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Evaluation of teaching factory using CIPP (Context, Input, Process, Product) model to improve vocational high school students' skills

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ABSTRACT

Teaching Factory (TEFA) is a program that provides a real learning experience for students. Students are taught simulation of job sheet practice, management, marketing, and entrepreneurship. This research examines the feasibility of teaching factories regarding context, input, process, and product. This research uses mixed methods, namely qualitative research supported by descriptive quantitative data. The research was conducted in vocational high schools in East Java Province, Indonesia. The population of this research used a sample size based on the empirical formula from Isaac and Michael. The results showed that: (1) Based on the context, the teaching factory follows the vision and mission of the school and the demand from the community, business, and industry. Production planning achieved a score of 2.825 with a good category, based on the learning questionnaire; (2) Teaching factory learning in VHSs is appropriate in terms of the readiness of buildings and teachers by VHSs, the completeness of facilities, and the readiness of students in attitudes and competencies to get a score of 2.855 with a good category; (3) Based on the process, the learning is appropriate in terms of workshop layout, student activities, product quality control, and practical activities getting a score of 2.825 with a good category; and (4) The evaluation results, concluded that the learning is appropriate in terms of workshop layout, student activities, product quality control, and practical activities getting a score of 2.855 with a good category. The results of this evaluation study can be used to contribute to developing and improving existing programs to make them better.

INTRODUCTION

Indonesia is currently facing free competition from the ASEAN Economic Community (AEC) (Awwallin, 2015; Warsono, 2017), which is marked by a flood of foreign labor competing for the local labor market (Henry, 2006). On the other hand, technological developments in the 21st century have led to automation in all fields of work, especially in vocational education. Incorporating technology into the physical, digital, and biological worlds will fundamentally change human interactions and life patterns (Sidik et al., 2019; Tjandrawinata, 2016). Therefore, policymakers in the 21st century need to shape and analyze a workforce that is fast, responsive, and agile in response to the changing global market conditions (Fakhruddin et al., 2013; Longmore, 2011; Romadin et al., 2021a).

The impact of AEC-free competition is a change in technology transfer that requires preparation in education, especially knowledge, skills, management, and the right production structure to master technological processes and products (Khurniawan & Erda, 2019; Soland et al., 2013). National education functions to develop abilities and shape the character and civilization of a dignified nation in order to educate the nation's life. The role of Vocational High Schools (VHS) is to prepare students for work and provide a set of essential competencies, including physical skills (Billet, 2011; Dardiri, 2017; Romadin et al., 2021b). The objectives of VHS are: (1) entering the world of work with a professional attitude; (2) choosing a career, competence, and self-development; (3) becoming a skilled workforce; and (4) becoming a productive, adaptive, and creative workforce; and (5) having an important role in the economic growth of the country (Clarke & Winch, 2007; Mouzakitis, 2010; Sampun et al., 2017).

Teaching factory is a concept that combines learning and a realistic work environment to create a learning experience that is relevant to the industrial world (Nurtanto et al., 2017). A teaching factory is the development of a production unit, an industrial partner system that aims to improve the competence of graduates and increase competitiveness in the world of work (Hasanah & Malik, 2018; Kuswantoro, 2014). Teaching factories have a legal basis, namely, to prepare students or graduates of VHS to become a professional workforce. Production units are used for school business development to increase revenue, maintain facilities, and provide real work experience to students.

Hadlock et al. (2008) explain that the purpose of the teaching factory is to explain that the teaching process should be more than just a textbook. Students are not only required to practice soft skills but also learn to work together in teams, practice interpersonal communication, and learn hands-on. Teaching factory teaches students to look for problems, find solutions, build prototypes, make business proposals, and present solutions (Chryssolouris et al., 2006). Roche (2017) also explained that industry assistance in teaching factories will impact participants through real-life learning experiences (life-based learning).

Schmidbauer et al. (2020) argue that the teaching factory can run well if each vocational school conducts evaluation activities to improve and enhance the program. Evaluation is an activity to collect information on whether a program stage has been achieved (planning, implementation, and end of program) (Supriyantoko et al., 2020). Evaluation is a process that determines the extent to which objectives can be achieved by providing information to make decisions (Pratiwi et al., 2019). One of the program evaluation models is CIPP (context, input, process, product). The CIPP evaluation model is an evaluation model that provides or describes a comprehensive evaluation format at each stage of the evaluation (Supriyantoko et al., 2020).

