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Teaching Factory Management to Improve the Employability of Vocational High School Graduates (A Case Study at SMK Negeri 8 Bandung and SMK Negeri 2 Cimahi)

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Abstract. This study analyzes the implementation of Teaching Factory (TeFa) management as a strategic instrument to increase the labor-market absorption of graduates of Vocational High Schools (SMK) in West Java, Indonesia. Although TeFa has been nationally mandated, the relatively high unemployment rate among SMK graduates in the province—12.42% in February 2025—indicates that many schools have not yet managed the program in an integrated, industry-oriented manner [5]. Using a qualitative approach and a comparative case study design, this research examines management practices at SMK Negeri 8 Bandung and SMK Negeri 2 Cimahi, both of which are regarded as information-rich cases. Data were collected through in-depth interviews, participant observation, and document analysis, and analyzed using the interactive model of Miles, Huberman, and Saldaña. The findings show that both schools implement TeFa using George R. Terry's four management functions—planning, organizing, actuating, and controlling—although with different emphases. Planning is carried out through curriculum alignment and business-plan formulation in collaboration with industry partners. Organizing simulates real industrial work environments, complete with role distribution, job descriptions, and standardized student practice rooms. Actuating engages students in full production cycles, enabling them to acquire both technical and soft skills. Controlling is conducted through quality-control mechanisms, performance assessment, and follow-up programs, including tracer studies. The study concludes that a comprehensive and industry-linked Teaching Factory management model is a key factor in improving SMK graduates' employability and competitiveness in the world of work.

Keywords: Teaching Factory, vocational school management, employability, POAC, industry link and match.

1 Introduction

Effective management is a decisive factor for vocational education programs seeking to produce graduates who are job-ready and aligned with the dynamics of industry [1]. Vocational High Schools (SMK) in Indonesia are mandated by Law of the Republic of Indonesia No. 20 of 2003 on the National Education System to develop human resources who are competent, productive, and able to contribute to national development [2]. This mandate was reinforced by Presidential Instruction No. 9 of 2016 on the Revitalization of Vocational High Schools and later by Presidential Regulation No. 68 of 2022 on the Revitalization of Vocational and Training Education, both of

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which emphasize curriculum alignment, industry partnerships, and work-based learning models such as Teaching Factory (TeFa) [3]. At the operational level, the Directorate of Vocational High Schools has issued detailed guidelines for TeFa implementation, positioning it as a bridge between school-based learning and actual industrial processes [4], [5].

The Teaching Factory model is intended to integrate learning with real production processes, so that students experience authentic work situations, develop technical competencies, and internalize professional work ethics and soft skills. However, despite the clarity of the policy framework, the Open Unemployment Rate (TPT) for SMK graduates in West Java was still 12.42% in February 2025, the highest among all education levels, indicating a gap between the policy vision and school-level execution [5]. Similar concerns have been raised in international TVET literature, which notes that vocational education improves employability only when it is closely tied to local labor-market needs, supported by industry, and managed with a clear business and quality-assurance orientation [6].

Previous studies in Indonesia have shown that TeFa improves graduate quality, workplace readiness, and technical skill mastery when it is implemented as industry-based, project-based learning. Sudiyono found that TeFa increases the practical relevance of learning and strengthens student competence [7]. Fattah, Martono, and Sawiji confirmed that TeFa-oriented learning produces graduates who better match industry requirements [8]. Ngusman and colleagues showed that effective TeFa management contributes directly to improved program quality in SMK [9]. More recent studies—such as Fauzi et al. and Nuryakin et al. (2025, cited in the Indonesian version)—also showed that TeFa boosts motivation, work readiness, and technical skills through real projects and school–industry collaboration [10], [11]. However, most of these studies still emphasized pedagogical aspects and less frequently unpacked the managerial process in a comparative manner.

