JPPIPA 11(8) (2025)

Jurnal Penelitian Pendidikan IPA

http://jppipa.unram.ac.id/index.php/jppipa/index

Developing A Teaching Factory Management Model to Improve Entrepreneurship Programs and Industry-Based Student Competencies in Vocational High School

Agustiani[1*], Yari Dwikurniangsih[1]

[1]Study Program Master of Educational Administration, Faculty of Teacher Training and Education, Universitas Kristen Satya Wacana, Salatiga, Indonesia

Received: June 06, 2025
Revised: July 23, 2025
Accepted: August 25, 2025
Published: August 31, 2025

Corresponding Author*:
Agustiani
942022028@student.uksw.edu

DOI: 10.29303/jppipa.v11i8.12277

Abstract: Teaching Factory in Vocational High Schools (SMK) is a forum to facilitate SMK students to have competencies, with the hope that SMK graduates can be ready for entrepreneurship and have competencies that are in accordance with industrial needs. This study aims to develop a SMK Teaching Factory management model that aims to improve entrepreneurship programs and industry-based student competencies in SMK by implementing the POAC (Planning, Organizing, Actuating, Controlling) management function. The type of research conducted is the Borg and Gall Research and Development model modified into five stages, using a qualitative approach. Data were collected through questionnaires and interviews with Teaching Factory managers and validated using technical and source triangulation. The data analysis technique was carried out using qualitative descriptive analysis of the Miles and Huberman model. This research produces a management model, model description, and guidance for using the Teaching Factory model for Vocational High Schools. The results of a limited initial field trial conducted by the Teaching Factory manager indicate that the Teaching Factory management model can be implemented in Vocational High Schools with a score of 89.33% in the good category. This finding explains that the application of the POAC management function in the Teaching Factory management model can facilitate Vocational High School students to improve entrepreneurship programs and industry-based competencies.

Keywords: Entrepreneurship; Industry-Based Competencies; Management Model; SMK Teaching Factory

Introduction

Indonesia is preparing to welcome the demographic bonus in 2045, a period in which the productive age population will dominate. This momentum presents a golden opportunity to boost economic growth and national prosperity. To maximize this potential, the government continues to strive to improve the quality of human resources through the transformation of vocational education, particularly Vocational High Schools (SMK) (Yasdin & Muksins, 2024; Zuo et al., 2025). The goal is to ensure that SMK graduates possess competencies, skills, and an entrepreneurial spirit relevant to industry needs, in line with the slogan "SMK Bisa, SMK Hebat, Vokasi Kuat Mengugukan Indonesia," to produce graduates who are ready to work, continue their education, and become entrepreneurs (BMW). The competency-based curriculum implemented by the government in SMK, including an emphasis on entrepreneurship (Marliyah, 2024), aims to prepare students to become professional

How to Cite:
Agustiani, & Dwikurniangsih, Y. (2025). Developing A Teaching Factory Management Model to Improve Entrepreneurship Programs and Industry-Based Student Competencies in Vocational High School. *Jurnal Penelitian Pendidikan IPA*, *11*(8), 161–168. https://doi.org/10.29303/jppipa.v11i8.12277

workers or entrepreneurs. However, vocational education currently faces serious challenges (Bano et al., 2022; Oketch, 2007). Data shows that SMK graduates have not fully met the established competency standards, as stipulated in the Regulation of the Minister of Education, Culture, Research, and Technology of the Republic of Indonesia No. 5 of 2022. Kholifah et al. (2025); Ramadhani et al. (2025), indicated that the low absorption of vocational high school graduates into the workforce is not solely due to a lack of job opportunities, but rather due to competencies that do not align with industry qualifications. As a result, many graduates work in fields irrelevant to the skills they learned in school (Di Paolo & Matano, 2022; Lazíková et al., 2022; (i & Park, 2024).

