant stated that:

"We use existing facilities." (MS/KJ/W/04/11/2024)

"Yes, and we use the facilities that already exist in the school which previously of course have been prepared according to the needs, before learning is carried out." (WU/WKS/W/04/11/2024)

The above statement is strengthened by the results of observation of learning facilities and infrastructure (HW/KP/O/11/11/2024) and documentation of facilities and infrastructure as well as accreditation of schools that are rated B as Good. It can be concluded that the facilities and infrastructure in the *teaching factory* learning are adequate, ranging from the tools and materials that students will use in the learning process to additional needs of students such as rulers to stationery that students can use in the practical process, so that students are more facilitated and active in learning.

This is in line with the statement [25], [26], [27], [28] that declares that in learning planning, it is necessary to have facilities and infrastructure that support the optimization of the achievement of these learning objectives.

Previous studies highlight the importance of providing appropriate facilities and infrastructure in learning planning to optimize the achievement of instructional objectives [25], [26], [27], [28].

f. School partnership with DUDI:

According to Table 3, the average value (mean) obtained in the partnership indicator with DUDI (X6) is 3.89% which can be categorized as Good. As the results of the interview with the informant stated that:

"Yes, we are working with the industry." (MKS/KS/W/04/11/2024).

One informant emphasized that collaboration with industry is an indispensable component in the implementation of the teaching factory. Such collaboration is not only intended to support learning activities but also serves as a critical mechanism for ensuring quality assurance. Through this partnership, industry actors are directly involved in reviewing, assessing, and validating whether the products and learning outcomes generated through the teaching factory align with real industrial standards, practices, and expectations. This involvement is particularly important to ensure that the competencies developed through the learning process remain relevant to the needs of the industrial sector.

Without strong industry engagement, the Teaching Factory risks losing its practical orientation and may fail to produce graduates whose skills meet current industry demands.

"Yes, establishing cooperation with industry is unavoidable because it is closely linked to quality assurance. Industry partners play a crucial role in reviewing and verifying whether the learning outcomes and products meet relevant industry standards." (HW/KK/W/06/11/2024)

The above statement is strengthened by the results of observations of the school's partnership with DUDI (MS/KJ/O/11/11/2024) and documentation of cooperation contracts with DUDI as well as the accreditation of schools that are ranked B which is categorized as Good. It can be concluded that the school and DUDI have collaborated very well, it is certainly an advantage for both parties such as the school in checking the quality assurance side requires the help of the industry and in terms of providing consumers and marketing the school also collaborates with the industry.

This is in line with the statement of the [29], [30], [31], [32] stating that schools must strive for and/or build strategic *partnerships*.

g. Determination of products/services produced by students:

As shown in Table 3, the average value (mean) obtained in the indicator of determining products/services produced by students (X7) is 4.24% which can be categorized as Very Good. As the results of the interview with the informant stated that:

"Yes, the product is determined based on strict quality considerations and relevant production standards to ensure that the outcomes are consistent with industry expectations and professional practices." (SA/KUP/W/04/11/2024)

"Usually, it is according to market needs, so it is determined what products will be produced." (HW/KP/W/04/11/2024)

The above statement is strengthened by the results of observations on the determination of products/services produced by students (SH/T/QC/O/08/11/2024) and documentation of student assessment sheets and school accreditation that is rated B which is categorized as Good. It can be concluded that teachers in *teaching factory learning* determine what products/services will be produced by students before the learning process takes place.

h. Organizing teaching factory learning in improving entrepreneurial competency in SMK Negeri 3 Kendari students:

The organization of teaching factory learning is an important step to ensure that the learning process runs efficiently and effectively, and supports the program's main goal, which is to prepare students with skills that are in line with industry needs.

After distributing questionnaires directly to students and conducting interviews with the vice principal for curriculum affairs, the head of the Fashion Department, and fashion educators involved in teaching factory learning, the data related to teaching factory learning organization indicators were obtained. The summary of respondents' perceptions is presented in Table 4.

Table 4. Respondent answers (teaching factory learning organizer indicators)

Item/indicator	Frequency (f) and Percentage (%)										Mean	Category
	STS (1)		TS (2)		RR (3)		S (4)		SS (5)			
	f	%	F	%	f	%	f	%	F	%	Items	
Learning Schedule (Y1)	3	4,8	1	1,6	9	14,3	27	42,9	23	36,5	4,05	Good
Organizational Structure & Jobdesk (Y2)	4	6,3	6	9,5	12	19,0	21	33,3	20	31,7	3,75	Good
Performance & Workflow SOP (Y3)	1	1,6	3	4,8	14	22,2	29	46,0	16	25,4	3,89	Good
Average Indicator	3	**4**	3	**5**	12	**19**	26	**41**	20	**31**	**3,89**	Good
Average Organizational Indicators (Y)												

The description of the respondents' answers presented in Table 4 is known to have an average value (mean) obtained on the organizing indicator of 3.89, which can be categorized as Good.

Based on the above data on teaching factory learning planning, it shows that 31% of students choose Strongly Agree, 41% of students choose Agree, 19% of students choose Doubtful, 5% of students choose Disagree and 5% of students choose Strongly Disagree.

From the results obtained, there are 3 activity items in organizing *teaching factory* learning that are applied at SMK Negeri 3 Kendari, as stated in the interview results that:

a. Teaching factory schedule:

Based on Table 4, the average value obtained in the teaching factory (Y1) schedule indicator is 4.05% which can be categorized as Good. As the results of the interview with the informant stated that:

"Yes, of course, teachers must prepare the schedule so that the learning is more scheduled and regular, of course." (MKS/KS/W/04/11/2024)

"Regarding curriculum scheduling, the learning process is organized through a bi-weekly block system. Under this arrangement, vocational subjects are grouped and scheduled on specific days, allowing students to concentrate on practical learning activities without interference from other academic subjects. This structure is intended to ensure a more focused and intensive implementation of vocational learning." (H/WKK/W/06/11/2024)

This statement is supported by observational data on the learning activity schedule (SH/TT/O/11/11/2024) and by documentation related to block scheduling, the utilization of studios and practice rooms, as well as the school's accreditation status, which is rated B (Good). The evidence shows that the fashion department implements a block-based learning schedule in teaching factory activities, with production lessons conducted during odd weeks and general learning activities scheduled in even weeks. This structured scheduling approach helps improve the efficiency and effectiveness of the learning process.

