International Research Journal of Multidisciplinary Scope (IRJMS), 2026; 7(1): 679-697 IRJMS

Original Article | ISSN (O): 2582-631X DOI: 10.47857/irjms.2026.v07i01.08512

Evaluating Indonesia's Vocational Centre of Excellence Program with the Kirkpatrick Model: Linking Facilities, Resources, and Student Outcomes

Joni Wuryanto*, Anan Sutisna, Yetti Supriyati Saefudin

Educational Research and Evaluation, Universitas Negeri Jakarta, Indonesia. *Corresponding Author's Email: joni.pep25@gmail.com

Abstract

Indonesia's Vocational High School Center of Excellence (SMK PK) Program seeks to enhance vocational education quality and strengthen graduate readiness for the labor market, yet alignment between school outputs and industry needs remains limited. This study evaluates the influence of facilities, teacher competence, curriculum implementation, and learning innovation on student learning outcomes using the Kirkpatrick Model to address the urgency of evidence-based improvements in vocational education. A mixed-methods sequential exploratory design was applied, and purposive sampling was used to select school principals, teachers, and program managers directly involved in the SMK PK program. Data were obtained through document analysis, interviews, observations, and questionnaires. Path analysis revealed that school facilities (X1), teacher competence (X2), and learning innovation (X4) significantly and positively affected student learning outcomes (Y), with path coefficients of 0.576, 0.584, and 0.492 ($p < 0.001$). Curriculum implementation (X3) showed no significant effect (–0.049, $p = 0.326$). Additionally, school facilities (X1) and learning innovation (X4) significantly influenced curriculum relevance to industry needs, with coefficients of 0.406 ($p < 0.001$) and 0.161 ($p = 0.002$). This study has limitations, including restricted sample coverage due to purposive sampling, the focus on selected SMK PK institutions, and reliance on self-reported data that may introduce bias. Nevertheless, the results provide relevant insights for policymakers and practitioners to refine the SMK PK program and advance Indonesia's efforts to build a responsive, competitive, and future-oriented vocational education system.

Keywords: Evaluating, Indonesia's Vocational Centre, Excellence Program, Kirkpatrick Model.

Introduction

Unemployment remains a persistent structural challenge in Indonesia's national development agenda. Despite the implementation of various mitigation programs, the unemployment rate has not demonstrated a significant or consistent decline (1-3). A critical underlying factor is the disparity between the steadily increasing labour force and the limited capacity for job creation (4, 5). This structural imbalance creates an urgent need for strategic interventions that directly enhance the quality, relevance, and competitiveness of human resources produced by the national education system. Such urgency grows even stronger as Indonesia approaches its demographic bonus period, where failures in workforce preparation may lead to long-term socio-economic consequences. To address these challenges, the Indonesian government has placed human resource development as a top priority in the 2020–2024 National Medium-Term Development Plan (RPJMN), in accordance with Presidential Regulation No. 18 of 2020. This development framework emphasizes cultivating a high-quality, globally competitive, and character-driven workforce. As part of this vision, the Ministry of Administrative and Bureaucratic Reform identified five presidential priorities for the 2019–2024 periods, with the second focused explicitly on improving education quality and managing national talent. Moreover, the Cabinet Secretariat (2020) highlighted that strengthening vocational education is essential to accelerate the production of a skilled labour force that can compete in domestic and international job markets. These national directives collectively signal an urgent expectation that vocational education must undergo accelerated reform to ensure its outputs match rapidly changing industrial needs. In the context of rapid advancements in science and technology during

(Received 04th October 2025; Accepted 26th December 2025; Published 20th January 2026)

the era of globalization, vocational education, particularly at the Vocational High School (Sekolah Menengah Kejuruan/SMK) level, is expected to evolve into an institutional model capable of producing adaptive, skilled, and industry-aligned graduates (6-8). The Ministry of Education and Culture (9) has aligned its 2020–2024 strategic plans with the RPJMN and the long-term national vision for a "Golden Indonesia 2045." The primary focus of this strategy is the development of globally competitive human resources through strengthening the quality of education and enhancing 21st-century skills. Yet, despite these strong policy commitments, actual learning outcomes and graduate readiness often fall short of expectations. This gap reinforces the urgency to examine whether policy-driven reforms—particularly at SMK level—are truly effective in improving student competencies.