The urgency of improving graduate competency standards to align with industry needs is crucial to ensure that vocational high school graduates can be absorbed into the job market or even become entrepreneurs. To bridge this competency gap, vocational high schools (SMK) are aggressively implementing various strategies, such as Field Work Practices (PKL), Teaching Factories (TEFA), and industry classes. TEFA, introduced in 2000 and reinforced by Presidential Instruction No. 9 of 2016, is an essential learning model that integrates the curriculum with the needs of the workforce or industry. The Fagerholm et al. (2018); Widiatna et al. (2025), explains that TEFA functions as a learning medium that produces competent and character-based graduates through the completion of products and services. The concept of TEFA, according to Mahindru et al. (2024); Zulfiqar et al. (2021), is to create a learning environment that mimics a real industrial setting, allowing students to practice business activities directly and foster an entrepreneurial spirit.

Various studies, such as those conducted by Anggitan & Gunadi (2025); Surya Patria et al. (2024), confirm that TEFA can improve student competency, shape work character, and encourage the growth of creative industries and entrepreneurship. However, the implementation of TEFA in the field still faces obstacles, such as the TEFA Automotive Engineering expertise program at the Nias Regional Government Vocational School (SMKS Pembda). Despite its significant potential as a learning resource, obstacles such as the lack of Standard Operating Procedures (SOPs), incomplete infrastructure, a lack of professional human resources as quality control officers, immature planning, limited raw material stocks, inadequate documentation and publications, and financial constraints hinder the optimization of the production process (Khedr & S, 2024; Singh et al., 2023). Furthermore, students often lack confidence in serving customers, and administrative and financial records are poorly organized (Hariyani et al., 2024; Salah et al., 2023).

This condition causes TEFA at SMKS Pembda Nias to not be able to function optimally as an effective learning resource to improve entrepreneurship programs and industry-based student competencies. Based on the above background, a study was conducted with the objectives of describing the current teaching factory management model in SMK; describing the weaknesses of the current teaching factory management model in SMK; developing a teaching factory management model to improve entrepreneurship programs and industry-based student competencies in SMK.

Method

This research uses a Research and Development (R&D) approach, focusing on the development of a teaching factory management model at the Nias Regional Government Private Vocational High School (SMK Pembda Nias), Gunungsitoli. The development model used is the Borg and Gall model, chosen for its systematic and detailed steps. This research will be implemented up to the fifth stage of the model.

Research Location and Subjects

The research was conducted at the Nias Regional Government Private Vocational High School (SMK Pembda Nias) from April–May 2024. The research subjects included the vice principal for curriculum, the vice principal for industrial and community relations, the head of the automotive engineering expertise program, and productive automotive engineering teachers.

Development Procedure

The development procedure for this teaching factory management model includes five main stages: Data/Information Collection (Research and Information Collecting): This initial stage involved interviews and documentation studies to identify potential and challenges in teaching factory management at the Nias Regional Government Vocational High School (SMKS Pembda Nias). Data was collected from internal (head of expertise program, teachers, students) and external (community, business) parties through interviews, questionnaires, documentation studies, and literature reviews. Planning: Based on the results of the preliminary study, this stage focuses on designing the product design for the teaching factory management model to be developed. Product Concept Development (Develop Preliminary Form of Product): A concept for a teaching factory management model utilizing the POAC

(Planning, Organizing, Actuating, Controlling) management functions will be developed. Once the model is available, it will be validated by experts. Preliminary Field Testing: The validated model will be tested to ensure its functionality. Researchers will observe the process, conduct interviews, and conduct surveys during the trial. Main Product Revision: Based on the trial results, the model will be revised to refine and optimize its functionality.

Product Validation and Trial

Product validation will be conducted by management experts to identify the model's strengths and weaknesses and assess its suitability for trial. After recommendations are obtained, initial field trials will be conducted with potential model users (vice principals for curriculum and public relations, teaching factory managers, heads of TO expertise programs, and TO productive teachers). The products being tested include model drawings, model descriptions, and a guide to using the POAC-based teaching factory management model.

