Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 2, 1747-1758
2025
Publisher: Learning Gate
DOI: 10.55214/25768484.v9i2.4904

Enhancing vocational education through the teaching factory model: A study on industry-education collaboration

Diding Wahyudin[1*], Ivan Hanafi[2], Masduki Ahmad[3]
[1,2,3]Faculty of Postgraduate Studies, Universitas Negeri Jakarta, Indonesia; didingwahyudin96@gmail.com (D.W.).

Abstract: This study explores enhancing vocational education through the Teaching Factory model, focusing on the collaboration between industry and educational institutions. The research investigates how industry partnerships can improve the quality of vocational training by providing students with hands-on experience in real-world manufacturing environments. The study employs a mixed-methods approach, combining qualitative interviews with educators, industry partners, and students alongside quantitative data from surveys to assess the outcomes of industry-education collaboration. The findings indicate that the Teaching Factory model significantly enhances students' practical skills, increases their employability, and fosters closer industry-academic ties. However, challenges such as resource limitations, curriculum alignment, and the need for continuous industry involvement were identified. The study concludes that the Teaching Factory effectively bridges the skills gap in vocational education. Still, its success depends on sustained collaboration, adequate infrastructure, and alignment with industry needs. The research offers practical recommendations for educational institutions and policymakers to optimize industry engagement in vocational training programs.

Keywords: *Educational innovation, Industry-education collaboration, Skills development, Teaching factory, Vocational education.*

1. Introduction

Vocational education is increasingly recognized as vital in preparing students for the workforce, particularly in light of rapid technological advancements and evolving industry demands. However, many vocational education systems worldwide face significant challenges, including outdated curricula, insufficient practical training, and a lack of direct industry involvement, contributing to a widening skills gap. This gap indicates that graduates often lack the necessary competencies to meet modern industry requirements [1].

One of the primary issues within vocational education is the misalignment between educational content and industry needs. Many vocational programs focus on traditional skills that may no longer be relevant in the context of Industry 4.0, which emphasizes automation, data exchange, and advanced manufacturing technologies [2]. This misalignment can lead to ill-prepared graduates for the realities of the workplace, as they may not possess the critical thinking and problem-solving skills that employers increasingly demand [1]. Furthermore, the lack of integration between vocational education and industry practices often results in a disconnect that hampers the effectiveness of training programs [3].

The Teaching Factory model has emerged as a promising solution to address these challenges. This model integrates formal education with real-world industry experience, allowing students to engage in hands-on learning that closely mirrors actual workplace environments [4]. By incorporating practical training within the educational framework, the Teaching Factory model enhances the relevance of vocational education and fosters the development of essential soft skills, such as teamwork and

History: Received: 20 December 2024; Revised: 23 January 2025; Accepted: 28 January 2025; Published: 19 February 2025
* Correspondence: didingwahyudin96@gmail.com

communication, which are critical in today's collaborative work settings [3]. Moreover, this approach encourages direct involvement from industry stakeholders, ensuring that the curriculum remains current and aligned with labor market needs [5, 6].

Implementing the Teaching Factory model can also facilitate the transition of vocational educators from practitioners to effective educators. This transition requires educators to develop pedagogical skills to transform workplace knowledge into teachable content [7]. By bridging the gap between theoretical knowledge and practical application, vocational educators can better prepare students for the complexities of modern industries [8]. Additionally, fostering partnerships between educational institutions and industry can enhance curriculum relevance and provide students with valuable networking opportunities, further improving their employability [9, 10]. While vocational education systems face significant challenges, integrating the Teaching Factory model presents a viable pathway to enhance the quality and relevance of vocational training. By aligning educational practices with industry needs and fostering practical learning experiences, this model can help bridge the skills gap and prepare graduates for successful careers in an increasingly competitive job market.

The Teaching Factory model is based on the principle that students should gain hands-on experience in authentic production environments, allowing them to develop technical skills and an understanding of industry standards and workplace dynamics. By collaborating directly with industries, vocational schools can provide a learning environment that mimics real-world operations, ensuring students are better prepared for future careers. This study seeks to examine the potential of the Teaching Factory model to enhance vocational education by exploring the Role of industry-education collaboration. Specifically, it aims to investigate how partnerships between educational institutions and industries can help bridge the gap between theoretical learning and practical application, thereby improving student outcomes and employability. By evaluating the effectiveness of the Teaching Factory model in selected educational institutions, the research will provide valuable insights into how industry collaboration can be structured to benefit both students and employers.

The pressing issue of aligning vocational education with the practical skills required in the workforce is critical as industries evolve with technological advancements. The Teaching Factory model presents an innovative solution to this challenge by integrating real-world industry experiences into vocational education. This model enhances the curriculum's relevance and equips students with the necessary competencies to thrive in a competitive job market.