Assessment with the CIPP model supports the decision-making process by offering choices and consequences (Sukardi, 2011). Therefore, it is necessary to conduct an in-depth study of the CIPP evaluation of teaching factories to develop the skills of vocational students in East Java, especially in private schools with a good community reputation. From field data, it is evident that 17 vocational high schools in East Java have implemented teaching factories in both public and private schools (Bakrun et al., 2019).

Several studies have been conducted to analyze the implementation and teaching factory in vocational schools. Endang and Kuat (2023) found that the implementation of a teaching factory in the mechanical engineering expertise program at SMK Sukoharjo was successful in terms of management functions and had reinforcing factors such as adequate infrastructure and qualified human resources. Sarwendah et al. (2022) conducted an experiment using the PDEODE learning model based on a teaching factory and found positive effects on students' reasoning skills and abilities. Ashari (2022) emphasized the importance of teaching factories to produce graduates ready to enter the workforce and develop an entrepreneurial spirit. Santoso et al. (2021) highlighted the need for a good management system to implement teaching factories to improve vocational graduates' skills. Another study at SMKN 2 Singaraja found that implementing the teaching factory is good regarding facilities and industry involvement. However, there is a need for a learning application model to improve students' critical thinking and work readiness (Dwijayanthi & Rijanto, 2022).

Based on the background of the problem, researchers are interested in raising the topic of discussion where the research aims to examine in depth the feasibility of implementing a teaching factory in the context, input, process, and product. This research is expected to contribute as a source of reference and reflection in preparing and improving the current program so that it can be even better.

METHOD

This research used mixed methods with qualitative research, multi-case study, and quantitative descriptive types. Data collection used a qualitative approach consisting of interviews, documentation, and observation. Qualitative research is a methodological approach that aims to understand phenomena from a subjective point of view, focusing on the depth and richness of data rather than numerical measurements (Ulfatin, 2015). This research was conducted at SMK PGRI 3 Malang, SMK Muhammadiyah 7 Gondanglegi, and SMK PGRI 1 Gresik. The three schools are the largest private schools in East Java Province, Indonesia, with the label "SMK Centre of Excellence." Many companies widely recognize this excellence, which shows that these three SMKs produce graduates of exceptional quality who are highly competitive in the job market. The informants in this research are the principal, vice principal for public relations, vice principal for curriculum, teaching factory mentor teachers from industry, and students.

A descriptive quantitative approach was used to determine data trends. Descriptive quantitative variables adjust to the qualitative research focus indicators. The population of this research is class XII students at SMK PGRI 3 Malang, SMK Muhammadiyah 7 Gondanglegi, and SMK PGRI 1 Gresik. The sample size was determined using the empirical formula from Isaac and Michael (Sugiyono, 2018). The sample determination used a confidence level of 0.05 population or as many as 1974 samples and obtained a research sample of 297 out of 6.6% of the population.

Table 1. Population and Sample Distribution

No.	School	Population	Sample
1	SMK PGRI 3 Malang	769	116
2	SMK Muhammadiyah 7 Gondanglegi	450	81
3	SMK PGRI 1 Gresik	665	100
	Total	1974	297

Furthermore, Table 2 describes the outline of the questionnaire to measure the sub-indicators in the teaching factory.

Table 2. Questionnaire Outlines

Aspect	Indicator	Sub Indicator	Data Source
Context	Production planning (Zutiasari et al., 2021)	Preparation for learning implementation	Students
Input	Student readiness (Anggraeni et al., 2016)	Mental and attitude Competence knowledge and skills	Students
Process	Learning implementation (Maarif, 2016)	Implementation of practical learning	Students
Product	Tefa products feasibility (Nilayanti, 2012)	The feasibility of the product produced by students during the practicum	Students

The questionnaire is made using a Likert Scale with four levels of response, where participants can choose from the options "Strongly Disagree", "Disagree", "Agree", and "Strongly Agree" (Sugiyono, 2018). The average value of respondents if described in percentage form with a scale of 4 can be calculated using Formula 1.