Data Collection Techniques and Instruments

Data will be collected using several techniques and instruments: Interviews: Conducted in person (face-to-face or online) to explore respondents' views and experiences regarding teaching factory management and student entrepreneurship programs; Questionnaires: Used to collect structured data regarding the entrepreneurship program, student competencies, and teaching factory management experiences; Documentation: Collecting evidence from documents or archives, such as financial reports and business plans, related to the entrepreneurship program and teaching factory management.

Results and Discussion

Results of the Teaching Factory (TEFA) Implementation at the Nias Regional Government Private Vocational School

The TEFA for Automotive Engineering at the Nias Regional Government Private Vocational School offers vehicle servicing (cars and motorcycles) and the manufacture of metal products (anti-theft windows, tables, chairs, fences) for the school and community. The goal is to improve students' entrepreneurial skills and industry-standard competencies, so that graduates are ready for work or entrepreneurship.

Current Conditions and Weaknesses in TEFA Implementation

Despite its noble goals, TEFA implementation at the Nias Regional Government Private Vocational High School (SMK Pembda) has not been optimal. Currently, TEFA only serves internal schools, with fewer than 10 service vehicles and product orders limited to internal needs. Several major obstacles hamper TEFA's operations: Schedule and Human Resources: The teacher and student shift schedules coordinated by the Head of the Expertise Program are often ineffective due to a lack of customers, resulting in a hiatus in activities. Teachers are also often constrained by other teaching duties. Industrial Partnerships: Partner industries have not provided the expected mentoring, resulting in less objective assessments of student industry-based competencies.

Program Impact: TEFA has not significantly improved the entrepreneurship program and industry-based student competencies. Time Constraints: The Vice Principal for Curriculum stated that teachers and students' time in the production unit is limited due to classroom teaching. Facilities and Infrastructure: The Vice Principal for Industrial and Public Relations highlighted the need for maximum support to meet official industry/workshop standards, including site design, service delivery, and spare part availability. The Vice Principal for Curriculum also acknowledged the lack of equipment and materials, as well as operational time efficiency. Organizational Structure and Administration: Productive Teacher Desman Telaumbanua emphasized the importance of a structured organization and a team with a strong execution mindset, including front desk staff.

The Head of the TEFA Expertise Program also stated the need for a management model led by a dedicated team. Availability of SOPs and Reporting: The Creative and Entrepreneurship Project (PKK) teacher cited weaknesses related to scheduling, the lack of SOPs, and the absence of TEFA activity reports. Marketing and Student Engagement: Lack of promotion has resulted in limited public awareness of TEFA at the Nias Regional Government Private Vocational School (SMK Swasta Pembda Nias), as acknowledged by students. Furthermore, students feel they have not been fully involved and expect a designated team/group to provide hands-on experience. Ineffective Management Model: Documentation shows that TEFA's vision, mission, objectives, organizational structure, work programs, and action plans are missing. This indicates that tasks and responsibilities are centralized in one person (the Head of the TEFA Expertise Program), resulting in TEFA not functioning as intended.

TEFA Management Model Development

To address these weaknesses, this study developed a TEFA management model using the Borg and Gall Model, consisting of five stages:

Research and Data Collection

This initial stage involved interviews with various stakeholders within the school (the Deputy Head of the Student Affairs Division (Wakakur), the Deputy Head of the Community Development Program (Wahubinmas), the Head of the Technical Education Program (Kapro TO), the Technical Education Productive Teacher (TKT), the Family Welfare Education Teacher (PKK), and 11th-grade students of the Technical Education Program (TKR), as well as a documentation study. The results identified the main problems with the TEFA at SMKS Pembda Nias: the lack of a vision, mission, goals, programs, and action plan; the lack of an organizational structure and division of tasks; an ineffective schedule and operating system; and the lack of reporting, evaluation, and assessment.