This is in line with the statement of the [33], [34], [35] stating that scheduling teaching and learning activities (schedule) means an effort to focus on optimizing resources (students, facilities and infrastructure, etc.) into something of efficient value.

b. Organizational structure and jobsdesk:

From Table 4, the mean value obtained in the organizational structure and jobdesk indicators (Y2) is 3.75% which can be categorized as Good. As the results of the interview with the informant stated that:

"In general, the teaching factory learning model is applied across the entire department. Nevertheless, there is currently no dedicated classroom or specialized learning space specifically designed to support the implementation of Teaching Factory activities." (MKS/KS/W/04/11/2024)

"The preparation of these materials is not undertaken by the teachers; rather, it is the responsibility of the head of the department, and the materials have already been developed and organized in the production room." (SU/GK/W/04/11/2024)

The above statement is strengthened by the results of observations of organizational structure & jobdesk (MS/KJ/O/11/11/2024) and documentation of organizational structure and accreditation of schools that are rated B as Good. It can be concluded that the fashion department makes an organizational structure and jobdesk in teaching factory learning well which of course can make learning take place more efficiently and effectively. In the fashion department itself, the department makes an organizational structure and jobdesk in accordance with the teacher's expertise so that in the implementation *of teaching factory learning* is of higher quality because it is supported by teachers who are experts in their respective fields.

This is in line with the statement of [36] denoting that the organizational structure explains how work tasks will be divided, grouped and coordinated formally.

c. Standard operating procedures (SOPs) for performance and workflow:

According to Table 4, the average value (mean) obtained in the performance and workflow SOP indicator (Y3) is 3.89% which can be categorized as Good. As the results of the interview with the informant stated that:

"Yes, it should be because teachers need to make performance SOPs and workflows to ensure that the implementation of the teaching factory runs well, effectively, and in accordance with learning objectives....." (MKS/KS/W/04/11/2024)

"Yes, of course, because the creation of performance SOPs and workflows is very necessary in the teaching factory because this activity is part of a curriculum that focuses on industrial work practices."(H/WKK/W/11/11/2024)

The above statement is strengthened by the results of the observation of the SOP for performance and work flow (SA/KUP/O/11/11/2024) and documentation of procedures for the use and accreditation of schools that are rated B which are categorized as Good. It can be concluded that the fashion department makes a good SOP, performance structure, and workflow in teaching factory learning, which of course can make learning take place more systematically and effectively.

This is in line with the statement of [37] saying that the SOP for each expertise program at vocational schools generally already exist, but not all vocational schools always attach guidelines to strategic places.

3.2 The Implementation of Teaching Factory Learning in Improving Entrepreneurial Competency in Students of SMK Negeri 3 Kendari

The implementation of teaching *factory learning* is the implementation stage of the planning that has been prepared. In the implementation of teaching *factory learning*, teachers of SMK Negeri 3 Kendari have implemented the learning in accordance with existing standards in the industry. The implementation of *teaching factory learning* is designed to integrate the theory learned in the classroom with real practice based on the standards of the business world and the industrial world (DUDI).After distributing questionnaires directly to students and conducting interviews with the vice principal for curriculum affairs, the head of the Fashion Department, and fashion teachers involved in teaching factory learning, data related to the implementation of teaching factory learning were obtained. A summary of respondents' perceptions is presented in Table 5.

Table 5. Respondents' answers to the implementation of teaching factory learning

Item/indicator	Frequency (f) and Percentage (%)										Mean	Category
	STS (1)		TS (2)		RR (3)		S (4)		SS (5)			
	F	%	f	%	f	%	F	%	F	%	Items	
Learning model (Z1)	3	4,8	6	9,5	3	4,8	27	42,9	24	38,1	4,00	Good
Adequate Practice Equipment (Z2)	3	4,8	3	4,8	6	9,5	22	34,9	29	46,0	4,13	Good
Involved HR (Z3)	4	6,3	5	7,9	7	11,1	16	25,4	31	49,2	4,03	Good
Practice Room Management (Z4)	2	3,2	3	4,8	7	11,1	29	46,0	22	34,9	4,05	Good
Engaging Industry (Z5)	3	4,8	5	7,9	7	11,1	34	54,0	14	22,2	3,81	Good
Producing the Right Products (Z6)	2	3,2	8	12,7	6	9,5	28	44,4	19	30,2	3,86	Good
Average Indicator	3	**5**	5	**8**	6	**9**	26	**41**	24	**37**	**3,98**	Good
Average Implementation Indicators (z)												

The description of the respondents' answers presented in Table 5 is known to have an average value (mean) obtained in the implementation indicator of 3.98 which can be categorized as Good. The average percentage distribution of the teaching factory learning implementation indicators is illustrated in Figure 2.

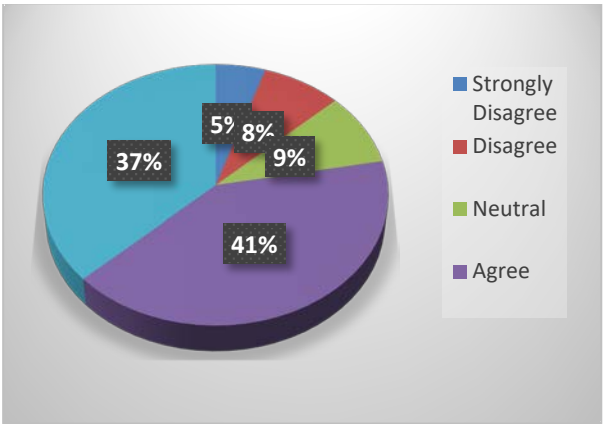

Figure 2. Implementation percentage

Based on the above data on the teaching setting, it shows that 37% of students choose Strongly Agree, 41% of students choose Agree, 9% of students choose Doubtful, 8% of students choose Disagree and 5% of students choose Strongly Disagree.