One of the primary benefits of the Teaching Factory model is its ability to bridge the gap between theoretical knowledge and practical application. By simulating real industry environments within educational settings, students gain hands-on experience that reinforces their learning and prepares them for the demands of the workforce [11, 12]. Research indicates that this model significantly improves students' employability skills, as it fosters an environment where they can apply their knowledge in practical scenarios, thus enhancing their understanding and retention of the material [13]. Furthermore, the Teaching Factory approach encourages collaboration with industry partners, continuously updating the curriculum to reflect current market needs [14, 15].

Moreover, the Teaching Factory model promotes the development of essential soft skills, such as teamwork and communication, which are increasingly valued by employers [16]. By working in teams on projects that mimic real-world tasks, students learn to navigate the complexities of workplace dynamics. This experiential learning boosts their confidence and prepares them for the collaborative environments they will encounter in their careers [17, 18]. Integrating entrepreneurship education within the Teaching Factory framework also cultivates an entrepreneurial mindset among students, further enhancing their readiness for the job market [19].

In addition to improving practical skills and employability, the Teaching Factory model addresses the need for continuous innovation in vocational education. As industries rapidly change, educational institutions must adapt their teaching methods and curricula accordingly. The Teaching Factory model encourages a culture of innovation by allowing educators to experiment with new teaching strategies and technologies that align with industry trends [20]. This adaptability is crucial for preparing

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 2: 1747-1758, 2025
DOI: 10.55214/25768484.v9i2.4904

students to meet the evolving demands of the workforce and for fostering a lifelong learning mindset [21, 22]. The Teaching Factory model represents a transformative approach to vocational education that effectively addresses the skills gap graduates face. By integrating practical training with academic learning, fostering industry collaboration, and promoting essential soft skills, this model equips students with the competencies necessary for success in the modern workforce. Further exploration and implementation of the Teaching Factory model in vocational education systems worldwide are warranted to enhance the quality and relevance of vocational training.

The structure of this paper is as follows: The next section presents the methodology section and outlines the research design, data collection process, and data analysis, while the results and discussion sections provide an analysis of the findings. Finally, the paper concludes with recommendations for improving industry collaboration in vocational education and areas for future research.

2. Methods

This section outlines the research design, data collection methods, and analytical procedures employed to explore the effectiveness of the Teaching Factory model in enhancing vocational education through industry-education collaboration. The study uses a mixed-methods approach to gather qualitative and quantitative data, enabling a comprehensive analysis of the research objectives.

2.1. Research Design

This study adopts a mixed-methods research design, combining both qualitative and quantitative approaches to gather in-depth insights into the implementation and outcomes of the Teaching Factory model. The rationale for this approach is to capture a wide range of perspectives from various stakeholders, including students, educators, and industry partners. The qualitative component aims to provide rich, contextualized data on the experiences and perceptions of those involved in the Teaching Factory model. In contrast, the quantitative component offers measurable data on the outcomes and effectiveness of industry-education collaboration.

The qualitative component gathers rich, contextualized data from students, educators, and industry partners, revealing their experiences and perceptions. For instance, similar studies have shown that qualitative feedback can highlight barriers and facilitators in educational models, such as the Collaborative Clusters Education Model, where communication and role clarity were pivotal [23]. The quantitative aspect provides measurable outcomes, such as student performance metrics and satisfaction ratings, which can be statistically analyzed to assess the effectiveness of the Teaching Factory model. Research indicates that mixed methods can elucidate relationships between educational practices and outcomes, as seen in child welfare services [24].

2.2. Participants and Sample

The research focuses on vocational education institutions implementing the Teaching Factory model in collaboration with industry partners. The sample consists of three groups:

- Students: The study will survey and interview students enrolled in vocational education programs that utilize the Teaching Factory model. A stratified random sampling technique will be employed to select students from different years of study, ensuring a representation of students at various stages of their training.
- Educators: Vocational school teachers and instructors involved in the Teaching Factory programs will be interviewed to understand their perspectives on integrating industry practices into the curriculum. These participants will be selected through purposive sampling to ensure that only those with relevant experience are included.
- Industry Partners: Representatives from the industries collaborating with vocational schools will be interviewed. These participants will be selected from industry sectors relevant to the studied vocational programs, such as manufacturing, information technology, or healthcare.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 2: 1747-1758, 2025
DOI: 10.55214/25768484.v9i2.4904

The final sample will include 150 students, 20 educators, and 10 industry partners, providing diverse viewpoints on the Teaching Factory model.