Vocational education is expected to produce graduates who possess not only theoretical understanding but also hands-on practical competencies relevant to the industry (10, 11). Therefore, improving the quality and relevance of vocational education is imperative to realizing the vision of an Advanced Indonesia, which demands an education system responsive to global economic and technological dynamics (12). Despite substantial reforms, persistent challenges remain. Statistics Indonesia reported that approximately 7.99 million individuals were unemployed in 2022, with SMK graduates consistently showing the highest unemployment rate at 10.38%. This was followed by university graduates (12.65%), while individuals with only elementary education exhibited the lowest rate at 3.09%. The fact that SMK graduates—who are supposed to be the most job-ready—suffer from the highest unemployment rate highlights a critical and urgent mismatch between vocational education outcomes and labour market demands. This paradox indicates that current educational inputs and processes may not be producing the intended results (13, 14).

In alignment with national priorities, the Indonesian government introduced the Centre of Excellence Vocational High School Program (SMK PK) as a strategy to enhance the competitiveness of vocational schools by strengthening graduate competencies to match industry needs (15). The SMK PK program seeks to improve institutional capacity and position SMKs as reference models for other vocational institutions (16). It emphasizes collaboration between schools, industry stakeholders, and higher education institutions through contextual curriculum development, competency-based learning, and continuous mentoring. However, at the implementation level, the urgency to evaluate the effectiveness of this program becomes critical, given the inconsistent performance outcomes and varied readiness of schools across regions.

The SMK PK initiative is supported by national policy and legal frameworks, including Law No. 20 of 2003 on the National Education System, Minister of Education and Culture Regulation No. 22 of 2020, and Ministerial Decree No. 17/M/2021 regarding SMK PK implementation. Additional support comes from Ministry of Industry Regulation No. 03/M-IND/PER/1/2017, which reinforces the "link and match" strategy to synchronize vocational training with industrial needs. As the continuation of prior revitalization and Center of Excellence (CoE) programs, SMK PK aims to produce graduates who are job-ready and equipped with soft skills, digital literacy, and entrepreneurship (17, 18). Yet empirical studies highlight persistent issues, including low graduate absorption and weak entrepreneurial outcomes (19). This recurring implementation gap underscores the urgent need for empirical, multi-level program evaluation to verify whether SMK PK's design translates into tangible improvements in student performance and employability.

To support the Ministry of Education, Culture, Research, and Technology's vision of developing the Pancasila Student Profile—faithful, independent, creative, critical-thinking, collaborative, and globally engaged—the SMK PK program aspires to create an excellent learning ecosystem. However, current literature rarely evaluates this program comprehensively using a systematic framework, especially one that examines how facilities, human resources, instructional processes, and student behavior interact to produce workforce readiness. This lack of empirical evaluation forms the core urgency of the present study.

Thus, this research evaluates the SMK PK Program using the Kirkpatrick Evaluation Model, encompassing reaction, learning, behavior, and results. This approach enables a comprehensive

assessment of how educational facilities, teaching resources, and instructional quality contribute to student learning outcomes and workforce readiness. By addressing the urgent need for evidence-based evaluation, this study aims to identify disconnects between policy and practice, assess program impact, and provide actionable recommendations for improving Indonesia's vocational education ecosystem. Ultimately, by mapping the interrelations among infrastructure quality, human resources, learning processes, and student outcomes, this research is expected to contribute to the formulation of more adaptive, responsive, and industry-relevant vocational education models that support Indonesia's long-term economic and human capital development goals.