From the results obtained, there are 6 activity items in the implementation of *teaching factory* learning that are applied at SMK Negeri 3 Kendari, as stated in the interview results.

a. Student-friendly learning model:

From Table 5, the mean value obtained in the learning model indicator (Z1) is 4% which can be categorized as Good. As the results of the interview with the informant stated that:

"Yes, the learning model used in the teaching factory is in accordance with the demands of the independent curriculum, namely the learning model used by PJBL which is product-centered." (SH/IT/W/11/11/2024)

One student explained that the teaching factory learning approach provides opportunities to engage directly in production and entrepreneurial activities. This experiential learning process enables students to develop practical skills and entrepreneurial confidence, as they are actively involved in producing, marketing, and selling their own products.

"Yes, the learning approach used by the teacher is highly relevant to our learning needs. Through direct involvement in production activities and project-based tasks, such as creating our own products, marketing them, and selling them, we are exposed to real entrepreneurial practices, which significantly strengthens our confidence and readiness to start a business." (BMS/S/W/04/11/2024)

The above statement is strengthened by the results of observation of learning models that are suitable for students (MS/KJ/O/11/11/2024) and documentation of RPP/modules and accreditation of schools that are rated B which are categorized as Good. It can be concluded that in the implementation of teaching *factory* teacher learning using the PJBL (Project Based Learning) learning model, this is in line with the curriculum used by the school, namely the independent curriculum where this curriculum requires students to be more active in the classroom compared to teachers.

This is in line with the statement of [38] stating that the Independent Curriculum bases its approach on an educational paradigm that is more contextual, inclusive, and student-centered.

b. Adequate practical equipment:

As shown in Table 5, the mean value obtained on the indicator of adequate practical equipment (Z2) is 4.13% which can be categorized as Good. As the results of the interview with the informant stated that:

"Yes, this is adequate according to the situation and existing conditions." (SH/TT/W/04/11/2024)

"Yes, Alhamdulillah, the tools we use here such as sewing machines are quite adequate." (SA/KUP/W/11/11/2024)

"Based on my observation in the fashion department, the learning process has been constrained by technical problems with the fabric cutting machine. As a temporary response, they have attempted to address the issue through provisional solutions." (WU/WKS/W/06/11/2024)

The above statement is strengthened by the results of observation of adequate practical equipment (MS/KJ/O/11/11/2024) and documentation of facilities and infrastructure as well as accreditation of schools that are rated B as Good. It can be concluded that the practical equipment in the implementation of *teaching factory* learning is quite adequate such as sewing machines, threads, fabrics, scissors, bars, etc. However, there is a slight shortage in the fabric cutting machine where the machine is lacking in terms of quantity but this of course is still being tried by the school so that the shortage can be fulfilled properly.

This is in line with the statement [39] that stated that the conditioning of practice rooms and environments is prioritized/focused on the arrangement of existing school facilities.

c. HR involved:

As shown in Table 5, the average value (mean) obtained in the HR indicator involved (Z3) is 4.03 which can be categorized as Good. As the results of the interview with the informant stated that:

"Teachers and students involved in industry." (SH/TT/W/04/11/2024)

"There are DUDI, students, and teachers and alumni as well." (HW/KP/W/04/11/2024)

"For those involved in this teaching factory, there are teachers, industry, students and alumni." (SA/KUP/W/11/11/2024)

The above statement is strengthened by the results of observations of the human resources involved (MS/KJ/O/11/11/2024) and documentation of organizational structure and accreditation of schools that are rated B as Good. It can be concluded that the human resources involved in the implementation *of teaching factory* learning are teachers, industry, students and alumni.

This is in line with the statement [39] that states that TeFa learning applies industrial work culture to students in the practical learning process, carried out through the assistance of teachers and/or partner industry elements.

d. Practice room management:

According to Table 5, the average value (mean) obtained in the practice room management indicator (Z4) is 4.05 which can be categorized as Good. As the results of the interview with the informant stated that:

"Yes, for example, the availability of rooms is still limited. A single room cannot be used simultaneously by two different groups, which means the learning activities must be scheduled alternately. This limitation often creates difficulties in organizing practical learning sessions effectively." (SH/TT/W/04/11/2024)

"Yes, the distribution is based on the day because if it is not adjusted to the day and schedule at the time of practice, it will accumulate students because the machine is inadequate and insufficient for the number of students." (HW/KP/W/04/11/2024)

The above statement is reinforced by the results of the observation of the practice room management (MS/KJ/O/11/11/2024) and the documentation of the block schedule and schedule for the use of the studio as well as the accreditation of schools that are rated B as Good. It can be concluded that the management of the practice room in the implementation of *teaching factory learning* is carried out very well. The department has arranged the use of the room so that the teachers who teach do not collide with each other, and the students who use the room must also be divided because the number of students with the number of existing equipment is not balanced.

This aligns with [40], which emphasizes the importance of managing practice rooms and workshops based on industry standards and procedural references.

e. Engaging industry relationships:

As indicated in Table 5, the average value obtained in the indicator involving industrial relations (Z5) is 3.81% which can be categorized as Good. As the results of the interview with the informant stated that:

"In terms of industrial outcomes, we attempt to align our practices with those found in industry. Elements of industrial culture, such as discipline, responsibility, and adherence to work procedures are emphasized in the learning process. However, only certain aspects of the industrial work system can be implemented, as the school environment cannot fully replicate the operational complexity and working conditions of real industrial settings." (SH/TT/W/04/11/2024)

"Yes, we often make the product seen as a product from the industry, namely previous interns, so at the time of the next year we make it according to the results of their reports." (HW/KP/W/04/11/2024)

The above statement is strengthened by the results of observations involving industrial relations (MS/KJ/O/11/11/2024) and documentation of DUDI cooperation contracts and accreditation of schools that are rated B as Good. It can be concluded that in the implementation of *teaching factory* learning, the school collaborates with the industry, because the teaching *factory learning* concept is learning that combines the learning process at school with real practices in the industrial world.