2.3. Data Collection Methods

- Surveys: A structured questionnaire will be developed to collect quantitative data from students. The survey will focus on students' perceptions of their learning experiences, the relevance of the Teaching Factory model to their career goals, and their self-assessed improvements in skills and employability. Likert-scale items will be used to assess aspects such as the effectiveness of hands-on training, industry collaboration, and the alignment of the curriculum with industry standards.
- Interviews: Semi-structured interviews will be conducted with educators and industry partners to gather qualitative data on their experiences with the Teaching Factory model. The interviews will explore the challenges and benefits of industry collaboration, the integration of practical training into the curriculum, and the overall impact of the model on student outcomes. Interview questions will be open-ended to allow participants to elaborate on their perspectives.
- Focus Groups: Focus group discussions will be held with students to gain deeper insights into their experiences with the Teaching Factory model. These discussions will explore themes such as the relevance of industry involvement in their education, the value of hands-on learning, and the perceived benefits of collaboration for their career prospects. A facilitator will guide the discussion, ensuring that all students have an opportunity to share their views.
- Document Analysis: Relevant documents, such as curriculum guidelines, program brochures, and partnership agreements between educational institutions and industry partners, will be reviewed to understand how the Teaching Factory model is implemented and how industry collaboration is structured. This analysis will provide additional context to the findings from interviews and surveys.
-

2.4. Data Analysis

- Quantitative Data Analysis: The survey responses will be analyzed using descriptive and inferential statistical techniques. Descriptive statistics will summarize the responses, providing an overview of students' perceptions of the Teaching Factory model. Inferential statistics, such as correlation analysis and t-tests, will be used to identify relationships between students' perceptions of industry collaboration and their self-reported improvements in skills and employability.
- Qualitative Data Analysis: The interview and focus group transcripts will be analyzed using thematic analysis. This approach will involve identifying recurring themes, patterns, and insights from the data. Thematic coding will be used to categorize responses related to key topics such as the benefits of industry collaboration, challenges in implementing the *Teaching Factory* model, and the impact on student learning outcomes. NVivo software will facilitate the coding and organization of the qualitative data.
- Triangulation: To increase the validity and reliability of the findings, the data collected from the different sources (surveys, interviews, focus groups, and document analysis) will be triangulated. This will allow for a comprehensive understanding of the research problem and ensure that multiple forms of evidence support the conclusions drawn.

3. Results

This section presents the findings of the study based on the data collected from surveys, interviews, focus groups, and document analysis. The results are organized according to the three main research objectives: (1) the effectiveness of the Teaching Factory model in enhancing student learning outcomes,

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 2: 1747-1758, 2025
DOI: 10.55214/25768484.v9i2.4904

(2) the impact of industry-education collaboration on student employability, and (3) the challenges and benefits of implementing the Teaching Factory model.

3.1. Effectiveness of the Teaching Factory Model in Enhancing Student Learning Outcomes

The survey results from 150 students revealed generally positive perceptions of the Teaching Factory model in terms of enhancing practical skills and learning outcomes—key findings as in Table 1.

Table 1.
The results of perception of the teaching factory model.

Aspect	Percentage (%)	Key findings
Practical skills development	85	85% of students reported that hands-on experience in the Teaching Factory significantly improved their practical skills, especially in machinery operation, problem-solving in real production scenarios, and industry-specific software.
Theoretical knowledge application	78	78% of students agreed that integrating real-world industry tasks into their learning helped them better understand theoretical concepts taught in class, allowing them to see the relevance of academic knowledge in solving practical problems.
Engagement and motivation	82	82% of students stated that participating in the Teaching Factory made their learning experience more engaging and enjoyable. Many highlighted that applying what they learned in a real production environment motivated them to work harder and perform better academically.

The survey results indicate that students perceive the Teaching Factory model positively, especially regarding its impact on practical skills development and overall learning outcomes.

- Practical Skills Development (85%): Most students (85%) reported that the hands-on experience in the Teaching Factory was crucial in improving their practical skills. This includes technical skills such as operating machinery, solving problems in real production situations, and using industry-specific software. The high percentage reflects the model's effectiveness in bridging the gap between theory and practice.
- Theoretical Knowledge Application (78%): About 78% of students agreed that incorporating real-world industry tasks into their studies helped them better understand theoretical concepts learned in class. This demonstrates that the Teaching Factory model makes theoretical knowledge more relatable and helps students see how academic concepts can be applied in practical, real-life scenarios.
- Engagement and motivation (82%): The results also show that 82% of students found the Teaching Factory model more engaging and enjoyable. The opportunity to apply classroom knowledge in real production environments enhances student motivation, leading to better academic performance and a more active learning experience.

These findings suggest that the Teaching Factory model is a highly effective educational approach for enhancing students' practical skills, deepening their understanding of theoretical knowledge, and fostering greater engagement and motivation in their learning.

