Journal of Social Research

P-ISSN: 2827-9832
E-ISSN: 2828-335x
Vol. 4, No. 11, November 2025
http://ijsr.internationaljournallabs.com/index.php/ijsr

Strategy Forming Hard Skills and Soft Skills Teaching Factory at SMK Warga Surakarta

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ABSTRACT

Vocational education plays a strategic role in preparing competent human resources aligned with labor market demands. One approach is forming hard skills and soft skills through the implementation of Teaching Factory (TEFA). This study aims to explore the formation of these skills at TEFA SMK Warga Surakarta and identify factors affecting its success. Using a qualitative descriptive case study method, data were collected through purposive and snowball sampling with interviews, observations, and document analysis. The results show that hard skills are developed by having students operate machines and master design software. Students also learn to plan tasks, use measuring instruments, and consistently apply the 5R work culture. Soft skills develop through leadership practice, teamwork, direct communication with consumers, and public speaking during learning sessions. Additionally, students manage orders, take responsibility for supervising work, and adapt to various roles. Teachers act as instructors by providing competencies and creating tasks for students, while also assisting them during work. The industry partners supply practical jobs and evaluate student outcomes to ensure learning aligns with industry standards. This integrated approach at TEFA SMK Warga Surakarta effectively combines technical and interpersonal skills, preparing students for real-world challenges and enhancing their readiness for future employment.

Keywords: *Hard Skill; Soft Skill; Teaching Factory*

INTRODUCTION

Education is a right for every individual to obtain. The development of education in Indonesia continues to be a focus for society and the government to improve the quality of human resources. Vocational education has a strategic role in preparing competent human resources, in accordance with the needs of the world of work that continues to develop. However, various challenges still hinder this effort. There are various problems that are currently occurring in education in Indonesia, such as the quality of education and its learning curriculum (Agustin & Supriyanto, 2020).

This has an impact on vocational school graduates who have not fully met the needs of the industry. Then it leads to Termination of Employment (PHK) and an increase in the number of unemployed. Then it also causes the Open Unemployment Rate (TPT) of vocational school graduates to be the highest compared to elementary, junior high, and high school graduates.

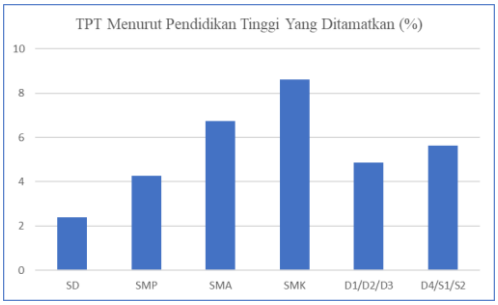

Figure 1. TPT According to Higher Education Completed (%)
Source: Central Bureau of Statistics (2024)

Based on the graph, the largest number of unemployed are from Vocational High School (SMK) graduates. It is quite concerning, considering that the workforce has a fairly high education. The TPT of vocational school graduates is the highest at 8.62%. Meanwhile, the lowest TPT is elementary school graduates, which is 2.38%. One of the causes is facilities and infrastructure, where this aspect has an important role in the success of the learning process. Therefore, facilities and infrastructure need to be met in order to support student learning.

Vocational education has a role in preparing human resources who are ready to work, especially in responding to the demands of the increasingly competitive and dynamic industrial world. One approach applied in vocational education is the Teaching Factory (TEFA), which is a production or service-based learning model that imitates real business and industrial processes. TEFA not only emphasizes mastery of technical skills (hard skills) such as operating machines and mastery of design software, but also instills soft skills such as communication, teamwork, and work ethic that are very much needed in the world of work.

This learning aims to change students' mindsets and be ready for the world of work after graduating (Amiruddin & Susanti, 2023). SMK Warga Surakarta is one of the Vocational High Schools in Surakarta, Central Java that has implemented TEFA learning. SMK Warga Surakarta has several expertise competencies including Machining Engineering, Light Vehicle Engineering, and Industrial Electronics Engineering.

At SMK Warga Surakarta, the implementation of TEFA is the main strategy in integrating the learning process with the real world of work. Through real production and service activities, students not only learn through theory, but also interact directly with projects and customers like in the industry. This provides a great opportunity to build technical and non-technical skills holistically.