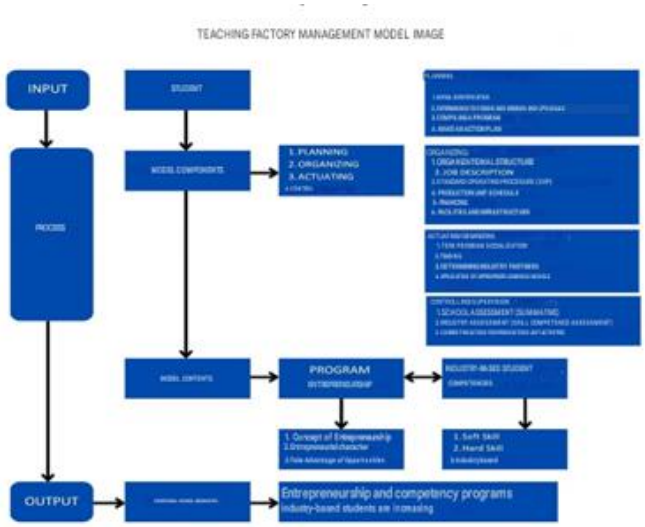

Figure 1. Image of the Vocational School Teaching Factory Model

Planning

Based on the results of the preliminary study, a TEFA management model was designed in the form of a model diagram and a user guidebook, aimed at improving the entrepreneurship program and industry-based student competencies.

Developing a Preliminary Form of Product

The product developed is a TEFA management model that integrates the POAC (Planning, Organizing, Actuating, Controlling) functions. This model has three parts: input (vocational high school students), process (implementation of POAC functions to improve entrepreneurship and industry-based competencies), and output (vocational high school graduates with improved entrepreneurship programs and industry competencies). This teaching factory management model integrates vocational high school students (as input) into a series of structured activities to improve graduate quality. The main process follows the POAC management functions:

Planning

This stage begins with initial identification, followed by establishing the vision, mission, and objectives of the teaching factory, and developing a work program and action plan.

Organizing

At this stage, the school organizes the various resources needed according to the action plan. This includes the allocation of human resources, finances, time, facilities, and infrastructure, as well as determining the division of authority and tasks, including the creation of an organizational structure (Nowotny et al., 2022).

Teaching Factory Management Model Book and Guide

The main product of this research is the Teaching Factory Management Model Book and its guide. This book contains a detailed description of the model, explaining the flow from input, process, to output. The process section specifically outlines the implementation of the POAC management functions (Planning, Organizing, Actuating, Controlling). This book also includes a user guide designed as a practical guide for teaching factory managers in vocational high schools, ensuring easy implementation of the model. After the product draft was developed, validation was carried out by management experts using an instrument consisting of 22 closed statements and recommendation notes for revision.

Table 1. Validation Results of the Teaching Factory Management Model by Management Expert Validators

Assessment Aspects	Validator	
	Dr. Sophia Tri Satyawati, M. Pd	Dr. Marinu Waruwu, S.S., M. Pd
Model Image	74.29 %	80%
Model Description	73.33 %	77.78 %
Model User Guide	80.00 %	76.67 %
Mean	75.45 %	78.18 %
Mean of 2 Validators		76.82 %
Category		Good

Based on the validation results from two management expert validators, the teaching factory management model received a score of 76.82%, categorized as "Good." Therefore, the teaching factory management model can be field-tested with several revisions as recommended by the validators. The expert validators' recommendations are: to make the model more organized with the following systematics: cover, foreword, table of contents, background, model contents and components, conclusion, and bibliography; to produce an attractive book; and to clarify guidelines for using the model according to its objectives.

Discussion of the Teaching Factory Management Model

Management is key to the success of any organization, including teaching factories. By implementing the POAC (Planning, Organizing, Actuating, Controlling) management functions in an integrated manner, teaching factories can achieve their goals efficiently and effectively. Each function is interconnected; weaknesses in one aspect will impact the others. Proper implementation of POAC will enable teaching factories to function optimally, minimize risk, encourage development, and facilitate adaptation to change (Fuertes et al., 2020; Tabares et al., 2025). This concept aligns with research by Abubakar et al. (2019); Alqudah et al. (2022), which demonstrated the effectiveness and efficiency of implementing management functions in teaching factory management.