$$P = \frac{r}{k} \quad (1)$$

Note: P = class interval scores, r = range, and k = class highest score
This: (r) highest score divided by lowest score = 4 - 1 = 3 (P) = r/k = ¾ = 0.75

Table 3. Likert Scale Category

Average Score	Category
1.00 -1.75	Poor
1.76 - 2.51	Fair
2.52 - 3.27	Good
3.28 - 4.00	Excellent

Source: (Sugiyono, 2018)

Table 4 explains the data collection techniques used in this study. Data collection was conducted using four methods, namely through documentation studies, interviews with relevant individuals, direct observation, and questionnaire distribution.

Table 4. Data Collection

Aspect	Indicator	Data				Data Souce
		Document Study	Interview	Observa-tion	Question-naire	
Context	School vision	v	v	v	-	Teachers and supervision
	Community demands	v	v	v	-	Teachers and supervision
	TEFA implementation	v	v	v	-	Teachers and supervision
	Production planning (Zutiasari et al., 2021)	-	-	-	v	Students
Input	TEFA preparation	-	v	v	-	Teachers and supervision
	Facilities and infrastructure	v	v	v		Teachers and supervision
	Students' readiness (Anggraeni et al., 2016)	-	-	-	v	Students
Process	TEFA management	-	v	v	-	Teachers and supervision
	Students' activities	-	v	v	-	Teachers and supervision
	Quality control	v	v	v	-	Teachers and supervision
	Learning implementation (Maarif, 2016)	v	v	v	v	Students
Product	TEFA achievement	v	v	v	-	Teachers and supervision
	TEFA product feasibility (Nilayanti, 2012)	-	-	-	v	Students

RESULTS AND DISCUSSION

Results

Teaching Factory from the Context Aspect

The results of interviews and documentation conducted by researchers show that the implementation of TEFA in the three research locations has followed the vision and mission of each school. Firstly, the teaching factory is a means to provide students with learning experiences in accordance with actual industrial conditions and create an industrial culture in schools to produce graduates who are skilled and ready to work. Secondly, the teaching factory equips students with an entrepreneurial spirit in accordance with one of the objectives, namely forming an entrepreneurial spirit.

The implementation of TEFA has followed the demands and conditions of the industrial world. The products and services produced have followed the targets and needs of the community, both in terms of quality and price. Services have also been adjusted by following the standards and procedures that generally apply in the industrial world so that consumers feel satisfied and many become regular customers.

Because the industry guides it, the implementation of TEFA is adjusted to business and industrial standards. Thus, the implementation process, product quality, service, management, and workshop layout are adjusted to industry standards. The industrial work culture applied to teaching factory learning can also be described as providing a real atmosphere in the world of work.

Based on the questionnaire with sub-indicators (1) job sheet preparation, (2) machine tool preparation, (3) occupational health and safety preparation, and (4) raw material preparation, Table 5 explains the data tabulation.

Table 5. Production Planning Tabulation (with scale)

Question No.	Score Weighting								∑f	Average F
	Strongly Disagree		Disagree		Agree		Strongly Agree			
	f1	(%)	f2	(%)	f3	(%)	f4	(%)		
1	3	1	55	18.5	197	66.3	42	14.1	297	2.94
2	2	0.67	70	23.6	191	64.3	34	11.4	297	2.87
3	4	1.3	70	23.6	186	62.6	37	12.5	297	2.86
4	14	4.7	111	37.4	142	47.8	30	10.1	297	2.63
Average (%)		1.9		25.7		60.25		12		
Total Average										2.825
Category (2.52 - 3.27)										Good

Table 6. Production Planning Conclusion

Indicator	Average Score	Percentage	Category
Production readiness	2.825	60.25%	Good

Based on the frequency tabulation in Table 5, Table 6 concludes that production planning in the teaching factory states that production planning in the teaching factory is in the good category with an average score of 2.825 with a percentage of 60.25%.