Several previous studies have discussed the implementation of TEFA in vocational schools. Research by Putri et al. (2019) highlights the improvement of hard skills and soft skills through the development of the TEFA program at SMK Model PGRI 1 Mejayan. Similarly, Wijanarka et al. (2023) examined the success of the implementation of teaching factories on the competence of machining skills in vocational schools. However, these studies tend to focus more on the results of TEFA implementation, and have not explored much specific strategies and mechanisms for the formation of these two dimensions of skills in an integrated and simultaneous manner.

However, forming hard skills and soft skills simultaneously is not easy. The right strategy is needed so that the learning process does not only emphasize technical aspects, but

also forms the character and professional work behavior of students. This study focuses on the strategies implemented by SMK Warga Surakarta in TEFA in order to produce graduates who are not only technically competent, but also adaptive, communicative, and have integrity.

The novelty of this article lies in a more specific approach, namely "Strategy for Forming Hard Skills and Soft Skills in Teaching Factory". Different from previous studies that tend to only highlight the results of TEFA implementation, this article provides an in-depth overview of the strategic mechanisms, teacher roles, job management, and social interactions that form two dimensions of students' main skills simultaneously. This study also provides practical contributions to the development of a more effective Teaching Factory curriculum and management in other vocational schools.

Based on the identification of the research gap, this study aims to: first, obtain an overview of the activities of forming hard skills and soft skills at TEFA SMK Warga Surakarta; and second, to know the factors that affect the success of the formation of hard skills and soft skills through TEFA at the Surakarta Citizens' Vocational School. The results of this study are expected to provide practical benefits for vocational schools in designing TEFA learning strategies that are more effective and relevant to industry needs. In addition, this research also makes a theoretical contribution to the development of vocational education literature, especially regarding the integration of hard skills and soft skills in the context of production-based learning. In policy, the findings of this research can be considered for education stakeholders in supporting the implementation of TEFA through curriculum development, teacher training, and school-industry collaboration.

METHOD

The location of this research was SMK Warga Surakarta. The research was conducted in stages from September 2024 to May 2025. The research employed a descriptive qualitative approach. The case study method was used. This method is suitable for research aimed at understanding complex phenomena in a real-world context. Data collection techniques included interviews, observation, and documentation.

Primary data were obtained from interviews with several informants and observations using observation sheets. Secondary data were obtained from compensation books, compensation certificates, and student learning outcomes. The data collection instruments included the researcher, pilot study, observation sheets, interview guides, documentation guides, and audio and video recording devices. The sampling techniques used were purposive sampling and snowball sampling.

This sampling was conducted by selecting informants selected by the researcher based on their specific characteristics (Febriyanti, 2023). This technique was chosen to ensure that the selected sample was relevant and directly involved in the research context, namely TEFA implementation in vocational schools. Purposive sampling enabled the researcher to select informants with in-depth knowledge and experience related to hard and soft skill development strategies in TEFA. In addition, the researcher also used snowball sampling, which involved seeking advice from the first informant to obtain subsequent informants who met the criteria to ensure the information obtained met expectations.

Table 1. Purposive Sampling Table

No	Research Subject	Sum
1	Head of TEFA Program	1
2	Head of Machining Engineering Expertise Competency	1
3	Productive Teacher of Machining Engineering	3
4	Grade XII Students of Mechanical Engineering	3
Total		8

Source: Researcher-processed data (2025)

Data analysis, according to Miles & Huberman (1994), includes data collection, data reduction, data presentation, and conclusion drawing.

Result and Discussion

Hard skills and soft skills are essential skills for vocational high school students who aim to find employment after graduation. The development of hard and soft skills in vocational high schools is influenced by many factors, including the school, teachers, and students. This study focused on 12th-grade students majoring in Mechanical Engineering at SMK Warga Surakarta. The research results and discussion are as follows.

Hard Skill Formation Activities

Operating the Machine

TEFA equips students with technical competencies (hard skills) that enable them to play a role in various industrial fields. During practical learning, students are divided into operator and design groups.

"In terms of hard skills, the child gains competence as a machine operator or designer..." (NOV)

Machine operating skills are developed through practice, similar to those carried out in real industry (Nugroho, 2014) . It is hoped that through this learning, they can become drafters or programmers .

