Teaching Factory Implementation for Fashion Design and Production Program at Vocational High School 3 Cilegon, West Java, Indonesia

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Abstract. This study examined the development of the teaching factory program for fashion design and production program expertise at SMK Negeri 3 Cilegon to equip students with skills and competencies. To achieve this objective, the school ran a teaching factory for the Fashion Design and Production Implementation program for two consecutive months, starting in November to December 2021. It aimed to examine the effectiveness of the project implementation program for students as well as for the school. This study used a qualitative approach with interviews, observations, and documentation during the program implementation. To start the program, situational analysis was conducted by employing SWOT analysis technique and the BCG Matrix. These analysis techniques analyze industry attractiveness relative to the market share of the school program. The program implementation has also worked on the partnership with the industry. It covered setting up the teaching factory; the development of links and matches and curriculum alignment with industry; teacher and student internships in the industry; an industrial guest teacher; opening an industrial class; competency certification from the industry; the agreement of employment positions for the school graduates; and industry scholarships. Although the implementation program was successfully completed, further issues were identified in school program development.

1 Introduction

Cilegon is a city in Banten province, Indonesia, located in the northwest of Java, on the edge of the Sunda Strait. Cilegon is famous as an industrial city with a strong manufacturing sector. The growth of the manufacturing industry has contributed more than half of the GRDP of Cilegon. Most of the large and medium-sized industries in Cilegon are engaged in chemicals, basic metals, and metal goods. In 2019 and the preceding years, the percentage of food consumption expenditure was more than on non-food; however, in 2020, the rate of non-food consumption expenditure was larger than food. The average monthly consumption expenditure per capita of Cilegon residents in 2020 amounted to Rp 1,743,397 consisting of Rp 795,922 for food (45.65%) and Rp 947,475 for non-food (54.35%). Meanwhile for consumption expenditure for non-food, durable goods, and various commodities and services showed to be increased (BPS Cilegon City, 2021).

Fashion design is a discipline of science and art concerning the application of design, aesthetics, and natural beauty to clothing and its embellishments. The application of fashion is influenced by cultural and social patterns, which vary depending on time and place. SMK Negeri 3 Cilegon has a Fashion Design and Production Implementation program, which equips students to become experts in fashion design and production as well as to be able to understand market preferences and trends in fashion.

The subjects in vocational school (*SMK*), in principle, consist of three groups, namely normative, adaptive, and productive topics. The challenge faced by vocational high schools in general is lacking of standard to measure the effectiveness of learning objective as well as inadequate facilities such as to support practicum activities. Therefore, it is vital to develop appropriate learning models. As for vocational secondary school, the learning model should be based on industry or user demand, referring to competency standards that apply in the world of work or industry. Based on data from the Indonesian Directorate General of Vocational Development, in 2013, 80% of SMK graduates could not create their jobs because they lacked entrepreneurial skills or competencies. While the students attended education in vocational schools, the learning was not oriented to the world of work or industry; it was limited to the only concept or knowledge transfer. Therefore, it was deemed necessary to employ a new paradigm with a learning model called 'the teaching factory' (Wijaya, 2013).

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Much research on teaching factories has been carried out. The research results stated that the entrepreneurial competence of students increased after receiving the teaching factory treatment. Other study indicated that teaching factory management had been developed, including planning, organizing, implementing, and evaluating. A teaching factory should be integrated with a production unit to implement student practice (Renita et al., 2020; Risnawan 2019). Studies also found that the implementation of teaching factory management able to equip students with the skills to suit the industry. However, the application of the teaching factory must also be carried out optimally by means of more collaboration so that it is able to produce o ensure it will have an impact on improving the quality of vocational schools (Budiyono, 2020).

The low absorption of vocational school graduates is due to various components, including the curriculum, teaching staff, and infrastructure of the vocational education. Employment providers, namely the business world and the industrial world, complained that the qualifications of SMK graduates were not in accordance with the demands of industry, so the objective of linking and matching had not been achieved. In addition, industry also complained about the occurrence of overbalance and scarcity in SMK graduates along with the dawning of Industry 4.0.

1.1 Objectives

This study aimed to examine the effectiveness of the project implementation program for students as well as for the school. This study used a qualitative approach with interviews, observations, and documentation during the program implementation. This research aimed to provide insight and framework of school program development through teaching factory. Therefore, may contribute to provide the best practice for vocational high school institution in Indonesia.