This is in line with the statement of the [40] which states that in the educational process at vocational schools, the involvement of DUDI in the learning process is very important, because the development of technology and production procedures/processes/services is very rapid.

f. Produce products that suit your needs:

As presented in Table 5, the average value (mean) obtained in the indicator of producing a suitable product (Z6) is 3.86 which can be categorized as Good. As the results of the interview with the informant stated that:

"Yes, the products developed in the teaching factory are determined based on market demand. In practice, different schemes are applied, including collaboration with companies and a needs-based production system that responds to real market requirements. For instance, the production of school uniforms is designed according to market demand because the products are intended to be marketed commercially. This approach ensures that the learning activities remain closely connected to real market dynamics rather than purely academic exercises." (SH/TT/W/04/11/2024)

"Yes, that's also one of the concepts of tefa learning because we want to produce goods or services so that the goods or services, we produce must be really in accordance with....." (H/WKK/W/06/11/2024)

The above statement is strengthened by the results of observations producing products that are in accordance with needs (MS/KJ/O/11/11/2024) and documentation of student assessment sheets and school accreditation that is rated B, which is categorized as Good. It can be concluded that in the implementation of *teaching factory learning*, students produce goods according to what has been determined by the teacher. The teacher determines what goods are produced according to customer demand and sees the needs that exist in the market.

This is in line with the statement [41] that states that the products (goods/services) produced in the learning model *teaching factory* must be able to function as a medium of introduction to competence, and not just the result of practice or utilization of laboratory or workshop equipment.

3.3 Evaluation of Teaching Factory Learning in Improving Entrepreneurial Competence in SMK Negeri 3 Kendari Students

Evaluation in *teaching factory learning* is a very important process to measure the effectiveness of learning, the quality of the products produced, and the development of student competencies. This evaluation must cover various aspects, both in terms of the learning process and the final results achieved.

After distributing questionnaires to the vice principal for curriculum affairs, teachers of SMK Negeri 3 Kendari, and students, as well as conducting interviews with the vice principal for curriculum affairs, the head of the Fashion Department, and fashion teachers involved in Teaching Factory learning, data related to the evaluation of Teaching Factory learning were obtained. A summary of respondents' perceptions is presented in Table 6.

Table 6. Respondent answers of teaching factory learning evaluation indicators

Item/indicator	Frequency (f) and Percentage (%)										Mean	Category
	STS (1)		TS (2)		RR (3)		S (4)		SS (5)			
	f	%	f	%	f	%	f	%	F	%	Items	
Student-produced products (A1)	1	1,6	4	6,3	11	17,5	26	41,3	21	33,3	3,98	Good
Student behavior (A2)	3	4,8	6	9,5	13	20,6	25	39,7	16	25,4	3,71	Good
Regularity of procedures of TeFa learning (A3)	2	3,2	8	12,7	9	14,3	28	44,4	16	25,4	3,76	Good
Average Indicator	2	**3**	6	**10**	11	**17**	26	**42**	18	**28**	**3,81**	**Good**
Average Evaluation Indicator (a)												

The respondents' answers presented in Table 6 are known to have an average value (mean) obtained on the evaluation indicator of 3.81% which can be categorized as Good. The diagram below illustrates the average percentage of indicators:

Based on the results of the teaching factory learning evaluation, the distribution of students' responses across the agreement categories is illustrated in Figure 3.

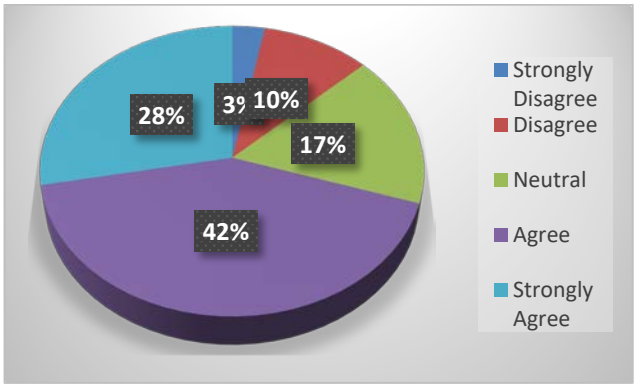

Figure 3. Evaluation percentage

From the results obtained, there are 3 activity items in the evaluation of *teaching factory* learning that are applied at SMK Negeri 3 Kendari, as stated in the interview results that:

a. Student-produced products:

As shown in Table 6, the average value obtained in the student-produced product indicator (A1) is 3.98% which can be categorized as Good. As the results of the interview with the informant stated that:

"Yes, one of the things we assess in the evaluation of TeFa learning is by looking at the products produced by students, because the results of the products certainly reflect the skills they learned....." (SA/KUP/W/04/11/2024)

"Yes, of course, the products produced by students are indeed one of the important indicators in learning evaluation....." (SU/GK/W/04/11/2024)

The above statement is strengthened by the results of observation of student-produced products (MS/KJ/O/11/11/2024) and documentation of student assessment sheets and school accreditation that is rated B as Good. It can be concluded that the products produced by students are an important indicator in the evaluation of *teaching factory* learning because it reflects the ability of students to apply the skills that have been learned. The quality of the resulting product shows how well students can follow procedures, manage time, and use their creativity and technical skills.