Theoretical Review

Definition of Vocational High School (SMK)

The theoretical foundation of modern vocational education can be traced back to Charles A. Prosser, an American education theorist. Prosser's theory has significantly shaped the conceptual framework of vocational education worldwide (20). According to Prosser, vocational education should be directly aligned with the world of work and designed to equip learners with practical skills that meet the specific needs of industry. One of his key principles is "learning by doing, "where students are trained in environments that simulate real-world working conditions (21). This framework has provided a solid foundation for the development of vocational education systems in many countries, including Indonesia, which currently implements a similar approach through the Center of Excellence Vocational High School Program (SMK PK) (22).

Vocational High Schools (SMK) are formal educational institutions that offer vocational education at the upper secondary level, following completion of lower secondary education (SMP, MTs, or their equivalents) (23). In accordance with Law No. 20 of 2003 on the National Education System, SMKs are designed to prepare students for employment in specific fields. This objective is further elaborated in Government Regulation No. 19 of 2005 on National Education Standards, which states that the aim of secondary education is to develop students' competencies in certain occupational areas, thereby requiring vocational education to be tailored to the demands of the labor market. Vocational education has distinctive characteristics that differentiate it from other types of education. These characteristics are reflected in its educational objectives, curriculum content, instructional requirements, and the competencies of its graduates (24). As an integral part of the education system, the learning process in SMKs requires on-going renewal and development by all relevant stakeholders. Key areas for improvement include curriculum design, teaching methodologies, instructional media, learning materials, teacher quality, and assessment mechanisms (25).

SMKs place a strong emphasis on preparing students for direct entry into the workforce by fostering professional attitudes and work readiness (26,27). As upper secondary institutions, SMKs serve as a continuation of junior secondary education (SMP/MTs or equivalent) (28). Unlike general high schools (SMA), SMKs are specifically structured to ensure that graduates are job-ready upon completion of their studies (29). Based on the aforementioned perspectives, it can be concluded that Vocational High Schools are formal educational institutions at the secondary level, primarily aimed at equipping students with the vocational skills and competencies necessary for employment immediately after graduation.

Functions of Center of Excellence Vocational High Schools (SMK PK)

According to the Ministry of Education and Culture (30), the Center of Excellence Vocational High School program is a development initiative that focuses on strengthening specific vocational competencies to enhance the quality and performance of vocational schools (SMKs). The Directorate General of Vocational Education has emphasized that SMK PK is not intended to become an elite institution or to compete with other schools in terms of superiority (31). The SMK PK program is a continuation of previous vocational education initiatives, such as the SMK Revitalization Program and the SMK Center of Excellence (CoE) Program (32).

The SMK Revitalization Program centered on providing physical assistance to SMKs in five priority sectors: tourism, maritime affairs, creative industries, agriculture, and technology, with active involvement of local governments in its implementation (18). Meanwhile, the CoE program emphasized human resource development in vocational schools and aimed to generate a

positive spill over effect on other schools through both physical and non-physical incentives, including training for school principals and vocational teachers in four main sectors (33).

The SMK PK initiative seeks to strengthen partnerships with the business world, industry, and the employment sector, positioning SMK PKs as drivers of improvement and quality enhancement across the broader SMK ecosystem (19). The program aims to produce graduates who are skilled in specific fields and prepared to enter the workforce, start their own businesses, or continue their studies in higher education (34). It systematically aligns vocational education with industry needs, ensuring a close link between school-based learning and labor market demands (35). SMKs that operate a Teaching Factory are expected to engage actively in production processes, possess high financial flexibility, and serve as learning centers for other SMKs with similar vocational programs. The ultimate goal is to produce graduates who embody the values of "Pancasila Student" and are ready to work, become entrepreneurs, or pursue further education (36).

In addition, the SMK PK program promotes coordination with vocational higher education institutions as partner mentors to ensure better integration of vocational education in Indonesia with industry and labor market requirements (37). A key element of this program is the establishment of link and match between SMKs and the industrial world, fostering synergistic partnerships. These partnerships enable integrated development across curriculum design, learning processes, assessment, and graduate employment strategies in collaboration with the business and industrial sectors (38, 39).