2 Literature review

2.1 Teaching factory

According to the Directorate of Vocational High School Development many educational institutions are trying to bring educational practice closer to industry. Thus, the teaching factory has become a new approach to vocational education with the aim of modernizing the teaching process by: bringing industrial practices closer together; leveraging industrial knowledge through new knowledge; supporting the transition from manual to automated ways of working; reducing the gap in industrial resources (labor and capital); spreading industrial knowledge (information); and increasing and maintaining the growth of industrial wealth (Nurtanto et al., 2017; Hadlock et al. 2008). Meanwhile, the implementation of the teaching factory is described in Figure 1.

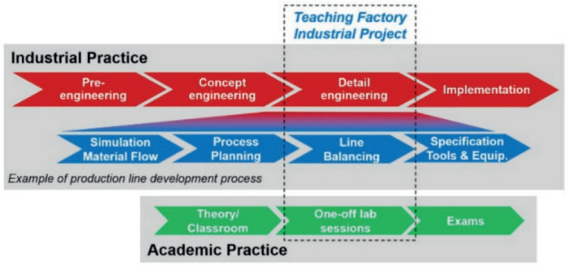

Fig. 1. Industry integration and academic practice.

Based on Figure 1, the implementation of 'industry to classes is an operation scheme carried out through the adoption of industrial projects. The aim of this project is to bring learning together in a concurrent context of industrial and academic practice. The teaching factory concept is based on knowledge of the concept triangle which aims to combine the learning environment and work environment to create a more relevant and realistic experience (Chryssolouris et al., 2006; 2016; Mavrikios et al., 2011). Meanwhile, the knowledge transfer cycle in the teaching factory is depicted in Figure 2.

Industry problems can cover specific tasks in the product/production life cycle. Each piece of work is characterized by direct interaction with the factory. These interactions include discussions, sharing presentations, a live video of the production, and other knowledge delivery mechanisms, depending on the content of the problem. Students must undertake project work between hands-on sessions, which may involve experimentation or data analysis to derive new conclusions and solutions. The support class is moderated by an academic supervisor who is also responsible for sparking discussion and providing guidance in finding solutions (Chryssolouris et al., 2016.) The teaching factory aims to teach students that learning should be more than just what is in the book. Therefore, vocational education has a vital role in the social and developmental fields of a nation. The development of vocational education in preparing students who are ready to work and who are competent in the industrial world should be a concern so that students are able to live prosperously in society, and it can be shown that this teaching factory improves student competence (Anane, 2013; Hadlock et al., 2008; Lestari et al., 2021).

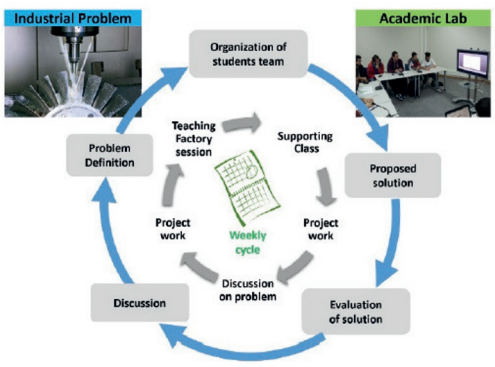

Fig. 2. Knowledge transfer cycle in teaching factory.

3 Methods

The study used a qualitative approach with interviews, observations, and documentation studies of implementing a teaching factory for a fashion design and production program. Meanwhile, the analysis technique used the SWOT analysis technique, which is an analytical technique to determine a strategy from the formulation, carried out in a compilation of strengths, weaknesses, opportunities, and threats. If a SWOT analysis is used in education, it is possible for a school to get a comprehensive picture of the situation of the school itself both in relation to society, other educational institutions, and the industrial field that will be entered by its students, even to the internal situation of the school. alone. For an understanding of external factors, (consisting of threats and opportunities), combined with an examination of strengths and weaknesses will help in developing a vision of the future. The Boston Consulting Group (BCG) Matrix analysis technique was conducted to analyze growth opportunities with long-term strategic planning relative to the school program in order to make decisions to invest, develop or discontinue the program. The BCG matrix method is used to determine the position of the market growth rate in school based on market share. The BCG matrix can be determined by two factors, namely: market growth rate, which is shown on the vertical axis; relative market share, which is shown on the horizontal axis.

4 Data collection

Data collection mainly gathered during the implementation of the school development program. Primary data were included observation and documentation of the event; meanwhile secondary data were collected from valid resources such as academic article and business article from reliable sources.