Planning a Job

One of the important steps before practicing at TEFA is Work Preparation (WP), which is the preparatory stage before students begin operating the machine. The use of media such as Work Preparation (WP) which contains work drawings and work steps can support students' learning process in planning work effectively (Hidayat & Purnomo, 2021) .

" Yes, for sure must create something called work preparation or WP...” (RAF)

So, every student required make plan work moreover previously , which includes election tools, sequence workmanship , and specifications that must be achieved .

Design Software Mastery

Mastery of design software such as Solidworks is an important skill for machining engineering students (Waluyo, 2025). Before TEFA is implemented, students are taught to use design software. The design software used is Solidworks .

"In design at TEFA, children are taught about design, we use solid software..." (NOV)

Then at TEFA, students just develop their skills while they are assigned to the design department.

Using Measuring Tools

Using measuring tools is a fundamental skill required for Mechanical Engineering students. Starting in 10th grade, students are taught how to use measuring tools. Training and practical experience can improve students' measuring skills and ensure product quality (Ramadhan, 2020).

"So class X has finished using measuring tools..." (NOV)

So, students simply need to develop their reading skills and are expected to be able to measure the size of a job before starting it. Furthermore, students are expected to be able to fulfill the role of Quality Control Officer (QC), tasked with checking the quality and size of finished jobs.

Implementation of 5R

Each student is required to clean the machine for 30 minutes before completing the practical. Applying the 5R principles to practical activities can create a positive work environment for students and prepare them for real-world work (Fadilah & Suryadi, 2018).

”At our place, usually 30 minutes before finishing, the kid is cleaning...” (NOV)

This cleaning includes cleaning machines and equipment that have been used, both on one machine and other machines involved in the work process.

Soft Skill Formation Activities

Communication

Communication is implemented from grades 10 to 12 with the aim of developing students' soft skills in communicating effectively with both teachers and fellow students. Therefore, students are equipped with this knowledge from the moment they enter vocational school. Students are also guided toward independence with the goal of practicing effective communication with those around them (Putri et al., 2019) .

In TEFA , students are trained to communicate with consumers. They are taught how to receive orders directly from consumers, understand their needs, and develop work plans based on the requests they receive.

"The soft skills at TEFA are directly communicating with consumers and students..." (NOV)

Even though students play the main role in communicating with consumers, teachers still play a role as companions who provide good guidance.

Public Speaking

Public speaking soft skills training can improve students' self-confidence and communication skills. Public speaking is a crucial soft skill in the workplace and everyday life (Saputra et al., 2024) . Vocational high school students' public speaking skills are typically developed through presentations and group discussions. This way, students learn to convey ideas clearly and confidently in public.

"Sometimes, after our practice, we interview our children and ask them to talk about what they were doing, and what the process was for them to be brave enough to speak..." (NOV)

TEFA teaches public speaking skills through post-practice interviews. Students are called upon to explain the work they have done, including the process. The goal of this activity is to build students' confidence in speaking in front of others and improve their ability to express their opinions.

Leadership

Leadership in mechanical engineering is crucial for developing students' character, enabling them to lead and take responsibility in the workplace (Wijanarka et al., 2023). Through the TEFA program , students are trained to develop effective leadership skills.

"When the student is appointed as PPIC , he will divide the work that must be done that day among his friends..." (TOM)

In developing soft leadership skills, teachers don't directly assign tasks, but instead assign students to take turns as PPIC . The designated student is responsible for assigning tasks to their peers based on the work required for that day. Therefore, structured leadership development can enhance these skills.

Teamwork

In TEFA, teamwork skills are crucial, as work often requires collaboration between team members to achieve optimal results (Raharjo & Hargiyanto, 2020). Thus, students learn communication and practice responsibility. TEFA , which requires collaboration among students, is highly effective in developing these skills.

"When the student is appointed as PPIC , he will divide the work... This is one of the soft skills that is given or taught, namely how to work together..." (TOM)

In practice, students are expected to work in teams. Therefore, they will be the ones to divide up the work. For example, in assigning tasks, students collaborate with other students to divide up the work. Students must also cooperate with each other during the process. This provides students with hands-on experience in understanding the working mechanisms of the industry.

Managerial

The implementation of TEFA is carried out by developing managerial skills with the concept of small-scale production management and in accordance with the existing concepts in an industry (Putri et al., 2019).