Planning

The planning stage begins with a comprehensive initial identification by the teaching factory management team, which includes the principal, vice principal for curriculum and industrial relations, head of the expertise program, and productive teachers. This identification includes an analysis of market and industry needs (e.g., the types of services or products required), student competency standards before and after the TEFA activity, types of training and curriculum development (including soft skills and hard skills), an inventory of available resources, school regulations and policies, and potential collaborations with industry (raw material provision, mentoring, quality control, etc.). Following the identification, the team develops the teaching factory's vision, mission, objectives, programs, and action plan.

Organizing

In the organizing stage, a crucial step is establishing a clear organizational structure and outlining the division of duties for each individual (Errida & Lotfi, 2021; Mouazen et al., 2023). The organizational structure is tailored to the teaching factory's services (e.g., vehicle servicing or welding product manufacturing) (Anumbe et al., 2022; Braidy et al., 2025; Giampieri et al., 2020). A clear division of duties will improve coordination, productivity, and flexibility. Furthermore, this stage also involves creating and establishing a workflow or SOP that adheres to industry standards, developing a teaching factory operational schedule (daily, weekly, monthly, or semesterly) that is integrated with the intracurricular schedule and includes weekly targets. Finally, determining funding sources and calculating operational costs is crucial to ensure budget availability, as recognized by (Saputro et al., 2021; Schoenmaker & Schramade, 2025), that financing is a significant challenge in teaching factory management.

Implementation (Actuating)

The implementation phase begins with the socialization of the teaching factory program to the entire school community and the surrounding community through various media. Next, training is conducted for the management team (teachers and students) in both technical and management aspects. For students, learning models such as project-based learning are highly recommended, as they have been proven to foster entrepreneurial spirit and develop hard and soft skills, as demonstrated by (Santoso et al., 2023; Wardani & Iriani, 2022). The implementation of a block schedule is also recommended to ensure student activities in the teaching factory run effectively without having to constantly wait for customers, addressing the problem of downtime, as experienced at the Nias Pembda Vocational School (SMKS). Furthermore, the 5S industrial work culture (Seiri, Seiton, Seiso, Seiketsu, Shitsuke) needs to be consistently implemented to foster professional work attitudes and behaviors, as found by (Rizkya et al., 2019). The involvement and identification of industry partners is also crucial for project implementation, understanding industry work standards, and quality control functions, as emphasized by (De Almeida Vittori Ferreira et al., 2024; Hailu, 2024).

Supervision (Controlling)

The supervision stage includes assessment and evaluation, as well as corrective action. Assessment can be conducted through school assessments at the end of each semester and through joint Vocational Competency Tests (UKK) with industry for 12th-grade students. If student competency targets are not achieved, management is required to make improvements. Progress evaluation and feedback are often overlooked, even though they are crucial to ensuring the teaching factory's objectives are achieved (Darling-Hammond et al., 2020; Poláková et al., 2023). The current weakness at SMKS Pembda Nias, namely the lack of an optimal POAC management function, hampers the development

of entrepreneurship programs and industry-based student competencies (Husna & Fahrimal, 2024). Therefore, implementing a teaching factory management model with a POAC function is highly relevant for SMKS Pembda Nias.

Conclusion

The Nias Regional Government Private Vocational High School (SMK Pembda) is facing challenges in managing its Teaching Factory (TEFA). Currently, the TEFA lacks proper planning, organization, implementation, and supervision. TEFA planning is not documented, and there is no vision, mission, objectives, programs, action plans, organizational structure, task allocation, schedule, or funding that is fully understood by all parties. This prevents TEFA from optimally enhancing its entrepreneurship and industry-based student competency programs, despite the government's expectations. The main weakness is the lack of planning, which leads to overlapping organizational tasks, ineffective implementation, and minimal oversight. As a result, TEFA is underdeveloped and unable to achieve its goal of enhancing entrepreneurship and industry-based student competency. The involvement of industry partners is also suboptimal, confusing TEFA management. To address this, a new TEFA management model has been developed, consisting of a model book containing images, descriptions, and a user guide. This model implements the POAC (Planning, Organizing, Actuating, Controlling) management function, as well as the industry-based entrepreneurship and student competency programs. After validation and testing, this model proved feasible and applicable in vocational schools, with a trial score of 89.33% (Very Good category). This indicates that this new TEFA management model is effective in enhancing entrepreneurship programs and industry-based student competencies in vocational schools.