5 Results and Discussion

5.1 SWOT and TOWS analysis

The fashion department at SMK Negeri 3 Cilegon is a superior department that produces professional graduates who are able to work independently and can be absorbed by industry as middle-level workers according to their competence. The purpose of learning in the fashion department is to provide training to be able to have a career, be tenacious and active in their competence, be able to adapt to the work environment, and be able to develop professional attitudes according to their competencies. The SWOT analysis results obtained an overview of the strengths, weaknesses, opportunities, and threats. The results of the SWOT analysis were then juxtaposed, analyzed, and used as a strategy formulation to be implemented as a school development program strategy. They are shown in Table 1.

The Fashion Design and Production program at SMK Negeri 3 Cilegon produced professional graduates who could work independently and were employed in the industry as middle-level workers according to their competence. The learning objective of the fashion design and production program was to equip students with skill and competency to be able to adapt to the work environment and possess professional attitudes accordingly. The fashion industry sector in today's digital era is growing rapidly. There is potential for advantages for the fashion department at SMK Negeri 3 Cilegon in the fields of making school uniforms, teacher uniforms, and providing sewing services for the community.

There has been opportunity for Fashion Design and Production program at SMK Negeri 3 Cilegon with the growing of tourism industry and festivals where program can contribute services in making ethnic carnival costumes, dance costumes, and souvenirs (Dardiri et al., 2018). SMK Negeri 3 Cilegon competes and regularly wins the annual carnival competition, held by the tourism office of the city of Cilegon. To date, in Cilegon only SMK N 3 Cilegon has a esign and production program. Fashion graduates were attracted by the fashion world, and many business opportunities they have are in accordance with their field of expertise in fashion. It is necessary to develop learning to improve soft skills and hard skills in order to be able to compete globally. Students with strong soft skills such as communication, attitude, and intellectual intelligence were expected to have strong characters and business professionalism and be able to master the hard skills such as technical ability, creativity, and accuracy. Hard skills with strong soft skills will create students that are competitive in the fashion industry in the future. Cilegon was not concentrated on the garment industry; therefore, the absorption of graduates in the workforce was limited.

5.2 Boston Consulting Group analysis

Based on the SWOT analysis, and the analysis of the Boston Consulting Group Matrix model of SMK Negeri 3 Cilegon, it can be concluded that the position of the teaching factory of SMK Negeri 3 Cilegon is currently in quadrant II, in the position of the question mark.

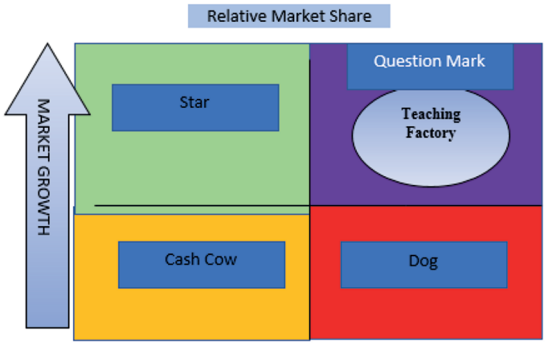

Fig. 3. Analysis of Boston Consulting Group matrix.

In Figure 3, Question Mark: The teaching factory majoring in fashion already has three assessors and teachers who are relatively young and currently are producing products from the teaching factory including:

Table 1. The SWOT and TOWS analysis.