This research, therefore, seeks to fill that gap by analyzing Teaching Factory (TeFa) management in two different institutional settings—SMK Negeri 8 Bandung and SMK Negeri 2 Cimahi—using George R. Terry's management framework comprising Planning, Organizing, Actuating, and Controlling (POAC) [16]. By comparing these two information-rich cases, this study aims (1) to describe how TeFa is planned in relation to industry demands; (2) to analyze how organizational structures, roles, and practice-room layouts are arranged to simulate real work environments; (3) to explain how teaching–production activities are actuated so that students participate in full production cycles; and (4) to evaluate how control mechanisms—quality control, student performance monitoring, and tracer studies—are used to ensure program sustainability. The overarching goal is to understand to what extent TeFa management contributes to improving SMK graduates' employability in the labor market, in line with national revitalization policies and global TVET trends [1].

2 Method

This study adopted a qualitative approach utilizing a comparative case study design to provide a holistic analysis of Teaching Factory (TeFa) management and its impact on graduate absorption [12], [13]. The research was situated at SMK Negeri 8 Bandung

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and SMK Negeri 2 Cimahi, purposively selected as "information-rich cases" due to their established industry collaborations and consistent TeFa implementation. Key participants included principals, TeFa coordinators, and productive teachers directly involved in operations.

To ensure robust findings, data were gathered through methodological triangulation involving semi-structured interviews, participant observation in production workshops, and analysis of relevant documents such as MoUs and tracer studies [14]. The collected data were processed using the interactive analysis model by Miles, Huberman, and Saldaña, encompassing data condensation, display, and conclusion drawing [15]. Furthermore, the study established trustworthiness through credibility, transferability, dependability, and confirmability strategies, including member checking and thick description [16]. This rigorous methodology enabled a deep exploration of how the management functions—Planning, Organizing, Actuating, and Controlling—are executed within real-world vocational settings.

3 Result

This section presents the findings on Teaching Factory (TeFa) management in the two schools, organized according to George R. Terry's four management functions—planning, organizing, actuating, and controlling. By dissecting these functions, the research makes visible the managerial logic that underpins the successful implementation of TeFa in strengthening graduate employability.

3.1 Planning

Planning serves as the fundamental bridge between the educational vision of the school and the practical demands of the industry. At both SMK Negeri 8 Bandung and SMK Negeri 2 Cimahi, planning was identified not merely as an administrative scheduling task, but as a strategic alignment process. According to George R. Terry, planning is the selecting and relating of facts and the making and using of assumptions regarding the future in the visualization and formulation of proposed activities [12]. In the context of these schools, this "visualization" involved projecting industrial trends into the classroom environment.

At SMK Negeri 8 Bandung, which specializes in the automotive sector, planning began with a rigorous curriculum synchronization process known as "Link and Match." The school management held annual strategic meetings with major industry partners, primarily Auto 2000. During these sessions, the industry's standard operating procedures (SOPs) for vehicle maintenance were dissected and mapped onto the national curriculum. The planning documents revealed a shift from traditional subject-based scheduling to a "Block Schedule" system. This was a crucial planning decision designed to mimic the working hours of a real repair shop. Instead of 45-minute periods, students were scheduled for 8-hour shifts in the workshop. This required complex logistical planning to ensure that rotation between theory classes and TeFa practice did not create academic gaps. Furthermore, the planning included business projections, where the school set targets for the number of public vehicles to be serviced per month, thereby treating the TeFa unit as a profit center that sustains itself.

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Conversely, at SMK Negeri 2 Cimahi, planning took a product-oriented approach suitable for its Industrial Chemistry expertise. The collaboration with CV Cipageran Agro Sejahtera necessitated a planning model based on "Production Orders." The school developed a Master Production Schedule (MPS) that aligned with market demand for chemical products such as detergents, soaps, and fertilizers. Planning here involved detailed material requirement planning (MRP)—calculating the raw materials needed, the lead time for procurement from suppliers, and the production timeline to ensure goods were ready for delivery. The planning documents explicitly stated quality targets; for instance, a specific pH level or viscosity had to be achieved for the product to be viable. This illustrates that planning in a TeFa context goes beyond lesson plans; it encompasses supply chain management and inventory forecasting.