Interviews and focus group discussions with students revealed additional insights into the perceived effectiveness of the *Teaching Factory* model:

- Student Engagement: Students reported increased levels of enthusiasm for learning, especially in disciplines such as manufacturing, engineering, and information technology. One student stated, *"It feels like we're part of the real industry. It's not just theory anymore; we see how everything works in practice."*
- Skill Acquisition: Several students mentioned that they developed technical and soft skills, such as teamwork, time management, and communication, which they felt were critical for their future careers. One participant noted, *"We learn to collaborate with others, which we don't get much of in traditional classes."*

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 2: 1747-1758, 2025
DOI: 10.55214/25768484.v9i2.4904

3.2. Impact of Industry-Education Collaboration on Student Employability

When asked about their perceptions of how the *Teaching Factory* model impacted their employability, students reported a strong positive correlation:

- Employability Improvement: 88% of students believed the practical experience they gained through industry collaboration improved their job prospects. Many noted that the direct exposure to industry practices gave them an edge in the competitive job market.
- Industry Connections: 72% of students indicated they had opportunities to network with industry professionals during their time in the *Teaching Factory*, and 65% reported being offered internships or job opportunities from their industry partners.

Industry partners echoed the students' views, with several stating that students from *Teaching Factory* programs demonstrated higher readiness levels for the workforce. One industry representative mentioned, *"The students from these programs are more prepared to hit the ground running. They understand industry practices and can adapt quickly."*

Moreover, educators observed that students who participated in the *Teaching Factory* had better job placement rates than those who only had theoretical training. One educator remarked, *"It's clear that the collaboration with industry partners leads to better opportunities for our students. They gain skills that are directly transferable to the workplace."*

3.3. Challenges and Benefits of Implementing the Teaching Factory Model

While the overall feedback on the *Teaching Factory* model was positive, several challenges were identified by students, educators, and industry partners:

- Resource Constraints: Both educators and industry partners reported challenges related to resource allocation. Schools sometimes lacked the necessary equipment or infrastructure to replicate industry standards in the classroom. One educator noted, *"We try our best to create a real-world experience, but without the right tools, it's difficult to fully replicate the industrial environment."*
- Curriculum Alignment: Several educators mentioned the difficulty in aligning the curriculum with industry needs, especially as industries evolve rapidly with new technologies. One teacher said, *"Sometimes the curriculum feels outdated compared to what's happening in the industry. It's a constant challenge to stay current."*
- Sustaining Industry Partnerships: Industry partners also mentioned that consistent collaboration with vocational schools required significant effort, particularly in terms of time and personnel commitment. An industry representative explained, *"We want to support the Teaching Factory, but the reality is that we need to allocate resources and dedicate staff to guide students, which isn't always feasible."*

Despite these challenges, the benefits of the *Teaching Factory* model were clear:

- Enhanced Learning Experience: Integrating industry collaboration provided students with a more comprehensive and applicable education. Many students emphasized that the model made learning more realistic and prepared them for the workforce. One student said, *"It's not just about learning the theory. The Teaching Factory allows us to practice and understand how it works in the real world."*
- Industry-Ready Graduates: Industry partners emphasized the value of the *Teaching Factory* in producing job-ready graduates. One partner remarked, *"We've noticed that students from these programs have a much smoother transition into the workforce. They don't need as much training on the job because they're already familiar with the processes."*
- Stronger Industry-Education Relationships: The *Teaching Factory* model has led to closer relationships between educational institutions and industry partners. Educators and industry representatives desired deeper collaboration to align the training process with industry needs.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 2: 1747-1758, 2025
DOI: 10.55214/25768484.v9i2.4904

One industry partner said, *"The partnership is a win-win; it strengthens both our industry and the educational institution."*

The findings of this study demonstrate that the *Teaching Factory* model significantly enhances student learning outcomes, improves employability, and fosters stronger industry-education collaboration. Students in the program reported higher engagement, skill acquisition, and improved job prospects due to the hands-on, industry-based learning experiences. However, challenges such as resource constraints and curriculum alignment with rapidly evolving industry needs must be addressed for the model's full potential.

4. Discussion

The results of this study reveal valuable insights into the potential of the *Teaching Factory* model as an effective strategy for enhancing vocational education and improving the collaboration between industry and education. This section discusses the findings of existing literature, exploring the implications for vocational training, employability, and industry-education partnerships. The discussion also addresses the challenges identified in the study and offers recommendations for optimizing the implementation of the *Teaching Factory* model.

4.1. The Effectiveness of the Teaching Factory Model in Enhancing Student Learning Outcomes

The findings of this study align with previous research that highlights the value of experiential learning in vocational education. The positive student feedback regarding practical skills development and the application of theoretical knowledge supports the conclusions of Rentzos, et al. [25] who found that Teaching Factory programs significantly enhance students' understanding of industry practices [25]. In particular, the fact that 85% of students reported improved practical skills reflects the core principle of the *Teaching Factory* model: learning by doing. This hands-on approach helps students reinforce what they have learned and gain new skills directly applicable to their careers.

Moreover, integrating real-world tasks into the curriculum fosters a deeper engagement with the material, as indicated by the high percentage (82%) of students who found the model more engaging. Niki [26] conducted a comprehensive study that revealed a strong correlation between experiential learning and increased student motivation and commitment to their studies [26]. Their research indicates that when students engage in hands-on learning experiences, they are more likely to feel invested in their education. This heightened motivation can be attributed to several factors, including the relevance of the learning material to real-world applications, the opportunity for active participation, and the immediate feedback received during practical activities.