This is in line with the statement of [42] stating that evaluation is a process that determines the extent to which goals can be achieved by providing information for decision-making. One of the program evaluation models is CIPP (context, input, process, product). Teaching factory *products* are used as a tangible manifestation of practice-based learning to evaluate students' success in applying theory into real practice.

b. Student behavior:

As presented in Table 6, the average score obtained on the student behavior indicator (A2) is 3.71% which can be categorized as Good. As the results of the interview with the informant stated that:

"Yes, in the final assessment, of course, student behavior during learning is one of the aspects that we pay attention to. Because it concerns how the responsibility of students is, ..." (SH/TT/W/04/11/2024)

"Yes, in the evaluation, of course, we look at student behavior during learning because this teaching factory learning not only teaches technical skills, but also shapes students' character." (HW/KP/W/04/11/2024)

The above statement is strengthened by the results of the observation of student behavior evaluation (MS/KJ/O/11/11/2024) and documentation of student assessment sheets and school accreditation that is rated B as Good. It can be concluded that in the evaluation of assessment learning carried out by teachers, one of them is by looking at student behavior. Teachers assess that student behavior, such as discipline, ability to collaborate, initiative, responsibility, and good communication skills.

This is in line with the statement of [43] stating that the evaluation of the implementation of *the teaching factory* does not only look at the results of the product, but also the behavior of students in interacting, collaborating, and applying the skills acquired during learning.

c. Regularity of procedures in the implementation of teaching factory learning:

As presented in Table 6, the average value obtained in the indicator of procedural regularity in the implementation of *teaching factory* learning (A3) is 3.76% which can be categorized as Good. As the results of the interview with the informant stated that:

"Yes, the evaluation of teaching factory learning is carried out by looking at the regularity of the procedure, the regularity of this procedure is very important because students need to understand the stages of work....." (HW/KP/W/04/11/2024)

"Yes, according to the mother, the regularity of the procedure is an important part of the evaluation, in that assessment we assess whether the student is able to understand the purpose of each step in the procedure....." (SH/TT/W/04/11/2024)

The above statement is strengthened by the results of observation of procedures in the implementation of *teaching factory learning* (MS/KJ/O/11/11/2024) and documentation of procedures for the use and accreditation of schools that are rated B which are categorized as Good. It can be concluded that in the evaluation of assessment learning carried out by teachers, it is by looking at the regularity of procedures in the implementation of *teaching factory learning***.** Regularity of procedures in the implementation of *teaching factory learning* is very important to ensure that students can follow the correct stages in accordance with industry standards.

This is in line with [12] statement that the regularity of procedures in the implementation of *teaching factory learning* is very important to ensure that students can follow the work steps that have been determined, as well as comply with the SOPs that apply in the industry.

4 Discussion

The findings of this study demonstrate that the management of TeFa learning encompassing planning, organization, implementation, and evaluation plays a pivotal role in fostering entrepreneurial competence among vocational students. This aligns with previous research showing that structured TeFa programs bridge the persistent gap between theoretical learning and industrial practice, enhancing employability and entrepreneurial mindset [44]. The novelty of this study lies in its contextual application within the fashion design program, where management efficiency and industry collaboration become determining factors in students' business readiness.

Effective planning in TeFa learning reflects a systematic alignment of curriculum, facilities, and human resources. Similar patterns were observed by [45], who found that strategic scheduling and clear job divisions were instrumental in improving students' entrepreneurial competencies. Moreover, curriculum design integrating industry participation ensures that students experience authentic production processes, a model that strengthens vocational relevance [46].

Organizational management is another critical factor underpinning the success of TeFa implementation. The establishment of SOPs, transparent job descriptions, and efficient resource allocation facilitate a learning environment akin to industrial operations. Similar approaches have been emphasized by [47], who highlighted that strong managerial systems in vocational schools foster professionalism, teamwork, and entrepreneurship skills essential for sustainable education outcomes.

The implementation of TeFa learning at SMK Negeri 3 Kendari was characterized by the use of PjBL aligned with the Independent Curriculum. This finding corroborates the research of [48], who found that innovative models combining TeFa with flipped classrooms and knowledge management systems significantly enhanced students' 21st-century competencies. This integration of digital and experiential learning supports the sustainability of vocational education in the era of Industry 4.0.

Industrial collaboration emerged as a cornerstone of TeFa success, ensuring relevance between school-based production and market needs. Research by [49] and [50] reaffirmed that partnerships with industries create authentic production opportunities, while fostering student independence, creativity, and entrepreneurship through exposure to real-world challenges.

These collaborations ensure the sustainability and scalability of school-industry linkages.

The development of entrepreneurial competence in this study reflects the synergy between experiential learning and entrepreneurial education, as evidenced by [51], who found that entrepreneurial education combined with TeFa learning strengthens entrepreneurial intentions. However, they also highlighted that insufficient management or motivation could hinder full transformation supporting the importance of consistent supervision and reflective evaluation observed in this study.

Despite the success in integrating production-based learning, this research also revealed that limited infrastructure and equipment still constrain the optimization of TeFa outcomes. Similar challenges were identified by [52], who emphasized that inadequate facilities slow down industrial-standard learning, widening the skill gap between students and industry requirements. Therefore, investment in infrastructure and technology becomes a fundamental policy implication for improving learning quality and industry relevance.

The evaluation process within TeFa learning emphasizes not only technical output but also character formation, such as discipline, teamwork, and responsibility. This aligns with findings by [53], who discovered that empathy and responsibility are crucial behavioral factors influencing customer satisfaction in TeFa contexts. Such affective competencies are indispensable for nurturing sustainable entrepreneurial values beyond mere technical ability.

Globally, the learning factory concept has been adapted to diverse educational systems, underscoring its flexibility and relevance. In Denmark, for example, the model was successfully localized to accommodate technological integration and digital tools in vocational education [54]. Similarly, the systematic review by [55] confirmed that various TeFa innovations significantly enhance student motivation, industrial partnership, and curriculum modernization across multiple countries.

Finally, the study's findings confirm that well-managed teaching factory systems contribute not only to entrepreneurial competence but also to students' work readiness and lifelong learning potential. This observation is consistent with [56], who found that TeFa implementation increased vocational students' readiness and independence by up to 57%. These outcomes emphasize the critical role of integrated management, stakeholder collaboration, and contextual innovation in sustaining vocational education relevance.