Acknowledgments
Thank you to all parties who have supported this research. We hope this research proves beneficial.

Author Contributions
Conceptualization; methodology; validation; formal analysis; investigation; resources; data curation: writing—original draft preparation; writing—review and editing; visualization: A., Y. D. All authors have read and approved the published version of the manuscript.

Funding
Researchers independently funded this research.

Conflicts of Interest
The authors declare no conflict of interest.

References

Abubakar, A. M., Elrehail, H., Alatailat, M. A., & Elçi, A. (2019). Knowledge management, decision-making style and organizational performance. *Journal of Innovation & Knowledge*, *4*(2), 104–114. https://doi.org/10.1016/j.jik.2017.07.003

Alqudah, I. H. A., Carballo-Penela, A., & Ruzo-Sanmartín, E. (2022). High-performance human resource management practices and readiness for change: An integrative model including affective commitment, employees' performance, and the moderating role of hierarchy culture. *European Research on Management and Business Economics*, *28*(1), 100177. https://doi.org/10.1016/j.iedeen.2021.100177

Anggitan, T. & Gunadi. (2025). Mediation Effect of Teaching Factory Implementation on Student Work Readiness with Individual Readiness to Change. *Jurnal Pedagogi Dan Pembelajaran*, *8*(1), 144–154. https://doi.org/10.23887/jp2.v8i1.84534

Anumbe, N., Saidy, C., & Harik, R. (2022). A Primer on the Factories of the Future. *Sensors*, *22*(15), 5834. https://doi.org/10.3390/s22155834

Bano, N., Yang, S., & Alam, E. (2022). Emerging Challenges in Technical Vocational Education and Training of Pakistan in the Context of CPEC. *Economies*, *10*(7), 153. https://doi.org/10.3390/economies10070153

Braidy, A., Pokharel, S., & ElMekkawy, T. Y. (2025). Research Perspectives on Innovation in the Automotive Sector. *Sustainability*, *17*(7), 2795. https://doi.org/10.3390/su17072795

Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for educational practice of the science of learning and development. *Applied Developmental Science*, *24*(2), 97–140. https://doi.org/10.1080/10888691.2018.1537791

De Almeida Vittori Ferreira, M., Morgado, C. D. R. V., & Estellita Lins, M. P. (2024). Organizations and stakeholders' roles and influence on implementing sustainability requirements in construction projects. *Heliyon*, *10*(1), e23762. https://doi.org/10.1016/j.heliyon.2023.e23762

Di Paolo, A., & Matano, A. (2022). The impact of combining work with study on the labour market performance of graduates: The joint role of work intensity and job-field match. *International Journal of Manpower*, *43*(7), 1556–1578. https://doi.org/10.1108/ijm-03-2021-0182

Errida, A., & Lotfi, B. (2021). The determinants of organizational change management success: Literature review and case study. *International Journal of Engineering Business Management*, *13*. https://doi.org/10.1177/18479790211016273

Fagerholm, F., Hellas, A., Luukkainen, M., Kyllönen, K., Yaman, S., & Mäenpää, H. (2018). Designing and implementing an environment for software start-up education: Patterns and anti-patterns. *Journal of Systems and Software*, *146*, 1–13. https://doi.org/10.1016/j.jss.2018.08.060

Fuertes, G., Alfaro, M., Vargas, M., Gutierrez, S., Ternero, R., & Sabattin, J. (2020). Conceptual Framework for the Strategic Management: A Literature Review—Descriptive. *Journal of Engineering*, *2020*, 1–21. https://doi.org/10.1155/2020/6253013