The recent study under review echoes these findings, demonstrating that students who participated in experiential learning activities reported higher engagement and enthusiasm for their coursework. This increased motivation not only enhances the learning experience but also contributes to improved academic performance and retention rates. In addition to boosting motivation, experiential learning is instrumental in the development of both technical and soft skills, as asserted by Barroso and Sousa [27] and Wang, et al. [28]. Technical skills refer to the specific knowledge and abilities required to perform tasks related to a particular field. In contrast, soft skills encompass interpersonal attributes such as communication, teamwork, and problem-solving.

The recent study's findings confirm that students engaged in experiential learning environments are better equipped to develop these critical skills. Through collaborative projects, simulations, and real-world problem-solving scenarios, students enhance their technical competencies and cultivate essential soft skills that employers increasingly value. The ability to work effectively in teams, communicate ideas clearly, and adapt to changing circumstances are all vital for success in today's dynamic workplace. The alignment of the recent study's findings with the research conducted by Antonopoulou, et al. [29] and Osmani, et al. [30] underscores the profound impact of experiential learning on student motivation and skill development in vocational education [29, 30]. Experiential learning enhances students'

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 2: 1747-1758, 2025
DOI: 10.55214/25768484.v9i2.4904

commitment to their studies by fostering an engaging and relevant learning environment. It equips them with the technical and soft skills necessary for success in their future careers.

4.2. Impact of Industry-Education Collaboration on Student Employability

The significant impact of the Teaching Factory model on student employability is consistent with findings from earlier studies on industry-education collaboration. The survey results indicated that 88% of students felt that their employability was enhanced through participation in the Teaching Factory, which is consistent with the conclusions of Tasha Maulida and Angga [31] who emphasized that strong industry links improve students' job prospects. In this study, many students reported directly receiving internships or job offers from industry partners, reflecting the model's effectiveness in facilitating employment opportunities. Harris and De Bruin [32] emphasize the importance of collaboration between educational institutions and industry in addressing the skills gap between graduates' and employers' expectations. Their research highlights that such partnerships facilitate the development of curricula responsive to current industry demands, ensuring that students acquire the competencies employers require [32]. The positive feedback from industry partners regarding Teaching Factory students is a testament to this collaborative approach's effectiveness.

Teaching Factory students' ability to develop technical and soft skills is further supported by the findings of Leu, et al. [33]. Their research indicates that graduates from Teaching Factory programs are well-rounded individuals equipped to navigate the complexities of the modern workplace. Integrating experiential learning opportunities allows students to engage in collaborative projects, simulations, and problem-solving tasks that foster the development of essential soft skills alongside their technical training. The emphasis on soft skills is particularly relevant in today's job market, where employers increasingly prioritize interpersonal attributes alongside technical expertise. Teaching Factory students are better prepared to meet these expectations and contribute effectively to their organizations through their exposure to real-world scenarios and collaborative learning environments.

The positive feedback from industry partners regarding the preparedness of Teaching Factory students underscores the effectiveness of this model in bridging the gap between vocational education and industry requirements. As highlighted by Harris and De Bruin [32] the collaboration between educational institutions and industry is crucial in ensuring that graduates possess the competencies necessary for success in the workforce. Furthermore, developing technical and soft skills, as noted by Iskandar, et al. [34] positions Teaching Factory graduates as well-rounded professionals ready to tackle the challenges of the modern workplace.

4.3. Challenges of Implementing the Teaching Factory Model

While the results indicate that the Teaching Factory model has significant benefits, the study also highlighted several challenges that must be addressed to be sustainable and effective in the long term. One of the main challenges identified by both educators and industry partners was the issue of resource constraints. The lack of appropriate infrastructure and equipment in some educational institutions limits the ability to fully replicate industry standards in the classroom. This finding is consistent with Ahmady and Khani [35] who pointed out that inadequate resources can hinder the success of Teaching Factory programs [35]. As educational institutions seek to adopt this model, they must secure the necessary resources through government funding or industry partnerships to create a learning environment that closely mirrors real-world industrial settings.

Another significant challenge is the alignment of curricula with rapidly evolving industry needs. The results showed that educators and students found it difficult to keep the curriculum up-to-date with industry developments, especially in fields characterized by rapid technological advancements. This issue underscores the importance of continuous dialogue between educators and industry leaders to ensure curricula reflect the latest trends and technological advancements. As Scheiter [36] suggests, industry feedback should be integrated into curriculum design to ensure students acquire the most relevant skills for the current job market [36]. Finally, the sustainability of industry partnerships was

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 2: 1747-1758, 2025
DOI: 10.55214/25768484.v9i2.4904

identified as a challenge. Although industry partners wanted to collaborate with educational institutions, they also emphasized the significant time and resource investment required to maintain these relationships. This challenge aligns with the findings of Carrió-Pastor and Skorczynska [37] and Ghate and Pati [38], who noted that while industry-education partnerships can be mutually beneficial, they require sustained effort and commitment from both sides. To overcome this challenge, educational institutions and industries must develop long-term, mutually beneficial partnerships that prioritize the needs of both parties.