Common to both schools was the formulation of clear, hierarchical objectives. At the strategic level, the objective was to increase the absorption rate of graduates into the labor market. At the tactical level, the objective was to embed work ethics—discipline, safety, and precision. At the operational level, the objective was to produce goods and services that met the specific quality standards of their industry partners. This multilayered planning approach ensures that every activity in the workshop has a pedagogical and economic purpose. It confirms that the schools have moved beyond ad-hoc practical activities to a systematic implementation as mandated by the national TeFa guidelines [4]. The findings indicate that successful TeFa begins with a plan that treats the school not just as a place of learning, but as a micro-industry with clear inputs, processes, and outputs.

3.2 Organizing

Once the strategic plans were established, the schools moved to the organizing function, which Terry defines as the determining, grouping, and arranging of the various activities needed necessary for the attainment of the objectives [17]. The findings at both research sites revealed that organizing was essentially an exercise in corporate simulation. The schools dismantled the traditional classroom hierarchy and replaced it with an industrial organizational structure.

At SMK Negeri 8 Bandung, the automotive workshop was organized to replicate an official service center. The organizational chart clearly distinguished roles: the Head of the Competency Program acted as the *Service Manager*, senior teachers acted as *Foremen* or *Service Advisors*, and students were organized into different levels of *Technicians* based on their competency progression. Organizing also involved the physical arrangement of the workspace. The workshop was divided into specific stalls—quick service, heavy repair, and final inspection. Each stall was equipped with a standardized tool set shadow-boarded to ensure accountability. The application of the 5R culture (*Ringkas, Rapi, Resik, Rawat, Rajin*) was not just a slogan but a structural requirement. Students were organized into cleaning rosters and tool maintenance teams, ensuring that the "Rawat" (Maintain) and "Rajin" (Diligent) aspects were integrated into their daily organizational duties.

Similarly, SMK Negeri 2 Cimahi organized its resources to support continuous production flow. The structure here distinguished between the R&D division (Research and Development), the Production division, and the Quality Control (QC) division. Students were rotated through these divisions, ensuring a holistic understanding of the

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industrial chemistry workflow. The physical organization of the laboratory was critical; dangerous chemicals were stored in organized, ventilated cabinets with clear Material Safety Data Sheets (MSDS), reflecting strict industrial safety standards. The school also organized a "Marketing Team" composed of students and teachers to handle the distribution of products, thereby adding a commercial dimension to the organizational structure.

A key finding in the organizing function was the dual role of the teacher. In a traditional setting, a teacher organizes a lesson; in TeFa, the teacher organizes a production line. This required the schools to create clear job descriptions that blended pedagogical supervision with technical supervision. Ngusman et al. emphasized that good TeFa management requires clear structures [9], and this was evident in how both schools managed the student-teacher ratio in the workshops. Groups were kept small to ensure safety and intense supervision. Furthermore, the organizing extended to external relations; specific staff members were assigned as liaisons to the partner industries to ensure smooth communication regarding technology updates and internship placements. By organizing the school environment to mirror the industry—down to the uniform codes and shift work—the schools effectively conditioned students to the rigors of professional life long before graduation.

3.3 Actuating

Actuating, or the implementation phase, is where the abstract plans and structures transform into concrete action. According to Terry, actuating involves getting all members of the group to want to achieve and to strive to achieve the objective. In the context of SMK Negeri 8 Bandung and SMK Negeri 2 Cimahi, this was characterized by a shift from "simulation" to "real production." The actuating function here was driven by the "Project-Based Learning" (PjBL) model, where the project was a real customer order.