Teaching Factory from the Input Aspect

The results of the workshop facilities support the implementation of the teaching factory program. Partner industries and the Directorate of Vocational Development assist in procuring supporting equipment, raw materials, and teacher training programs. In addition, the government of Indonesia provides machinery support through the Department of Education and the Department of Industry. Based on observations made by researchers, the equipment and machinery used in supporting the teaching factory program have met industry and workshop standards by being equipped with first aid kits, light fire extinguishers, and personal protective equipment. The teaching factory operations follow the Standard Operating Procedures (SOP) that have been agreed upon by both parties, both by the school and the partner industry.

There are two versions of teaching factory preparation at SMK PGRI 3 Malang, SMK Muhammadiyah 7 Gondanglegi, and SMK PGRI 1 Gresik, as described in Table 7.

Table 7. Teaching Factory Preparation in Vocational High School

First Version	Second Version
Cooperation between schools and industries schools provide a teaching factory building procurement of supporting tools and facilities preparation of educators (teachers) with industry standard competencies.	Cooperation between industry and SMK, establishment of MoU and SOP, product design agreement, preparation of teaching factory building, practicum equipment, and workshop, teachers with certificates, experience, and competence according to industry standards, students who have more competence in their expertise programme (mentality, attitude, skills, and knowledge), and preparation of teaching factory curriculum.

In this research, to determine students' readiness in the teaching factory is measured based on a questionnaire that has been designed and includes mental sub-indicators such as (1) adaptability, (2) cooperation, (3) curiosity, (4) critical thinking, (5) problem solving, and (6) active role in learning as described in Table 8.

Table 8. Tabulation of Student's Mental Readiness

Question No.	Score Weighting								∑f	Average F
	Strongly Disagree		Disagree		Agree		Strongly Agree			
	f1	(%)	f2	(%)	f3	(%)	f4	(%)		
1	1	1.3	70	23.6	186	62.6	37	12.5	297	2.86
2	4	4.7	111	37.4	142	47.8	30	10.1	297	2.63
3	14	1	55	18.5	197	66.3	42	14.1	297	2.94
4	3	0.67	70	23.6	191	64.3	34	11.4	297	2.87
5	2	0.67	15	5.1	189	63.6	91	30.6	297	3.24
6	2	0	37	12.5	154	51.9	106	35.7	297	3.23
7	0	1	76	25.6	200	67.3	18	6.1	297	2.78
8	3	1.6	93	31.3	169	56.9	30	10.1	297	2.75
9	5	2.3	107	36.0	158	53.2	25	8.4	297	2.68
10	7	2	94	31.6	173	58.2	24	8.1	297	2.72
11	6	0.33	65	21.9	196	66.0	35	11.8	297	2.89
12	1	2	60	20.2	165	55.6	66	22.2	297	2.98
13	6	0	27	9.1	190	64.0	80	26.9	297	3.18
14	0	0.67	76	25.6	194	65.3	25	8.4	297	2.81
15	2	1.6	47	15.8	213	71.7	32	10.8	297	2.92
Average %		1.3		22.5		61.0		15.2		
Total Average										2.89
Category (2.52 - 3.27)										Good

Furthermore, students' readiness is measured based on a questionnaire that includes competency sub-indicators such as knowledge competency and skill competency, as shown in Table 9.

Table 9. Tabulation of Student's Competency Readiness

Question No.	Score Weighting								∑f	Average F
	Strongly Disagree		Disagree		Agree		Strongly Agree			
	f1	(%)	f2	(%)	f3	(%)	f4	(%)		
1	0	0.00	16	5.39	207	69.7	74	24.92	297	3.20
2	1	0.34	79	26.60	192	64.65	25	8.42	297	2.81
3	6	2.02	143	48.15	133	44.78	5	5.05	297	2.53
4	0	0.00	64	21.55	207	69.70	26	8.75	297	2.87
5	0	0.00	81	27.27	191	64.31	25	8.42	297	2.81
6	0	0.00	112	37.71	168	56.57	17	5.72	297	2.68
7	0	0.00	81	27.27	192	64.65	24	8.08	297	2.81
8	0	0.00	64	21.55	214	72.05	19	6.40	297	2.85
9	0	0.00	70	23.57	187	62.96	40	13.47	297	2.90
10	3	1.01	73	24.58	194	65.32	27	9.09	297	2.82
11	2	0.67	76	25.59	194	65.32	25	8.42	297	2.81
Average %		0.37		26.29		63.64		9.70		
Total Average										2.82
Category (2.52 - 3.27)										Good

Table 10. Analysis Results of Students' Mental Readiness, Attitudes, and Competencies

No.	Sub Indicator	Average Score	Percentage	Category
1	Mental	2.89	61.0%	Good
2	Competency	2.82	63.64%	Good
Average Score		2.855	62.32%	Good

Table 10 states that the mental sub-indicator obtained 61.0% with a good category and the competency sub-indicator which includes skills and knowledge obtained 63.64% with a good category. Thus, student readiness based on the questionnaire received an average score of 2.855 and a percentage of 62.32% in the good category.