Internal Strategic Factors Analysis Summary [IFAS] / ***External Strategic Factors Analysis Summary*** [EFAS]	Strenght (S) 1. Professional educators in accordance with the field of fashion. 2. Formation of student character with industrial culture. 3. Students have good competitiveness in competitions/contests. 4. Adequate teaching factory workshop facilities. 5. Produce products that are worth selling. 6. Practice according to industry standards. 7. Cooperation with 2 industries, PT Fatahillah Anugerah Nibras, Jakarta and NAFIS Collection, Cilegon. 8. Two out of six productive teachers as Indonesian Dress Examiners (Indonesian Fashion Designers Association-IPBI). 9. The market share of students' parents is very high.	Weakneses (W) 1. Lacking computers and software for advanced fashion design. 2. Less mastery of branding and marketing/digital marketing theory and practice, both productive teachers and students. 3. Productive hours are still lacking, especially the hours of pattern making and sewing. 4. Some students are less skilled. 5. Students' soft skills are still low. 7. Teachers teach many subjects. 8. Not enough classrooms. 9. The location of SMKN 3 Cilegon is far from the city center.
Opportunity (O) 1. Becoming a vocational high school center for excellence in the creative economy, in the Department of Fashion in Banten province. 2. The only vocational high school in Cilegon city that has a Fashion Design department. 3. Many industries are collaborating with SMKN 3 Cilegon (data source: Deputy Head of Public Relations/Hubind). 4. Collaborating with the Cilegon tourism office. 5. Teaching factory with the industrial world (PT. Fatahillah Anugerah Nibras, Jakarta and NAFIS Collection, Cilegon). 6. There are training and job suppliers from the Manpower Office of Cilegon City and Banten province	SO, Strategy: 1. Strengthening the competence of productive fashion teachers with the development of Industry 4.0. 2. Every subject and extracurricular activity is directed at building character and industrial culture [soft skills]. 3. Build industry-standard workshop facilities with up-to-date equipment and the latest technology. 4. The sales process is carried out through manual sales [parents, tourism offices, private vocational schools in Cilegon City] and digital marketing. 5. Optimizing the function of the Special Job Exchange for SMKN 3 Cilegon.	WO Strategy: 1. Procurement of client computers with graphic standards. 2. Bringing guest teachers/ resource persons related to digital marketing materials. 3. Provide training opportunities for productive teachers of clothing on digital marketing [ongoing two KKPI teachers]. 4. Teachers and students carry out industrial internships at PT Fatahillah Anugerah Nibras, Jakarta and NAFIS Collection, Cilegon, for six teachers [first week of November].
Threat (T) 1. Practical tools and materials are hard to find in Cilegon city. 2. Cilegon's culture of people who are reluctant to migrate. 3. The industrial visiting teacher is very busy. 4. Regional regulations regarding industry support for SMK have not been maximized.	ST Strategy: 1. Procurement of practical tools and raw materials held long before the implementation of the teaching factory model learning. 2. Provide understanding and socialization to students and parents related to achieving success in the future. 3. Implement MoU commitments with industry partner(s). 4. Submitting regulations to the Banten Provincial Government regarding the determination of BLUDs at SMKN 3 Cilegon. 5. Promote and socialize the existence of SMKN 3 Cilegon to people who have implemented the TEFA learning model.	WT Strategy: 1. Requires teachers and students to master and use the latest industrial technology applications. 2. Teachers and students take advantage of online media by mastering digital marketing. 3. The school invited alumni who have successfully worked in industry and are entrepreneurs to provide enlightenment and motivation to students. 4. Using a workshop room that was built with a size of 32 x 14 m2 along with the latest industrial equipment, which will be completed at the end of December 2021.

Koko clothes, internship clothes, department clothes, batik clothes, Muslim party clothes, work clothes, wedding clothes, and most recently batik clothes that can be reused during the COVID-19 pandemic. The business that has been carried out is the marketing and sales of these products. There are definite consumers, namely students who need uniforms to carry out school activities every day. The school earns other income through teaching factory products managed by the School Production Unit. In addition to school uniforms for KBM, the teaching factory at SMK Negeri 3 Cilegon also develops cultural ethnic clothing products made from various used waste such as plastic bottles, while the market share is from the tourism office of the Cilegon city government.

The question mark position indicated a strong organization, which faces big challenges. The strategic recommendation given is strategy diversification, meaning that the organization is in a stable condition but faces a number of severe challenges so it is estimated that the wheels of the organization will have difficulty continuing to spin if it only relies on its current strategy. This means that the development of the teaching factory at SMK Negeri 3 Cilegon must implement a variety of accurate strategies in an effort to develop the teaching factory, from planning, implementing, and evaluating to follow-up improvements from the results of the actions. The right strategy is through improving the quality of cooperation and expanding the scope of cooperation with industry by maximizing the strengths and taking advantage of great opportunities. Therefore, it is important to implement the school development program through teaching factory.