The SMK Link and Match Program

One of the government's key policies to support the revitalization of vocational schools is the Regulation of the Minister of Industry No. 3 of 2017. Philosophically, the concept of link and match refers to a strategic effort to develop human resource quality with forward-looking perspectives, excellence, professionalism, added value, and efficiency. It involves an interactive process designed to produce relevant outcomes (40). The central idea is to ensure alignment and compatibility between the competencies of vocational school graduates and the expectations of the labor market (41).

SMKs are encouraged to establish partnerships with relevant stakeholders in the workforce, including industry, in accordance with the Decree of the Minister of Manpower and Transmigration of the Republic of Indonesia No. 389 of 2013. The Link and Match program, initiated by the Directorate General of Vocational Education under the Ministry of Education, Culture, Research, and Technology, aims to bridge the gap between vocational education and the world of work (42). A notable government initiative under this program is the 8+1 Link and Match Package, which includes collaborative curriculum development. However, several challenges still hinder the alignment between vocational education and industry needs. These have been identified through a fishbone diagram analysis conducted by the Ministry of Education. The contributing factors include:

a) limited teacher expertise in both hard and soft skills;
b) outdated teaching methods;
c) inadequate facilities and infrastructure;
d) misaligned curricula;
e) lack of information from the business and industrial sectors (DUDI);
f) limited opportunities for SMK PK implementation;
g) insufficient career guidance;
h) low levels of entrepreneurship; and
i) poor soft skills among graduates (43,44).

Methodology

This study employed an evaluation instrument based on the Kirkpatrick Model and utilized path analysis as the primary statistical technique. Path analysis is a statistical method used to examine both direct and indirect effects between one dependent variable and two or more independent variables. This technique enables researchers to estimate causal relationships among variables through a series of regression equations that represent mathematical associations between observed variables and predicted outcomes (45). The application of path analysis requires a strong theoretical foundation, as the model emphasizes cause–effect relationships. Accordingly, the model structure was developed based on logically derived hypotheses and supported by relevant empirical and theoretical literature. Within this framework, variables are classified into

independent variables that exert influence and dependent variables that receive such influence (46).

To ensure methodological rigor and relevance, this study employed a purposive sampling technique. Purposive sampling is a non-probability sampling method in which cases are deliberately selected based on predefined criteria aligned with the objectives of the study, allowing the selection of information-rich cases. This approach is particularly appropriate for program evaluation research that requires participants with direct experience and exposure to the evaluated program.

The selected cases consisted of vocational high schools officially designated as SMK Pusat Keunggulan (SMK PK) by the Ministry of Education, Culture, Research, and Technology. The selected schools had implemented the SMK PK program for a minimum of one year to ensure the availability of observable and measurable program outcomes. In addition, the schools possessed complete data related to facilities, resources, learning implementation, and student outcomes. Key school stakeholders—including teachers, vice principals of curriculum, program coordinators, and students—who were directly involved in the implementation of SMK PK activities were included as respondents to provide comprehensive and credible information.

Data Collection Techniques

Data collection was conducted using a mixed-methods approach that integrated quantitative and qualitative techniques to comprehensively evaluate the SMK PK program based on the four levels of the Kirkpatrick Model: Reaction, Learning, Behavior, and Results. The use of multiple data collection techniques aimed to strengthen data validity through triangulation and to capture both perceptual and outcome-based evidence of program effectiveness.

Primary data were collected through questionnaires, semi-structured interviews, and observations. Questionnaires were administered to students and teachers to obtain quantitative data related to satisfaction, learning outcomes, behavioral changes, and perceived program results. Semi-structured interviews were conducted with teachers and vice principals of curriculum to explore in depth the implementation process, instructional practices, behavioral changes, and institutional support related to the SMK PK program. Observations were carried out to document actual teaching–learning activities, instructional strategies, and behavioral manifestations that emerged during program implementation. The distribution of data sources and data collection methods for each Kirkpatrick evaluation level is summarized in Table 1.