Giampieri, A., Ling-Chin, J., Ma, Z., Smallbone, A., & Roskilly, A. P. (2020). A review of the current automotive manufacturing practice from an energy perspective. *Applied Energy*, *261*, 114074. https://doi.org/10.1016/j.apenergy.2019.114074

Hailu, A. T. (2024). The role of university–industry linkages in promoting technology transfer: Implementation of triple helix model relations. *Journal of Innovation and Entrepreneurship*, *13*(1). https://doi.org/10.1186/s13731-024-00370-y

Hariyani, D., Hariyani, P., Mishra, S., & Sharma, M. K. (2024). Causes of organizational failure: A literature review. *Social Sciences & Humanities Open*, *10*, 101153. https://doi.org/10.1016/j.ssaho.2024.101153

Husna, A., & Fahrimal, Y. (2024). Enhancing post-disaster tourism marketing communication in Aceh Jaya Regency. *Jurnal Kajian Komunikasi*, *12*(1), 127–142. https://doi.org/10.24198/jkk.v12i1.54876

Khedr, A. M., & S, S. R. (2024). Enhancing supply chain management with deep learning and machine learning techniques: A review. *Journal of Open Innovation: Technology, Market, and Complexity*, *10*(4), 100379. https://doi.org/10.1016/j.joitmc.2024.100379

Kholifah, N., Nurtanto, M., Mutohhari, F., Hamid, M. A., Mutiara, I., Setiawan, D., & Saputro, I. N. (2025). Factors influencing student career choice in vocational education in Indonesia: A mediating effect of self-efficacy. *Social Sciences & Humanities Open*, *11*, 101369. https://doi.org/10.1016/j.ssaho.2025.101369

Lazíková, J., Takáč, I., Rumanovská, Ľ., Michalička, T., & Palko, M. (2022). Which Skills Are the Most Absent among University Graduates in the Labour Market? Evidence from Slovakia. *Social Sciences*, *11*(10), 438. https://doi.org/10.3390/socsci11100438

Mahindru, R., Kumar, A., Bapat, G., Rroy, A. D., Kavita, & Sharma, N. (2024). Metaverse Unleashed: Augmenting Creativity and Innovation in Business Education. *RAiSE-2023*, 207. https://doi.org/10.3390/engproc2023059207

Marliyah, L. (2024). The Management Dimensions of Entrepreneurship Education in Agribusiness Vocational School (A Case Study in SMKN 1 Bawen and SMK SPMAN Ungaran). *Indonesian Journal of Business and Entrepreneurship*. https://doi.org/10.17358/ijbe.10.2.272

Mouazen, A. M., Hernández-Lara, A. B., Abdallah, F., Ramadan, M., Chahine, J., Baydoun, H., & Bou Zakhem, N. (2023). Transformational and Transactional Leaders and Their Role in Implementing the Kotter Change Management Model Ensuring Sustainable Change: An Empirical Study. *Sustainability*, *16*(1), 16. https://doi.org/10.3390/su16010016

Nowotny, S., Hirsch, B., & Nitzl, C. (2022). The influence of organizational structure on value-based management sophistication. *Management Accounting Research*, *56*, 100797. https://doi.org/10.1016/j.mar.2022.100797

Oketch, M. O. (2007). To vocationalise or not to vocationalise? Perspectives on current trends and issues in technical and vocational education and training (TVET) in Africa. *International Journal of Educational Development*, *27*(2), 220–234. https://doi.org/10.1016/j.ijedudev.2006.07.004

Poláková, M., Suleimanová, J. H., Madzík, P., Copuš, L., Molnárová, I., & Polednová, J. (2023). Soft skills and their importance in the labour market under the conditions of Industry 5.0. *Heliyon*, *9*(8), e18670. https://doi.org/10.1016/j.heliyon.2023.e18670

Ramadhani, I. S., Isbah, M. F., & Azca, M. N. (2025). Intersectional factors in youth transition: Stories of vocational high schools' graduates in Indonesia. *Simulacra*, *8*(1), 63–78. https://doi.org/10.21107/sml.v8i1.28847