5 Conclusion

This study comprehensively examined the management of TeFa learning in enhancing the entrepreneurial competence of Fashion Design students at SMK Negeri 3 Kendari. The results showed that all four management components planning, organizing, implementation, and evaluation were categorized as Good, with overall mean scores ranging from 3.81 to 3.98 on a five-point scale. These findings indicate that the institution has implemented Teaching Factory learning effectively, reflecting a strong alignment between classroom learning and industrial practices.

The planning component achieved an average score of *3.85*, demonstrating that the school had successfully developed a structured learning plan that included the preparation of TeFa learning programs, guides, lesson plans, and collaboration with industry partners (DUDI). The highest indicator in this category was the determination of student-produced products and services, which obtained a mean score of *4.24*, categorized as Excellent. This result reflects that learning activities have been well aligned with industrial standards and market needs. The organizing component, with an average score of *3.89*, shows that the implementation of structured learning schedules, clear organizational hierarchies, and SOPs has significantly improved coordination and efficiency in the learning process.

The implementation aspect recorded the highest mean score of *3.98*, indicating that Teaching Factory learning was conducted effectively. The indicators with the strongest performance were adequate practice facilities and well-managed practice rooms, supported by competent human resources and industry collaboration. Despite this positive outcome, there remain minor challenges related to limited facilities, particularly the shortage of large-scale fabric cutting machines. Meanwhile, the evaluation aspect achieved an average score of 3.81, categorized as Good, showing that the evaluation process had been carried out systematically through the assessment of student-produced products, student behavior, and adherence to procedural standards. Overall, the mean score across all management indicators was 3.88, confirming that the Teaching Factory learning management at SMK Negeri 3 Kendari was effectively implemented.

These findings highlight that Teaching Factory management has succeeded in bridging the gap between theoretical instruction and industrial practice, thus fostering students' entrepreneurial readiness.

The novelty of this research lies in its comprehensive assessment of TeFa learning management within the specific context of the fashion design discipline and area that remains underexplored in previous studies.

The integration of Project-Based Learning (PJBL) models, collaboration with DUDI, and real production environments has created a dynamic and industry-relevant learning ecosystem that enhances both technical and entrepreneurial competencies.

Based on the findings, it is recommended that schools continuously improve infrastructure by increasing the availability of production tools, especially fabric-cutting machines, to achieve a 1:1 student-equipment ratio. The development of a standardized teaching factory learning guide aligned with the Independent Curriculum is also necessary to ensure uniformity and quality in implementation. Teachers should regularly participate in professional development and industry internship programs to ensure that teaching practices remain relevant to evolving industrial standards. Strengthening collaboration with DUDI partners will further enrich students' industrial exposure and improve the market relevance of learning outcomes. Moreover, it is important to develop an integrated evaluation framework that not only assesses technical skills but also entrepreneurial creativity, teamwork, and business acumen.

For future research, it is suggested that comparative studies be conducted across different vocational disciplines to identify the most effective management models in enhancing entrepreneurial competence. Longitudinal and experimental studies could also be employed to examine the long-term impact of teaching factory management on graduate employability and entrepreneurial success. Additionally, future researchers should consider integrating digital-based Teaching Factory models, such as virtual or simulation-based factories, to improve scalability and adaptability in vocational education.

In conclusion, the teaching factory learning management implemented at *SMK Negeri 3 Kendari* demonstrates a robust and effective model that connects vocational education with real industrial demands. Continuous improvement in infrastructure, instructional guidance, and industry collaboration will be essential to sustain and enhance this program. Strengthening these aspects will ensure that vocational schools not only produce technically skilled graduates but also cultivate innovative and resilient young entrepreneurs who are ready to compete in the global workforce.

Acknowledgements

This research was financially supported by the Directorate of Vocational Education Development, Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia under the Vocational Education Quality Improvement Program (Grant No. 042.06/2024).

References:

[1]. Finch, C. R., & Crunkilton, J. R. (1999). *Curriculum development in vocational and technical education: Planning, content, and implementation*. Allyn and Bacon.

[2]. Antony, R., Subari, A. J., & Mulyatno, C. B. (2023). Teaching factory learning management in developing entrepreneurial spirit in students: The study of SMK Muhammadiyah Gamping Yogyakarta. *Jurnal Inovasi Pendidikan Dan Teknologi Informasi (JIPTI)*, *4*(2), 163-174. Doi: 10.52060/pti.v4i2.1409

[3]. Dombrowski, U., Wullbrandt, J., & Reimer, A. (2017). Lean stress sensitization in learning factories. *Procedia manufacturing*, *9*, 339-346. Doi: 10.1016/j.promfg.2017.04.016

[4]. Kinkel, S., Schemmann, B., & Lichtner, R. (2017). Critical competencies for the innovativeness of value creation champions: Identifying challenges and work-integrated solutions. *Procedia Manufacturing*, *9*, 323-330.

[5]. Widiatna, A. D. (2019). Four pillar teaching factory: a teaching and learning management model in technical and vocational senior high school. *Padang international conference on educational management and administration (PICEMA 2018)*, 61-66. Atlantis Press.

[6]. Nadira, N., & Kamaruddin, S. A. (2024). Pengaruh penerapan teaching factory untuk meningkatkan kompetensi dan jiwa kewirausahaan siswa SMKN 10 Luwu. *Jurnal Ilmiah Manajemen Dan Kewirausahaan (JIMAK)*, *3*(1), 28-34.

[7]. Büth, L., et al. (2017). Bridging the qualification gap between academia and industry in India. *Procedia Manufacturing*, *9*, 275-282. Doi: 10.1016/j.promfg.2017.04.009

[8]. Ogorodnyk, O., Granheim, M. V., & Holtskog, H. (2016). Preconditions for learning factory a case study. *Procedia CIRP*, *54*, 35-40.