Teaching Factory from the Process Aspect

TEFA management is held by teachers who act as managers, educators, and supervisors for the program's success. In Indonesia, there are three management models of teaching factory implementation, namely: (1) Teaching factory management that is fully carried out by schools where schools handle all facilities and human resources as well as management; (2) Management carried out by schools in collaboration with industry where all facilities and human resources are jointly prepared between VHS and industry, while the implementation can be carried out inside or outside the school; and (3) Teaching factory management that is fully carried out by industry in VHS where all facilities and human resources are prepared by industry and the implementation is carried out inside or outside the VHS (Kuat & Purnawan, 2022; Tjiptady et al., 2020; Wahjusaputri et al., 2020).

TEFA management is divided into workshop management, teacher/industry instructor schedules, and learning activities. The implementation layout is adjusted to the actual industrial conditions to improve the industrial atmosphere. The workshop is equipped with occupational safety and health posters and fire extinguishers. The placement of tools is arranged according to ergonomics, and the workshop is equipped with work area dividers and mobilization.

Teaching factory learning is conceptualized as learning activities equated with the work of employees/workers in the industry. Students learn to plan and carry out the job sheet process and activities according to the SOP, and they are required to meet work targets and serve consumers. Students and teachers/industry instructors conduct quality control (QC) on teaching factory products. Students measure the dimensions of the products they work on, and teachers who act as supervisors ensure the feasibility of products and worksheets. Quality control benchmarks are accuracy, dimensions, aesthetics, and satisfaction of customers who use the service.

The results of the questionnaire regarding the process sub-indicator instruments, which include (1) learning implementation procedures, (2) equipment and machinery, (3) teacher assistance during learning, and (4) product reporting, can be seen in Table 11.

Table 11. Analysis Results of Students' Mental Readiness, Attitudes, and Competencies

Question No.	Score Weighting								∑f	Average F
	Strongly Disagree		Disagree		Agree		Strongly Agree			
	f1	(%)	f2	(%)	f3	(%)	f4	(%)		
1	0	0	63	21.2	203	68.4	31	10.4	297	2.89
2	1	0.3	78	26.3	192	64.6	26	8.8	297	2.82
3	0	0	109	36.7	166	55.9	22	7.4	297	2.71
4	1	0.3	79	26.6	192	64.6	25	8.4	297	2.81
5	0	0	63	21.2	212	71.4	22	7.4	297	2.86
6	1	0.3	67	22.6	188	63.3	41	13.8	297	2.91
7	3	1	73	24.6	193	65	28	9.4	297	2.83
8	2	0.7	75	25.3	192	64.6	28	9.4	297	2.83
9	0	0	80	26.9	190	64	27	9.1	297	2.82
10	1	0.3	64	21.5	213	71.7	19	6.4	297	2.84
11	2	0.7	64	21.5	186	62.6	45	15.2	297	2.92
Average %		0.33		24.94		65.1		9.6		2.84
Total Average										2.84
Category (2.52 - 3.27)										Good

Table 12. Results of Analysis of Practice Implementation in Teaching Factory

No.	Indicator	Average Score	Percentage	Category
1	Practice Learning Implementation	2.84	65.1%	Good

Table 12 states that production readiness in practicum implementation resulted in a percentage of 65.1% and an average score of 2.84 in the good category.

Teaching Factory from the Product Aspect

The results of achieving the objectives are good, as evidenced by the results of TEFA, which follow industry demand, public interest, ability to compete in the market and pay attention to product quality. Product feasibility is good in performance and quality and has followed industry standards, as evidenced by the number of consumers who have become regular customers. The results of the questionnaire with sub-indicators of suitability (size, shape, and implementation of QC by students, teachers, and industry) can be seen in Table 13.