Rizkya, I., Hidayati, N., Sari, R. M., & Tarigan, U. (2019). Evaluation of The Leading Work Culture 5S in Industry. *IOP Conference Series: Materials Science and Engineering*, *648*(1), 012003. https://doi.org/10.1088/1757-899x/648/1/012003

Salah, A., Çağlar, D., & Zoubi, K. (2023). The Impact of Production and Operations Management Practices in Improving Organizational Performance: The Mediating Role of Supply Chain Integration. *Sustainability*, *15*(20), 15140. https://doi.org/10.3390/su152015140

Santoso, R. T. P. B., Priyanto, S. H., Junaedi, I. W. R., Santoso, D. S. S., & Sunaryanto, L. T. (2023). Project-based entrepreneurial learning (PBEL): A blended

model for startup creations at higher education institutions. *Journal of Innovation and Entrepreneurship*, *12*(1). https://doi.org/10.1186/s13731-023-00276-1

Saputro, I. N., Soenarto, S., Sofyan, H., Riyanita, M. C., Rebia, P. S., & Listiana, A. (2021). The Effectiveness of Teaching Factory Implementation in Vocational Education: Case Studies in Indonesia. *Universal Journal of Educational Research*, *9*(11), 1841–1856. https://doi.org/10.13189/ujer.2021.091104

Schoenmaker, D., & Schramade, W. (2025). Teaching finance for responsible management. *The International Journal of Management Education*, *23*(2), 101170. https://doi.org/10.1016/j.ijme.2025.101170

Singh, B. J., Chakraborty, A., & Sehgal, R. (2023). A systematic review of industrial wastewater management: Evaluating challenges and enablers. *Journal of Environmental Management*, *348*, 119230. https://doi.org/10.1016/j.jenvman.2023.119230

Surya Patria, A., Krisitiana, N., Ekohariadi, E., Sutiadiningsih, A., & Tejo Sampurno, M. B. (2024). Teaching Factory Management on Vocational High School Case Study: Arts and Creative Industry Competency. *SAR Journal - Science and Research*, 29–35. https://doi.org/10.18421/sar71-05

Tabares, S., Parida, V., & Chirumalla, K. (2025). Twin transition in industrial organizations: Conceptualization, implementation framework, and research agenda. *Technological Forecasting and Social Change*, *213*, 123995. https://doi.org/10.1016/j.techfore.2025.123995

Wardani, M. K., & Iriani, A. (2022). Soft Skill Oriented Project Based Learning Training Module in Center of Excellence Vocational High School. *Journal of Education Action Research*, *6*(2), 286–295. https://doi.org/10.23887/jear.v6i2.44664

Widiatna, A. D., Utami, P. P., & Kemal, I. (2025). Implementing and Managing the Teaching Factory Learning Model at Vocational Schools. *Jurnal Penelitian Pendidikan IPA*, *11*(5), 341–351. https://doi.org/10.29303/jppipa.v11i5.10944

Yasdin, Y., & Muksins, M. (2024). Political paradigms and vocational education policy in Indonesia: A document analysis. *Quality Education for All*, *1*(1), 204–221. https://doi.org/10.1108/qea-10-2023-0007

Yi, E., & Park, D.-H. (2024). The effect of core competencies of university students on employment and first year salary level based on school activity log. *Heliyon*, *10*(7), e28474. https://doi.org/10.1016/j.heliyon.2024.e28474

Zulfiqar, S., Al-reshidi, H. A., Al Moteri, M. A., Feroz, H. M. B., Yahya, N., & Al-Rahmi, W. M. (2021). Understanding and Predicting Students' Entrepreneurial Intention through Business Simulation Games: A Perspective of COVID-19. *Sustainability*, *13*(4), 1838. https://doi.org/10.3390/su13041838

Zuo, H., Zhang, M., & Huang, W. (2025). Lifelong learning in vocational education: A game-theoretical exploration of innovation, entrepreneurial spirit, and strategic challenges. *Journal of Innovation & Knowledge*, *10*(3), 100694. https://doi.org/10.1016/j.jik.2025.100694