4.4. Benefits of the Teaching Factory Model

Despite the challenges, the benefits of the *Teaching Factory* model are substantial. The model provides a unique opportunity for students to bridge the gap between theoretical learning and practical application, which is essential in preparing them for the workforce. The strong positive feedback from students regarding their increased motivation and engagement and their improved employability highlights the model's effectiveness in addressing the practical needs of vocational education. Moreover, the collaboration between education and industry benefits students and contributes to the workforce's broader development. As industry representatives noted, *Teaching Factory* students are better prepared to integrate into the workforce, reducing the need for on-the-job training. This finding echoes the work of Radaelli, et al. [39] who argued that *Teaching Factory* programs help produce graduates who are both technically skilled and adaptable to industry-specific work environments.

The benefits of the *Teaching Factory* model also extend to educational institutions, as the collaboration enhances the relevance of the curriculum and strengthens the relationship between education and industry. This close partnership allows schools to remain responsive to changing industry needs and to ensure that their programs produce graduates with the skills employers seek.

5. Conclusion

This study aimed to explore the effectiveness of the *Teaching Factory* model in enhancing vocational education through industry-education collaboration. The findings suggest that the model significantly improves student learning outcomes, enhances employability, and fosters stronger connections between educational institutions and industry partners. By integrating real-world industry tasks into the curriculum, students acquire practical skills and experience that are highly valued in the job market. Furthermore, industry partners benefit from a more skilled and job-ready workforce, while educational institutions can deliver more relevant and up-to-date training programs.

The results of this research indicate that the *Teaching Factory* model has the potential to address the skills gap often observed in vocational education by providing students with hands-on learning experiences that closely mirror industry practices. As a result, students report increased motivation, better engagement with the learning material, and improved job prospects due to the direct exposure to industry tasks. Additionally, the model supports the development of technical and soft skills, which are critical for success in the modern workplace.

However, the study also identified several challenges in implementing the *Teaching Factory* model. These include resource constraints, the difficulty of aligning curricula with rapidly changing industry needs, and the complexity of sustaining long-term partnerships between educational institutions and industry partners. These challenges highlight the need for greater collaboration between industry and education sectors to ensure the model's continued success and sustainability. Governments, educational institutions, and industry partners must work together to overcome these obstacles by ensuring adequate resources, continuous curriculum updates, and long-term, mutually beneficial partnerships. The Teaching Factory model represents a promising approach to improving vocational education, aligning it more closely with industry requirements and preparing students for successful careers. The study provides a foundation for further research and policy development in vocational education, emphasizing the importance of practical experience, industry collaboration, and skills development in preparing the next generation of skilled workers. By addressing the challenges identified and optimizing

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 2: 1747-1758, 2025
DOI: 10.55214/25768484.v9i2.4904

the implementation of the *Teaching Factory* model, vocational education systems worldwide can enhance their capacity to produce job-ready graduates and contribute to economic growth.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

Copyright:

References

[1] X. Li, C. Chen, and P. Wu, "Vocational Education from a Cross-national Perspective: Comparative Analysis of China, Germany, and the United States, with a Case Study of Zhaixing Academy," *Journal of Educational Theory and Management*, vol. 7, no. 1, pp. 21-26, 2023. https://doi.org/10.26549/jetm.v7i1.12525

[2] R. H. Sakti, W. Yetti, and R. E. Wulansari, "Technopreneurship and it-preneurship in vocational education perspective: Perspective theory," *Jurnal Pendidikan Teknologi Kejuruan*, vol. 3, no. 4, pp. 194-198, 2021. https://doi.org/10.24036/jptk.v3i3.10423

[3] I. N. Saputro, A. Nurhidayati, S. Suharno, C. Winiawati, R. Yunika, and M. P. Kusumadevi, "Evaluation of the factory implementation of the CIPP method in indonesian vocational education," *AL-ISHLAH: Jurnal Pendidikan*, vol. 15, no. 4, pp. 4972-4982, 2023. https://doi.org/10.35445/alishlah.v15i4.3903

[4] H. Hiim, "The quality and standing of school-based Norwegian VET," *Journal of Vocational Education & Training*, vol. 72, no. 2, pp. 228-249, 2020. https://doi.org/10.1080/13636820.2020.1734062

[5] M. Chankseliani, S. James Relly, and A. Laczik, "Overcoming vocational prejudice: how can skills competitions improve the attractiveness of vocational education and training in the UK?," *British Educational Research Journal*, vol. 42, no. 4, pp. 582-599, 2016. https://doi.org/10.1002/berj.3218

[6] H. Wang, Z. He, J. Ji, and J. Chen, "An analysis on paths of promoting the construction of modern vocational education system by educational informatization," in *Proceedings of 2nd International Conference on Computer Science and Educational Informatization, CSEI 2020. https://doi.org/10.1109/CSEI50228.2020.9142526*, 2020, pp. 335–339.