[9]. Fagerholm, F., Oza, N., & Munch, J. (2013). A platform for teaching applied distributed software development: The ongoing journey of the Helsinki software factory. *2013 3rd International Workshop on Collaborative Teaching of Globally Distributed Software Development, CTGDSD 2013 - Proceedings*, 1–5. Doi: 10.1109/CTGDSD.2013.6635237

[10]. Baskoro, F., et al. (2022). Teaching Factory Management in the Edutel Sector at SMK Negeri 1 Surabaya. *Proceeding Series of International Conference on Arts and Humanities*, *2*, 93–99.

[11]. Lamancusa, J. S., et al. (2008). 2006 Bernard M. Gordon Prize Lecture: The Learning Factory: Industry-Partnered Active Learning. *Journal of engineering education*, *97*(1), 5-11. Doi: 10.1002/j.2168-9830.2008.tb00949.x

[12]. Amar, A. F., Hidayat, D., & Suherman, A. (2015). Penerapan Model Pembelajaran Teaching Factory 6 Langkah (TF-6M). *Journal of Mechanical Engineering Education*, *2*(2), 189–198.

[13]. Kasali, R., et al. (2010). *Modul kewirausahaan untuk program strata 1*. PT. Mizan Publika.

[14]. Hadlock, H., et al. (2008). From Practice to Entrepreneurship: Rethinking the Learning Factory Approach. *Proceedings of The 2008 IAJC IJME International Conference*, 231.

[15]. Izurieta, C., & Gunderson-Izurieta, S. (2018). An Experiential Report on Using a Software Factory in a Rural State to Promote Entrepreneurship. *2018 IEEE Technology and Engineering Management Conference, (TEMSCON), 1-6*. Doi: 10.1109/TEMSCON.2018.8488398

[16]. Trisnantari, H. E., Mutohar, P. M., & Subiyantoro, S. (2015). Manajemen pembelajaran berbasis kompetensi dan karakter bangsa: Strategi implementasi kurikulum 2013. *Tulungagung: Penerbit Cahaya Abadi*.

[17]. Miladiah, S. S., Syaodih, C., & Permadi, D. (2021). Manajemen pembelajaran teaching factory dalam meningkatkan kompetensi lulusan SMK Negeri 3 dan SMK Negeri 15 di Kota Bandung. *PeTeKa*, *4*(3), 441-454.

[18]. Muhitasari, R. (2019). Manajemen Pembelajaran Teaching Factory untuk Meningkatkan Kompetensi Berwirausaha Siswa SMK. *Prosiding Seminar, 28.*

[19]. Sugiyono. (2020). *Metodologi Penelitian Kuantitatif, Kualitatif dan R&D*. Alfabeta.

[20]. Martawijaya, D. H. (2012). Developing a teaching factory learning model to improve production competencies among mechanical engineering students in a vocational senior high school. *Journal of Technical Education and Training*, *4*(2).

[21]. Mourtzis, D., Panopoulos, N., & Angelopoulos, J. (2023). A hybrid teaching factory model towards personalized education 4.0. *International Journal of Computer Integrated Manufacturing*, *36*(12), 1739-1759.

[22]. Tisch, M., et al. (2016). Learning factory design: a competency-oriented approach integrating three design levels. *International journal of computer integrated manufacturing*, *29*(12), 1355-1375.

[23]. Pratantia, N. D., & Nasution, Y. (2023). Analisis Pengaruh Digitalisasi Dan Kepemimpinan Transformasional Terhadap Kepuasan Kerja Yang Dimediasi Otonomi Kerja. *Journal of Syntax Literate*, *8*(9).

[24]. Hendra, A. A. U., Jaedun, A., & Prihadi, W. R. (2020). Pola pembelajaran teaching factory pada program keahlian teknik furnitur di SMK Negeri 1 Purworejo. *Jurnal Pendidikan Teknik Sipil*, *2*(2), 124-138. Doi: 10.21831/jpts.v2i2.36347

[25]. Skerker, J. B., et al. (2023). Quantifying the value of learning for flexible water infrastructure planning. *Water Resources Research*, *59*(6), e2022WR034412.

[26]. de Groot, B., Leendertse, W., & Arts, J. (2024). Collective learning in project-oriented organisations in infrastructure planning: Interaction for adaptation. *Public Works Management & Policy*, *29*(3), 415-445.

[27]. De Groot, B., Leendertse, W., & Arts, J. (2020). Building adaptive capacity through learning in project-oriented organisations in infrastructure planning. *Urban Planning*, *5*(1), 33-45.

[28]. Yeo, K. T. (1995). Planning and learning in major infrastructure development: systems perspectives. *International Journal of Project Management*, *13*(5), 287-293.

[29]. FitzGerald, A. M., & Quiñones, S. (2019). Working in and with community: Leading for partnerships in a community school. *Leadership and Policy in Schools*, *18*(4), 511-532.

[30]. Wohlstetter, P., Smith, J., & Malloy, C. L. (2005). Strategic alliances in action: Toward a theory of evolution. *Policy Studies Journal*, *33*(3), 419-442.

[31]. Tschannen-Moran, M., et al. (2000). Creating smarter schools through collaboration. *Journal of Educational Administration*, *38*(3), 247-272.

[32]. Frølund, L., Murray, F., & Riedel, M. (2018). Developing successful strategic partnerships with universities. *MIT Sloan management review*, *59*(2), 71-79.

[33]. Xu, Y., et al. (2015). An effective teaching–learning-based optimization algorithm for the flexible job-shop scheduling problem with fuzzy processing time. *Neurocomputing*, *148*, 260-268.

[34]. Zheng, H. Y., Wang, L., & Zheng, X. L. (2017). Teaching–learning-based optimization algorithm for multi-skill resource constrained project scheduling problem. *Soft Computing*, *21*(6), 1537-1548.