Table 13. Tabulation of Feasibility of Teaching Factory Products

Question No.	Score Weighting								∑f	Average F
	Strongly Disagree		Disagree		Agree		Strongly Agree			
	f1	(%)	f2	(%)	f3	(%)	f4	(%)		
1	1	0.3	12	4.0	189	63.6	95	32.0	297	3.27
2	1	0.3	23	7.7	125	42.1	148	49.8	297	3.41
3	1	0.3	41	13.8	96	32.3	159	53.5	297	3.39
4	0	0	20	6.7	139	46.8	138	46.5	297	3.40
5	0	0	29	9.8	122	41.1	146	49.2	297	3.39
6	2	0.7	54	18.2	126	42.4	115	38.7	297	3.19
Average %		0.26		10.03		44.7		44.9		3.34
Total Average										3.34
Category (2.52 - 3.27)										Excellent

Table 14. Results of the Teaching Factory Product Suitability Questionnaire Analysis

No.	Indicator	Average Score	Percentage	Category
1	Product Feasibility	3.34	44.9%	Excellent

Table 14 states that the products produced during the teaching factory obtained a score of 44.9% and an average score of 3.34 with a very good category. The products produced have followed industry standards as evidenced by passing QC and are ready to be marketed.

One of the products from SMK PGRI 3 Malang that has been recognized by industrial companies, namely from PT Artawena Saktigemilang Malang, is a hand pallet (Figure 1). Hand pallets manually lift and move goods in warehouses, factories, or other locations. The design of the hand pallet has been the subject of several studies, which aim to improve its efficiency and ease of use.

Figure 1. Hand Pallet Product form SMK PGRI 3 Malang

Figure 2. Key Retainer and Knuck Pin Product from SMK PGRI 1 Gresik

One of SMK PGRI 1 Gresik's products recognized by PT INKA Madiun is a key retainer and knuck pin (Figure 2) used as spare parts for Indonesian railway cars (KAI). The key retainer and knock pin for the railway carriage coupler are adapted for disposition in the holes formed by the knuckle coupler assembly to connect adjacent railway carriages.

Figure 3. The Daihatsu Teaching Factory at SMK 7 Gondang Legi

Daihatsu's teaching factory at SMKN 7 Gondang Legi is a collaborative program between Daihatsu and SMKN 7 Gondang Legi. This cooperation program aims to provide practical training to automotive industry students, including various skills such as car assembly, vehicle maintenance, and technical troubleshooting. Through this teaching factory, students can gain hands-on experience in a real working environment, thus preparing them to enter the workforce after graduation.

Discussion

Teaching Factory from the Context Aspect

The results showed that the implementation of TEFA is one of the programs to realize the vision and mission of the school, which provides learning experiences to students in accordance with the conditions in the real industrial world, realizes industrial culture in schools, and equips students with an entrepreneurial spirit. Teaching factory is a concept that combines learning and a realistic work environment to create learning experiences that are relevant to the industrial world (Sampun et al., 2017). Teaching factory is the development of production units and the implementation of an industrial partner system in VHS production units, which aims to increase school revenue, improve human resources, maintain equipment, and provide real work experience to students (Kuswantoro, 2014; Tisch et al., 2013). Thus, a teaching factory is a vocational program that realizes the school's vision and mission, provides students with learning experiences per the conditions in the industry, and becomes a business unit used to improve school quality.

The results of the implementation show that they follow the demands and conditions of industrial society, adjusting to industry standards in terms of implementation process, product quality, service, management, and workshop layout. Teaching factory provides an accurate picture of work-based learning and provides hands-on experience as a workforce (Chryssolouris et al., 2006). The achievement of teaching factory products is seen in products that are marketed with indicators of satisfaction and comfort levels (Pratiwi et al., 2019; Sari et al., 2020). Based on Government Regulation of the Republic of Indonesia Number 29 of 1990, the implementation of a teaching factory in VSH has a legal basis, namely to prepare students or graduates of VHS to become a workforce oriented towards professionalism. The description of the research results and experts' opinions on the application of teaching factories provide an accurate picture that work-based learning in VHS produces products that are saleable in the community and prepare VHS graduates to become a professional workforce.