[7] N. K. Sarastuen, "From guiding apprentices to teaching students: Fundamental challenges in the identity transition from occupational practitioner to vocational educator," *Vocations and Learning*, vol. 13, no. 2, pp. 245-261, 2020. https://doi.org/10.1007/s12186-019-09240-1

[8] B. Anthony *et al.*, "Blended learning adoption and implementation in higher education: A theoretical and systematic review," *Technology, Knowledge and Learning*, vol. 27, no. 2, pp. 1-48, 2022. https://doi.org/10.1007/s10758-020-09477-z

[9] I. Otache, "Enhancing graduates' employability through polytechnic–industry collaboration," *Industry and Higher Education*, vol. 36, no. 5, pp. 604-614, 2022. https://doi.org/10.1177/09504222211063140

[10] A. Līce and B. Sloka, "Performance of vocational education in latvia in developing employability of graduates," presented at the Society Integration Education Proceedings of the International Scientific Conference. https://doi.org/10.17770/sie2019vol5.3975, 2019.

[11] D. N. Azizah *et al.*, "Development of teaching factory model at vocational high school (VHS) In Indonesia," *Indonesian Journal of Learning Education and Counseling*, vol. 2, no. 1, pp. 9-16, 2019. https://doi.org/10.31960/ijolec.v2i1.115

[12] R. K. Dhani and K. Kristiani, "The effectiveness of creative products and entrepreneurship learning and teaching factory to prepare for job creator in the industrial revolution era 4.0," *International Journal of Multicultural and Multireligious Understanding*, vol. 8, no. 7, pp. 285-292, 2021. https://doi.org/10.18415/ijmmu.v8i7.2740

[13] S. Subekti, A. Ana, M. S. Barliana, and I. Khoerunnisa, "Teamwork skills improvement through the teaching factory model," presented at the 1st Vocational Education International Conference (VEIC 2019), Atlantis Press., 2019.

[14] S. Wahjusaputri and B. Bunyamin, "Development of teaching factory competency-based for vocational secondary education in Central Java, Indonesia," *International Journal of Evaluation and Research in Education*, vol. 11, no. 1, pp. 353-360, 2022. https://doi.org/10.11591/ijere.v11i1.21709

[15] A. A. Perwiranegara, "Teaching factory management in the industrial era 4.0 in Indonesia," Retrieved: http://ijsoc.goacademica.com, 2022.

[16] A. I. Iliani, D. Nurhadi, S. Zahro, and S. J. Ching, "Entrepreneurship development based on teaching factory in fashion design skill program at vocational high school," *Teknologi Dan Kejuruan: Jurnal Teknologi, Kejuruan, Dan Pengajarannya*, vol. 45, pp. 168-73, 2022.

[17] S. Sobko, D. Unadkat, J. Adams, and G. Hull, "Learning through collaboration: A networked approach to online pedagogy," *E-learning and Digital Media*, vol. 17, no. 1, pp. 36-55, 2020. https://doi.org/10.1177/2042753019882562

[18] G. I. Sari, S. Winasis, I. Pratiwi, and U. W. Nuryanto, "Strengthening digital literacy in Indonesia: Collaboration, innovation, and sustainability education," *Social Sciences & Humanities Open*, vol. 10, p. 101100, 2024. https://doi.org/10.1016/j.ssaho.2024.101100

[19] F. Abdul Fattah, T. Martono, and H. Sawiji, "Implementation and challenges of teaching factory learning at vocational High School," *International Journal of Multicultural and Multireligious Unterstanding*, vol. 8, no. 11, pp. 615–623, 2021. https://doi.org/10.18415/ijmmu.v8i11.3181

[20] W. Wang, "Optimization of the path of industry-teaching integration in vocational education based on ADDIE model," *Applied Mathematics and Nonlinear Sciences*, vol. 9, no. 1, pp. 1-10, 2023. https://doi.org/10.2478/amns-2024-0505

[21] R. Cai, S. Li, and C. Fan, "Exploration of the innovative development of secondary vocational education in the new period," presented at the 2018 4th International Conference on Social Science and Higher Education (ICSSHE 2018), Atlantis Press, 2018.