Table 1: Data Sources and Data Collection Methods

No	Component	Data Sources	Data Collection Methods
1.	Reaction	Students Teachers Vice Principal of Curriculum	Interviews Observations Questionnaires
2.	Behaviour	Teachers Vice Principal of Curriculum	Interviews Questionnaires
3.	Learning	Teachers Vice Principal of Curriculum	Interviews Observations Questionnaires
4.	Results	Students	Questionnaires

The combination of these techniques enabled the researchers to capture immediate responses to the program (Reaction), changes in knowledge and skills (Learning), behavioral transformations in instructional practices (Behavior), and measurable outcomes related to student performance and graduate quality (Results). This comprehensive data collection strategy ensured that the evaluation results accurately reflected the effectiveness and impact of the SMK Pusat Keunggulan program.

Research Variables and Hypotheses Development

These selection criteria were formulated to ensure that the participating schools and respondents were directly relevant to the evaluation objectives and capable of providing accurate and contextually

appropriate data. Through this purposive sampling approach, the analysis reflects the actual implementation of the SMK PK program and its impact on learning outcomes, thereby strengthening the validity of the study findings.

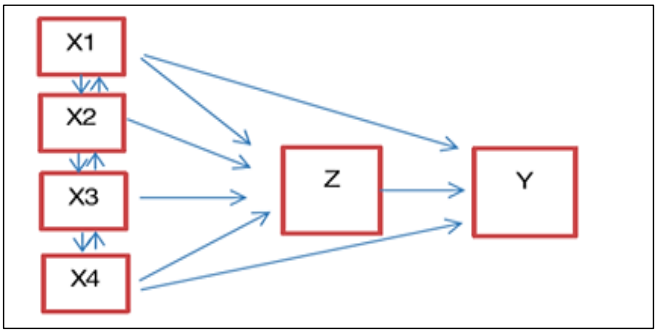

Figure 1: Descriptive Statistics of Research Variables

Figure 1 presents the descriptive statistics of the research variables included in the path analysis model. The figure illustrates the distribution, central tendency, and variability of each variable, serving as a preliminary examination of the data prior to hypothesis testing and model estimation.

Path analysis was employed to examine and map the causal relationships among the variables under investigation. In this model, the dependent variable (Y), namely the quality of vocational school graduates, is influenced by several independent variables (X1, X2, X3, and X4), either directly or indirectly through the mediating variable (Z), which represents relevance to industry needs. This analytical approach enables a comprehensive assessment of both direct and indirect effects, providing deeper insight into the mechanisms through which program components influence graduate quality.

Table 2: Operational Definition and Classification of Variables

Code	Variable Name	Type of Variable
X1	Quality of School Facilities	Independent
X2	Teacher and Instructor Competence	Independent
X3	Curriculum Implementation	Independent
X4	Learning Innovation	Independent
Z	Relevance to Industry Needs	Mediator
Y	Quality of Vocational School Graduates	Dependent

Table 2 summarizes the operational definitions and classifications of the variables used in this study. The table clarifies the roles of independent variables, the mediating variable, and the dependent variable to ensure conceptual clarity and analytical consistency throughout the research process. Based on this analytical framework, hypotheses were formulated to systematically examine the relationships among variables within the Kirkpatrick-based evaluation model. These hypotheses aim to strengthen the empirical foundation of the study and enhance understanding of the program's impact. The hypotheses tested in this study are as follows:

H1: The quality of school facilities (X1), teacher and instructor competence (X2), curriculum implementation (X3), and learning innovation (X4) positively affect relevance to industry needs (Z).

H2: Relevance to industry needs (Z) positively affects the quality of vocational school graduates (Y).

H3: The quality of school facilities (X1), teacher and instructor competence (X2), curriculum implementation (X3), and learning innovation (X4) positively affect the quality of vocational school graduates (Y).