At SMK Negeri 8 Bandung, the actuating phase began the moment a customer (often public car owners or teachers) entered the workshop. Students, acting as Service Advisors, greeted the customer, diagnosed the problem, and drafted a work order. This required actuating soft skills: communication, empathy, and professional grooming. Once the car moved to the stall, the student technicians executed the repair. Here, the teachers played a crucial role in "mobilizing" the students. Instead of lecturing, teachers moved from stall to stall, providing real-time guidance, correcting posture, ensuring safety goggles were worn, and troubleshooting difficult mechanical issues. The actuating force was the pressure of a real customer waiting; this created a sense of urgency and responsibility that a textbook could never replicate. The findings showed that this pressure was instrumental in building the "industrial character" needed for employability [18].

At SMK Negeri 2 Cimahi, actuating involved the precise execution of chemical formulations. Students weighed ingredients, monitored reaction temperatures, and operated mixing machinery. The actuating function here highlighted the importance of standard operating procedures (SOPs). Teachers motivated students to adhere strictly to the SOPs, as a deviation could result in a failed product batch, leading to financial loss. This introduced the concept of risk and accountability into the learning process.

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Actuating also involved the packaging and labeling phase, where students had to ensure the final product was aesthetically pleasing and commercially viable.

A significant aspect of actuating observed in both schools was the "Morning Briefing." Before every shift, teachers and students gathered to discuss the day's production targets, safety reminders, and evaluate the previous day's performance. This ritual was a key leadership tool used by teachers to motivate students and align their focus, directly reflecting Terry's concept of leadership within the actuating function. By immersing students in these real-world workflows, the schools effectively bridged the gap between hard skills (technical competency) and soft skills (teamwork, time management). The students were not passive recipients of knowledge but active agents of production, realizing the core intent of the SMK revitalization policy to make learning performance-oriented.

3.4 Controlling

The final function, controlling, is the process of determining what is being accomplished, evaluating the performance, and, if necessary, applying corrective measures so that the performance takes place according to plans [19]. In the TeFa environment of both schools, controlling was implemented through a rigorous, multilayered Quality Assurance (QA) and Quality Control (QC) system, ensuring that the educational outcome met industrial standards.

The first layer of control was "Self-Control" by the students. At SMK Negeri 8 Bandung, after servicing a vehicle, the student had to complete a checklist verifying that every bolt was tightened and every fluid level was correct. This instilled a sense of personal responsibility. The second layer was "Internal QC" by the teacher. Before the car was returned to the customer, the teacher (acting as the final inspector) performed a test drive and a visual inspection. If the work was substandard, the student was required to rework it immediately. This immediate feedback loop is far more effective than a traditional exam grade received weeks later.

At SMK Negeri 2 Cimahi, controlling was scientific. Samples from every product batch were tested in the laboratory for consistency, pH balance, and cleaning power. If a batch failed the test, it was rejected. This harsh reality of "Reject" vs. "Pass" taught students the uncompromising nature of industrial quality standards. Furthermore, controlling extended to inventory management; stock takes were conducted regularly to control waste and ensure cost-efficiency, teaching students the economic value of materials.

Beyond the daily operations, controlling also involved external validation. Industry partners were invited to conduct competency tests (UKK) to verify if the students' skills matched current industrial needs. The ultimate form of controlling identified in the study was the use of "Tracer Studies." Both schools actively tracked their alumni to see how many were employed, how long they waited for a job, and whether their skills were relevant. This data was fed back into the *Planning* phase for the next academic year, creating a cycle of continuous improvement as mandated by national guidelines. Customer satisfaction surveys were also used as a control mechanism; positive feedback validated the teaching methods, while complaints triggered curriculum reviews. These comprehensive control mechanisms ensured that the Teaching Factory

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remained a sustainable, high-quality program that genuinely enhanced graduate employability.

4 Discussion

The findings above indicate that the two vocational schools implemented Teaching Factory using broadly the same managerial logic—POAC—but adapted it to their respective expertise areas, industry partners, and resource availability. This strengthens the argument that the success of TeFa is less about having a single uniform model and more about having *managerially coherent* processes that connect planning, organizing, actuating, and controlling to the objective of graduate employability.