The results of production planning include (1) preparation of job sheets, (2) preparation of machine tools, (3) K3 preparation, and (4) preparation of raw materials, stating that production planning obtained an average score of 2.825 and a percentage of 60.25% in the good category. Production planning includes structured and systematic activities to prepare activities or programs in accordance with the objectives of the teaching factory (Fajaryati, 2012; Zutiasari et al., 2021). The planning process includes activities before the program runs, such as road maps, preparation of raw materials, and equipment used (Afandi, 2019; Mavrikios et al., 2018). Based on the research results and the description, roduction planning for teaching factory learning in terms of job sheet preparation, machine tools, K3, and raw materials has gone well.

Teaching Factory from the Input Aspect

The preparation stage of the teaching factory starts with collaboration between schools and industrial companies. Good cooperation between vocational schools and industries can improve the quality of learning in schools and increase the competitiveness of vocational school graduates in the labor market (Basith & Rahmawati, 2020; Firdaus et al., 2019; Yoto, 2014). As stated in the MoU, preparation for the teaching factories includes school infrastructure and facilities for a smooth learning process (Chryssolouris et al., 2016; Setiani, 2020).

Human resource preparation requires teachers to have industry-standard competencies through internship/training programs in the industry. Teacher training activities provide insight into technology to improve the quality of education (Blimpo & Pugatch, 2019; Orellana et al., 2017). According to Instefjord and Instefjord and Munthe (2017), the training is evidenced by training certificates and competency test certificates. Therefore, in implementing the teaching factory, teachers must participate in training programs and internships organized by the industry to improve teachers' competencies improve the quality of learning in VHS.

The results of the observations made by the researcher and the completeness of the infrastructure in the workshop of the VHS, where the research location is located, show that the existing facilities have supported the implementation of the teaching factory program. Equipment and machinery for teaching factory activities have met industry standards. The success of teaching factories is influenced by various factors, including the completeness of infrastructure and practicum facilities owned by schools (Asaaju, 2012; Chryssolouris et al., 2016; Setiani, 2020). Facilities and infrastructure are very important in supporting learning process activities, which consist of buildings, furniture, and land and include physical facilities for learning spaces and additional spaces (Clarke & Winch, 2007; Musa & Ahmad, 2012; Timilehin, 2012; Uche et al., 2011). Therefore, infrastructure affects the success rate of learning activities, becomes an effective learning medium, and contributes to the quality of teaching and learning process and academic achievement.

The budget allocated for the teaching factory is less than 100%, derived from VHS revenue funds. However, additional assistance is needed from the government and industries that collaborate or cooperate with related VHSs. The success of the teaching factory program must be connected to the funding system; in some VHSs, the operational funding comes from schools, the government, and industry (Jariah, 2019).

Students' readiness is measured based on their mental indicators and competencies, where based on the results of data analysis that researchers have carried out, the two indicators get results with an average score of 2.855 and a total percentage of 62.32% in the good category. This shows that students have good enthusiasm, motivation, work attitude, and competence in participating in teaching factory activities. The teaching factory program is influenced by several factors, namely the input of qualified participants with a good attitude and competence (Chryssolouris et al., 2016; Mavrikios et al., 2018). The description shows that the success of the teaching factory is largely determined by the input of students who have good enthusiasm, work attitude, and competence. More than good competence is needed because the business world and industry want prospective workers with enthusiasm, work attitudes, and excellent competence, so VHS must improve the quality of learning processes and outcomes.

Teaching Factory from the Process Aspect

The management aspect of TEFA shows that vocational schools and industries have implemented it. Teaching factory management activities are divided into three types: (1) workshop management, (2) teacher/industry instructor schedule management, and (3) learning activity management. The management of teaching factory learning at VHS is designed with industry to provide an authentic working world atmosphere. Experiential learning is expected to be far more optimal in developing students' potential (Chryssolouris et al., 2006). Education management must be carried out according to the demands of the times to prepare quality human resources and compete in the labor market (Abidin, 2020; Carlgren, 2013; Widarto, 2012). Another opinion states that teaching factory processing must follow the standards made by VHS and Industry (Pratiwi et al., 2019). The description shows that the management of teaching factory learning at VHS is jointly designed between VHS and the industry to find implementation standards by taking into account the demands of technological and industrial developments to prepare quality human resources.