[35]. Lei, D., Gao, L., & Zheng, Y. (2017). A novel teaching-learning-based optimization algorithm for energy-efficient scheduling in hybrid flow shop. *IEEE Transactions on Engineering Management*, *65*(2), 330-340.

[36]. Hakim, A. N., et al. (2022). Peran struktur organisasi terhadap produktivitas perusahaan pada CV. Kreasi Mandiri. *Jurnal Peradaban Masyarakat*, *2*(3), 69-72. Doi: 10.55182/jpm.v2i2.162

[37]. Sudiyono, S. S. (2019). Teaching factory sebagai upaya peningkatan mutu lulusan di SMK. *Jurnal Penelitian Kebijakan Pendidikan*, *12*(2), 159-181. Doi: 10.24832/jpkp.v12i2.271

[38]. Tuerah, R. M., & Tuerah, J. M. (2023). Kurikulum merdeka dalam perspektif kajian teori: Analisis kebijakan untuk peningkatan kualitas pembelajaran di sekolah. *Jurnal Ilmiah Wahana Pendidikan*, *9*(19), 979-988. Doi: 10.5281/zenodo.10047903

[39]. Mavrikios, D., Georgoulias, K., & Chryssolouris, G. (2018). The teaching factory paradigm: Developments and outlook. *Procedia Manufacturing*, *23*, 1-6. Doi: 10.1016/j.promfg.2018.04.029

[40]. Direktorat Jenderal Pendidikan Vokasi. (2022). *Panduan penyelenggaraan teaching factory (TEFA) di SMK*. Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi Republik Indonesia.

[41]. Wahjusaputri, S., et al. (2024). Development of artificial intelligence-based teaching factory in vocational high schools in Central Java Province. *Journal of Education and Learning (EduLearn)*, *18*(4), 1234-1245. Doi: 10.11591/edulearn.v18i4.21422

[42]. Yoto, Y., et al. (2024). Evaluation of teaching factory using CIPP (Context, Input, Process, Product) model to improve vocational high school students' skills. *Jurnal Pendidikan Vokasi*, *14*(1), 12-28. Doi: 10.21831/jpv.v14i1.62573

[43]. Fajaryati, N. (2012). Evaluasi pelaksanaan teaching factory SMK di Surakarta. *Jurnal Pendidikan Vokasi*, *2*(3), 325-337. Doi: 10.21831/jpv.v2i3.1040

[44]. Iliani, A. I., et al. (2022). Entrepreneurship development based on teaching factory in fashion design skill program at vocational high school. *Teknologi Dan Kejuruan: Jurnal Teknologi, Kejuruan, Dan Pengajarannya*, *45*, 168-173. Doi: 10.17977/um031v45i22022p168-173

[45]. Puspita, D. A., Muchlas, M., & Kuat, T. (2020). The implementation of teaching factory to improve student interest in entrepreneurship at multimedia competencies. *Journal of Technology and Humanities*, *1*(2), 42-50. Doi: 10.53797/jthkkss.v1i2.5.2020

[46]. Diwangkoro, E., & Soenarto, S. (2020). Development of teaching factory learning models in vocational schools. *Journal of Physics: Conference Series*, *1456*(1), 012046. Doi: 10.1088/1742-6596/1456/1/012046

[47]. Rejeki, M. E. S., & Kuat, T. (2023). Teaching factory implementation to grow the entrepreneurship character of vocational school students. *Journal of Vocational Education Studies*, *6*(1), 52-61. Doi: 10.12928/joves.v6i1.8094

[48]. Vitriani, V., et al. (2023). Teaching factory model using flipped classroom and knowledge management system based in improving 21st century competencies in vocational high schools. *Al-Ishlah: Jurnal Pendidikan*, *15*(2), 1347-1356. Doi: 10.35445/alishlah.v15i2.3785

[49]. Heriyati, P., Yunus, U., Ariestyani, A., & Ubaidillah, U. (2023). Teaching Factory as a Competency-Based Learning Program for Vocational High School. *Proceedings of the 5th International Conference on Vocational Education and Technology (IConVET 2022)*.

[50]. Junaedi, E., Setyaningsih, S., & Suhardi, E. (2024). Implementation Of The Teaching Factory Learning Model In Improving Students' Competence At State Vocational High School 1 Pacet. *Lencana: Jurnal Inovasi Ilmu Pendidikan*, *2*(4), 57-69. Doi: 10.55606/lencana.v2i4.4039

[51]. Fatmawati, K., Kusdiyanti, H., & Sumarsono, H. (2023). The effect of entrepreneurial education and experiential learning on entrepreneurial intention mediated by teaching factory (TEFA). *International Education Trend Issues*, *1*(2), 285-301. Doi: 10.56442/ieti.v1i3.287

[52]. Mukhidin, M., & Mupita, J. (2018). Bridging the skills gap through teaching factory (TEFA). *International Conference on Indonesian Technical Vocational Education and Association (APTEKINDO 2018)*, 218-221.

[53]. Sudrajat, A., & Setiawan, A. (2025). Pengaruh Kepemimpinan Transformasional Dan Kompetensi Pegawai Terhadap Kualitas Pelayanan Publik Pada Dinas Kependudukan Dan Pencacatan Sipil Kabupaten Sumedang. *Jurnal Tata Kelola dan Kebijakan Publik*, *1*(1).

[54]. Lindvig, K., & Mathiasen, H. (2020). Translating the learning factory model to a Danish vocational education setting. *Procedia manufacturing*, *45*, 90-95.

[55]. Muslim, S. (2019). The implementation teaching factory and implications on the preparation of candidates for vocational high school teachers. *Humanities & Social Sciences Reviews*, *7*(3), 323-330. Doi:10.18510/hssr.2019.7348

[56]. Anggitan, T. (2025). Mediation Effect of Teaching Factory Implementation on Student Work Readiness with Individual Readiness to Change. *Jurnal Pedagogi dan Pembelajaran*, *8*(1), 144-154. Doi: 10.23887/jp2.v8i1.84534