5.3 Teaching factory implementation for the fashion design and production program

To achieve the school objectives of increasing the practical as well as soft skill competencies, the teaching factory for the Fashion Design and Production program was implemented for two full consecutive months from November to December 2021. The project involved all school members' participation. For those two months, the project implementation aimed to set a strong background for the teaching factory to be able to operate and gain profit and benefit in the long run. The Schol Development program through, has objective to improve the functional aspect of the school. The program meant to improve nahuman resource function by allmean the skill of the teacher as well as students, the Production, Marketing function, and aspects of digitalization in the implementation of the Program. The explanation is as follows. Functional aspects of human resource. The resources of educators and education at SMK Negeri 3 Cilegon are in accordance with the required competencies. For all teachers in the Fashion Design department, they have carried out internships in industry in November, at PT Fatahilah Anugrah Nibras as one of the industrial partners ready to implement the MoU for SMK PK in accordance with their 8+1 target. By character, productive teachers have industrial characteristics. In addition, several teachers have carried out competency certification from the Director General of GTK, at the Ministry of Education and Culture. In this case, productive teachers majoring in Fashion Design already have 3 certifications: certification from the Ministry of Education and Culture; Professional Certification of Assessor Competence from BNSP; and Industry certification where the internship was located.

Operational/production aspect. The implementation of teaching factory production in the Fashion Design department means it can serve orders from both school residents and the environment in Cilegon. However, with the addition of assistance from the PK SMK program at SMK Negeri 3 Cilegon, the Department of Fashion Design, workshops and equipment with updated technology will increase and accelerate the amount of mass production. Meanwhile, the production steps are as follows:

- Inspecting fabric (checking rejected fabric is not, for example damaged, rejecting shading/striped colors, broken, and rejecting size) because it will affect the product/consumption of consumables
- Making product designs/worksheets
- Product sampling
- Consumption calculation (calculation of consumables per shirt) Making patterns/markers one sheet of marker has three sizes of robes, and six sizes of children's robes clothes)
- Cutting according to the pattern
- Numbering: coding of clothing items to make it easier when connecting/sewing clothes from one part to another
- Bundling: Combining multiple products into one
- Coating application
- Sewing according to each line
- Quality control
- Product Pressing and ironing
- Delivery of goods

Marketing aspect. The teaching factory at SMK Negeri 3 Cilegon requires a special Marketing Team consisting of: deputy principals, the Head of Fashion Design, the School Committee and representatives of parents. Meanwhile, our market share in marketing the products of the teaching factory is dominated by school members, students, and parents of students. In the marketing strategy for fashion, products recently maid are being sold using digital marketing.

Aspects of digitalization in the implementation of the School Development Programs: In the era of the Industry 4.0, technology is very necessary. Through the results of the teaching factory, a marketing strategy was carried out by providing information services for products from the teaching factory, by creating a marketplace on the SMKN 3 Cilegon website.

6 Conclusion

The results of the study showed that a teaching factory for clothing products — such as company uniforms and party clothes — acted as a driving force for improvement at

Fashion program at SMK Negeri 3 Cilegon. Based on SWOT analysis, the school has number of strength such as reputation, attractive programs to offer, strong industry partnership as well as young and skilled teacher. However, it contained also weaknesses such as, still lacking of facilities to support the students practicum, and the school is located outside city Centre. In addition to, based on BCG analysis, the school positioned in the question mark quadrant. It indicated the school has potential to grow but faces big challenges. Therefore, school decided to implement the Program development through teaching factory. There are several main points to conclude regarding the implementation of a teaching factory as follows:

Firstly, the revitalization of the collaboration between SMK Negeri 3's Fashion Design and Production program and companies is expected to be a driving force for the development of teaching factories in fashion departments by fostering a creative economy for the schools. Secondly, the cooperation between the school and industry must be expanded and strengthened in a sustainable and holistic manner. The partnership between the school and industry may cover involvement in the school learning process through to absorption of the school graduates. It may start from industry participation in the selection of new students. Industry figures should be guest teachers for at least 50 hours per year. Industry should be actively involved in the assessment/competency testing of the graduates, and the industry should assist in providing job placement of SMK graduates. Finally, curriculum alignment ensures that graduate competencies match with the industry needs and standards.

7 Recommendation and further research

Teaching factory has gained its popularity in the learning and teaching model and process at vocational school. It proved to provide significant improvement for student and teacher in their practical skill and competencies. However, the implementation of teaching factory require a full commitment from all aspect of the school including provoding the necessary facilities that meet with user or industry requirement. Therefore, the implementation sometime require adequate investment. Other important aspect also it require the participation and active involvement from the industry. The implementation of teaching factory should become a continuous program for the school to ensure the continuous improvement of the student skill and competency as well as to maintain the close partnership with the industry. For further research it is important to have a longitudinal study to gain insight how the development and improvement process of the program implementation. Further study may as well to compare between schools in order to learn the key success factor of the teaching factory implementation.

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