Research into the layout of the workshop found that the layout of the workshop followed the actual conditions in the industry so that students feel the atmosphere and culture of the industry, which is supported by the results of the teaching factory implementation questionnaire, which obtained an average score of 2.84 and a percentage of 65.1% in the good category. The teaching factory workshop is closely related to the success and support in optimizing the achievement of learning objectives (Jariah, 2019). According to Pratiwi et al. (2019), the space and equipment of the teaching factory workshop must match the industry because it aims to provide an authentic experience to students during practicum. The implementation of a work-based teaching factory in the industrial world can be used as a portfolio of work learning (Chryssolouris et al., 2016; Mavrikios et al., 2019). Therefore, workshop layout and practicum implementation affect the success of the teaching factory program, which aims to provide work experience for students.

Research in the field of Quality Control (QC) provides results that show that students, teachers, and industrial instructors have conducted QC through measurement and conformity between products and job sheets. Teachers have the authority to guide students to achieve or realize the set goals and evaluate all stages of learning (Brevik et al., 2019; Simonović, 2021). The mentor teacher has a strategic role in implementing the teaching factory approach in VHS. The main determining factor in the quality of products and services is human resources, as most of the quality of education is determined by the academic level of teachers (Khan & Sarwar, 2011). Quality control by teachers (supervisors) and industry instructors ensures that the products from teaching factory learning are of higher quality (Supriyantoko et al., 2020). It can be concluded that the QC of teaching factory products is tested by students and teachers/industrial instructors through measurements and product feasibility with job sheets to provide excellent product results in the market.

Teaching Factory from the Product Aspect

The products produced in the teaching factory at the three VHS where the research was conducted can be said to be well achieved and supported by the results of the questionnaire on the feasibility of the products produced by getting an average score of 3.34 and a percentage of 44.9% in the very good category. This shows that students can make products according to industry standards and public demand that can compete in the market. According to Pratiwi et al. (2019)

products that are in accordance with industry standards can be seen from several indicators, namely the level of satisfaction, comfort, and product suitability. Teaching factory learning is oriented towards product manufacturing, ensuring feasibility, accuracy, aesthetics, and product marketing (Yanti & Muhamad, 2019). Therefore, the products produced achieve the objectives of industry standards, public interest, competition in the market, and guaranteed product quality.

CONCLUSION

In terms of context, the teaching factory at VHS has followed the vision and mission of the school as well as the demands of the community, industry, and the business world. The teaching factory program acts as an industry guide so that the implementation process, product quality, service, management, workshop layout, and culture align with industry standards. Production planning in teaching factory learning based on the questionnaire shows good results. The input aspect describes how the preparation of the teaching factory program includes (1) cooperation between schools and industry, (2) provision of teaching factory buildings by schools, (3) procurement of tools and supporting facilities, and (4) preparation of qualified educators who have industry standard competencies. The implementation of the teaching factory follows the standards agreed upon by the SMK and the industry. The results of the questionnaire regarding the readiness of vocational students on mental, attitudinal, and competency indicators obtained a good category.

In the process aspect, it is illustrated that teachers and industry instructors manage the teaching factory implementation as managers, educators, and supervisors. The teaching factory layout is adjusted to the actual conditions in the industry, and student activities are equated with workers in the industry. Quality Control (QC) on teaching factory products is carried out by students and then rechecked by teachers as supervisors. The results of the questionnaire on the implementation of TeFa obtained a good category. Finally, the product aspect illustrates that the product results are in accordance with industry demand and public interest and can compete in the market. Product quality is guaranteed because students, teachers, and industry instructors carry out QC. The questionnaire's results regarding the product's feasibility obtained a very good category. The researcher recommends that this research can be a reference material and self-reflection for schools that have implemented teaching factories, as well as an example for schools that have not implemented this learning approach. This research is still limited to the three schools in East Java Province, Indonesia, that are labeled as "SMK Centre of Excellence," so it is still very broad for future studies to research and raise similar topics with a wider scope.

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