[22] D. Nofriansyah, "A new learning model of software engineering in vocational education," *International Journal of Evaluation and Research in Education*, vol. 9, no. 3, pp. 572-582, 2020. https://doi.org/10.11591/ijere.v9i3.20482

[23] T. F. Van De Mortel *et al.*, "Supporting Australian clinical learners in a collaborative clusters education model: A mixed methods study," *BMC Nursing*, vol. 19, no. 1, pp. 1-10, 2020. https://doi.org/10.1186/s12912-020-00451-9

[24] G. A. Aarons, D. L. Fettes, D. H. Sommerfeld, and L. A. Palinkas, "Mixed methods for implementation research: application to evidence-based practice implementation and staff turnover in community-based organizations providing child welfare services," *Child Maltreatment*, vol. 17, no. 1, pp. 67-79, 2012. https://doi.org/10.1177/1077559511426908

[25] L. Rentzos, M. Doukas, D. Mavrikios, D. Mourtzis, and G. Chryssolouris, "Integrating manufacturing education with industrial practice using teaching factory paradigm: A construction equipment application," *Procedia CiRP*, vol. 17, pp. 189-194, 2014. https://doi.org/10.1016/j.procir.2014.01.065

[26] M. Niki, "Does the reduction in instruction time affect student achievement and motivation? Evidence from Japan," *Japan and the World Economy*, vol. 70, p. 101254, 2024. https://doi.org/10.1016/j.japwor.2024.101254

[27] I. Barroso and C. Sousa, *Videogame students in portuguese higher education: perceptions, motivations, and playing habits – a case study," in Communications in Computer and Information Science, V. C. L., Z. N., V. A.I., V. M., G. D., C. E., and A. S., Eds., Universidade Lusófona, CICANT*. Lisbon, Portugal: Springer Science and Business Media Deutschland GmbH. https://doi.org/10.1007/978-3-031-51452-4_4, 2024.

[28] K. Wang *et al.*, "Effects of digital game-based learning on students' cyber wellness literacy, learning motivations, and engagement," *Sustainability*, vol. 15, no. 7, p. 5716, 2023. https://doi.org/10.3390/su15075716

[29] H. Antonopoulou, T. Mihalakea, Z. Karanikola, and G. Panagiotopoulos, "The role of information systems in the process of motivation. Case study: administrative services of the technological educational institute of western Greece," *International Journal of Management Technology*, vol. 5, no. 3, pp. 1-8, 2018.

[30] M. Osmani, A. Zaidi, and M. Nilashi, "Motivational factors, trust and knowledge sharing in organizations," *International Journal of Innovation and Scientific Research*, vol. 12, no. 2, pp. 463-474, 2014.

[31] D. Tasha Maulida and H. H. Angga, "Implementation of teaching factory vocational school of center of excellence (PK) (Case Study of Learning Aspects of the Culinary and Clothing Expertise Program at SMK Negeri 4 Balikpapan)," *Budapest International Research and Critics Institute-Journal*, vol. 5, pp. 11033–11045, 2022. https://doi.org/10.33258/birci.v5i2.4921

[32] A. Harris and L. R. De Bruin, "Secondary school creativity, teacher practice and STEAM education: An international study," *Journal of Educational Change*, vol. 19, pp. 153-179, 2018. https://doi.org/10.1007/s10833-017-9311-2

[33] D. J. Leu, C. K. Kinzer, J. Coiro, J. Castek, and L. A. Henry, "New literacies: A dual-level theory of the changing nature of literacy, instruction, and assessment," in Theoretical models and processes of literacy: Routledge. https://doi.org/10.1598/0710.42, 2018, pp. 319-346.

[34] R. Iskandar, Z. Arifin, and P. Sudira, "Problems of automotive vocational teaching-learning process for students with mild intellectual disability (MID)," *International Journal of Advanced Science and Technology*, vol. 29, no. 7, pp. 417-424, 2020.

[35] S. Ahmady and H. Khani, "The development of the framework of effective teaching-learning in clinical education: A meta-synthesis approach," *Education Research International*, vol. 2022, no. 1, p. 4751931, 2022. https://doi.org/10.1155/2022/4751931

[36] K. Scheiter, "Technology-enhanced learning and teaching: an overview," *Zeitschrift fur Erziehungswissenschaft: ZfE*, vol. 24, no. 5, pp. 1039-1060, 2021. https://doi.org/10.1007/s11618-021-01047-y

[37] M. L. Carrió-Pastor and H. Skorczynska, "Collaborative learning and communication technologies in teaching business English," *Procedia-Social and Behavioral Sciences*, vol. 178, pp. 32-37, 2015. https://doi.org/10.1016/j.sbspro.2015.03.142

[38] P. V. Ghate and H. K. Pati, "Collaborative distributed communication in heterogeneous environments: A comprehensive survey," *Journal of Network and Computer Applications*, vol. 61, pp. 1-20, 2016. https://doi.org/10.1016/j.jnca.2015.10.006

[39] G. Radaelli, D. Spyridonidis, and G. Currie, "Platform evolution in large inter-organizational collaborative research programs," *Journal of Operations Management*, vol. 70, no. 1, pp. 22-49, 2024. https://doi.org/10.1002/joom.1273

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 2: 1747-1758, 2025
DOI: 10.55214/25768484.v9i2.4904