"Receiving jobs from consumers, then analyzing them and then sharing them..., so that children can get used to contributing and communicating with their consumers." (GAL)

TEFA teaches students how to handle jobs directly. When a customer orders, students are assigned roles, with some acting as PPIC and some as QC . The process of receiving customer orders trains students in decision-making, job analysis, and customer communication.

Work Ethics

Work ethics can be developed through habits of discipline, responsibility, and integrity in school activities (Rofiqoh et al., 2023)Soft skills development is practiced to ensure responsibility for assigned roles. Students are divided into PPIC and QC .

" Their soft skills teach them to be responsible PPICs , and also responsible QCs ..." (RAF)

So, PPIC will be responsible for job allocation, while QC will also be responsible for production results. In addition, students also responsible for the results of the job done.

Adaptation

Adaptability is the ability to adjust to new situations or relevant changes in the machining field, which continues to evolve with technological changes (Kimbal & Widodo, 2023). Through TEFA , students can improve their job readiness by adapting to changing work environments. Students learn to adapt to new situations, such as rotating PPIC and QC roles .

"It's rolling, sir, so on the first day the PPIC is absent 2 times, the QC is absent 3 times, then on the second day the PPIC is absent 3 times..." (BRI)

This is done on a rolling basis. So, for example, on the first day, the PPIC has 2 absences, and the QC has 3. Then, on the second day, the PPIC has 3 absences, and the QC has 4 absences.

Factors Influencing the Formation of Soft Skills

Industry Engagement

Collaboration with the industrial world through programs such as internships provides students with hands-on experience which is crucial in developing hard and soft skills. (Tanrasula et al., 2021) . TEFA involves industry in its implementation, as the recipient of

products and orders entrusted to TEFA . Industry involvement also helps in developing a curriculum relevant to job market needs.

Industry often brings work for students to complete. Therefore, collaborating industries trust students to work on their products. Furthermore, industry plays a role in evaluating student work. They provide not only general feedback but also specific input on areas for improvement in the learning and production process at TEFA . This evaluation helps schools align learning standards with industry needs.

TEFA Work Culture

The implementation of a good work culture in the TEFA environment , such as discipline, responsibility, and cooperation, contributes to the development of students' hard and soft skills (Putri et al., 2019) . A positive work culture creates a conducive learning environment and motivates students to develop their skills.

Through this work culture, students learn to organize their workspace to be comfortable, clean, and tidy, and to return all tools and materials to their proper place after use. This fosters structured, neat, and professional work habits, which are essential when they enter the industrial world. Furthermore, TEFA also shapes students' character, enabling them to work in a disciplined manner without the need for direct supervision from instructors or teachers. Students still carry out their tasks well according to established standards.

The Role of Teachers and Their Challenges

Teachers have an important role in the learning process at TEFA (Wijayanto et al., 2011). In TEFA, the teacher plays a role as a mentor, assisting students in completing assignments. Students are then instructed on which part to work on, and the students remain the ones doing the work.

One of the challenges in TEFA is the varying levels of student understanding in carrying out the assigned tasks. Even though students have been given instructions and understand the procedures, some still make mistakes, such as not following SOPs correctly or producing workpieces that are not the correct size.

Strategy to Overcome Obstacles

To overcome obstacles in developing hard and soft skills , strategies such as improving facilities, training teachers, and adapting learning methods need to be implemented (Putri et al., 2019). Collaboration between schools, industry, and the government is also key to overcoming these challenges.

One strategy implemented is the peer teaching method, which groups bright students with less bright ones. The goal of this method is to enable more capable students to help and guide their peers, creating a more collaborative learning environment.

CONCLUSION

Hard skills at TEFA SMK Warga Surakarta are developed by training students to operate machines, master design software, plan tasks, use measuring tools, and consistently apply the 5S work culture. Soft skills are enhanced through leadership opportunities, teamwork,

direct communication with customers, public speaking, order management, supervision of task execution, and role adaptability. Future research could explore the long-term impact of this integrated skill formation on graduates' career success and industry adaptability to provide deeper insights into the effectiveness of Teaching Factory models in vocational education.

Acknowledgement

This research is funded by RKAT Universitas Sebelas Maret for the 2025 Fiscal Year through the Research Scheme STRENGTHENING THE CAPACITY OF RESEARCH GROUPS (PKGR-UNS) B with Research Assignment Agreement Number 371/UN27.22/PT.01.03/2025

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