First, at the planning stage, both schools started from the national policy mandate—Law No. 20/2003, Presidential Instruction No. 9/2016, Presidential Regulation No. 68/2022—and translated it into concrete school-level plans that aligned curricula with specific industries. This confirms previous research that TeFa is effective only when the curriculum is genuinely "linked and matched" with employers' competency standards [2], [4]. The inclusion of business plans and identification of real markets (automotive services, chemistry products, food products, and similar) shows that the schools understood TeFa as a *school-based enterprise*, not merely as a practicum extension. This orientation is in line with international TVET perspectives that emphasize work-based learning, employer engagement, and production-to-learning feedback loops as key to employability [20].

Second, in organizing, the two schools successfully created learning environments that resembled real workplaces—complete with role hierarchy, job descriptions, workflow, and workspace layout. This is important because many TeFa programs fail at this point: the school may have production tools, but the work process is still "school-like," not "industry-like." By adopting industrial layouts and 5R principles, the two SMKs operationalized Terry's notion of organizing and at the same time instilled work discipline, safety, and teamwork in students [9]. This supports Yorke's view that employability is not only about subject knowledge but also about personal qualities and understanding of contexts in which knowledge is applied [18]

Third, the actuating stage in both schools was strongly production-based. Students were not passive recipients but active producers. Teachers played a dual role as instructors and production supervisors. This arrangement is in line with the competency-based and production-based learning models promoted by the Ministry of Education, Culture, Research, and Technology, especially in the SMK Center of Excellence (SMK PK) program, which demands strong industry involvement and real output from learning [17]. The fact that students were involved up to after-sales services indicates that the schools understood TeFa as a complete value chain, and this is precisely what employers expect from graduates—ability to work end-to-end, problem-solving, and service orientation [10]

Fourth, controlling in both SMKs used written instruments, teacher inspections, and product testing. These are standard managerial controls. What is noteworthy is that both schools used tracer studies as a macro-control instrument: graduate absorption data were fed back into program planning. This demonstrates a closed-loop quality-assurance cycle—plan, do, check, act—within the POAC frame. Such cycles are

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recommended in both national guidelines and international reports on strengthening vocational education in Indonesia [21]. In other words, TeFa in these two schools was not treated as a one-off project but as an evolving system whose success was measured by labor-market outcomes.

The findings also resonate with broader policy and international literature. OECD's and ADB's reports on vocational education in Indonesia stress that employability improves when schools (1) co-design programs with employers; (2) expose students to real production; (3) assess not only technical but also work-readiness skills; and (4) institutionalize feedback from employers and tracer studies [6]. All four elements were present—although with varying depth—in the two schools studied. Thus, this research adds empirical evidence from the school level that national policies on SMK revitalization are implementable when supported by sound management.

5 Conclusion

This study concludes that Teaching Factory (TeFa) management at SMK Negeri 8 Bandung and SMK Negeri 2 Cimahi has reached a relatively mature and effective level, and that this maturity is achieved because the two schools consistently applied George R. Terry's four management functions—planning, organizing, actuating, and controlling—to the whole cycle of school-based production. Planning was based on curriculum–industry alignment and business feasibility; organizing reproduced real industrial settings; actuating immersed students in complete production cycles; and controlling guaranteed product quality, student performance, and program sustainability. When these four functions were integrated, TeFa became more than a short-term project: it became a systematic school program that contributed to improving graduates' employability.

For practice, the study recommends that other vocational schools wishing to implement TeFa should (1) involve industry actors from the planning and controlling stages; (2) standardize organizing and workspace layouts based on industrial norms; (3) ensure that learning truly follows a production logic; and (4) make tracer studies a mandatory feedback mechanism. For policymakers, the study suggests the development of a national TeFa management benchmarking model containing qualitative and quantitative indicators for each POAC function, so successful models can be replicated across regions.

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