H4: Relevance to industry needs (Z) mediates the effects of school facilities quality (X1), teacher and instructor competence (X2), curriculum implementation (X3), and learning innovation (X4) on the quality of vocational school graduates (Y).

H5: There is a significant simultaneous relationship among variables X1, X2, X3, X4, and Z with the quality of vocational school graduates (Y).

Data Validity Technique

Data validity in this study is ensured through source triangulation, a verification method conducted by comparing and confirming data from multiple relevant information sources. This approach is intended to enhance the validity and credibility of the research findings by ensuring that the results are not reliant on a single source, but are supported by diverse perspectives. Through source triangulation, researchers are able to identify potential biases, enrich their understanding of the studied phenomena, and obtain a more comprehensive and objective depiction of the investigated reality.

Results

Table 3: Direct Effect Results

Direct effects

							95% Confidence Interval	
			Estimate	Std. Error	z-value	p	Lower	Upper
X1	→	Y	0.576	0.124	4.645	< .001	0.333	0.820
X2	→	Y	0.584	0.105	5.578	< .001	0.379	0.789
X3	→	Y	-0.049	0.050	-0.982	0.326	-0.146	0.049
X4	→	Y	0.492	0.096	5.110	< .001	0.304	0.681

Note. Delta method standard errors, normal theory confidence intervals, ML estimator

Results of Direct Effect Analysis

The direct effect analysis results presented in the Table 3 show the influence of various variables on the quality of vocational high school (SMK) graduates.

The Effect of School Facility Quality (X1) on SMK Graduate Quality (Y)

The analysis indicates that the quality of school facilities has a positive and significant effect on the quality of SMK graduates, with an estimated coefficient of 0.576 ($p < 0.001$). The 95% confidence interval for this effect ranges from 0.333 to 0.820, suggesting that the relationship is strong and consistent. This indicates that better school facilities can contribute to improving the quality of SMK graduates.

The Effect of Teacher and Instructor Competence (X2) on SMK Graduate Quality (Y)

Teacher and instructor competence also show a positive and significant influence on SMK graduate quality, with an estimated coefficient of 0.584 ($p < .001$). The 95% confidence interval for this effect is between 0.379 and 0.789, showing a strong and stable relationship. This suggests that enhancing teacher and instructor competence will contribute to better graduate quality.

The Effect of Curriculum Implementation (X3) on SMK Graduate Quality (Y)

Curriculum implementation does not show a significant effect on SMK graduate quality, with an estimated coefficient of -0.049 ($p = 0.326$). The 95% confidence interval for this effect ranges from -0.146 to 0.049, encompassing zero. This indicates that the impact of curriculum implementation on graduate quality is not strong enough to be considered significant in this model.

The Effect of Learning Innovation (X4) on SMK Graduate Quality (Y)

Learning innovation has a positive and significant effect on SMK graduate quality, with an estimated coefficient of 0.492 ($p < 0.001$). The 95% confidence interval for this effect ranges from 0.304 to 0.681, showing a strong and positive relationship. This suggests that increasing innovation in teaching methods can enhance the quality of SMK graduates.

Overall, the analysis shows that school facility quality (X1), teacher and instructor competence (X2), and learning innovation (X4) have a positive and significant impact on SMK graduate quality (Y). However, curriculum implementation (X3) does not show a significant effect in this model.

Table 4: Indirect Effect Results

Indirect effects									
								95% Confidence Interval	
					Estimate	Std. Error	z-value	p	Lower	Upper
X1	→	Z	→	Y	-0.156	0.064	-2.435	0.015	-0.282	-0.031
X2	→	Z	→	Y	0.023	0.024	0.962	0.336	-0.024	0.069
X3	→	Z	→	Y	-0.007	0.011	-0.606	0.545	-0.028	0.015
X4	→	Z	→	Y	-0.062	0.031	-2.007	0.045	-0.123	-0.001

Note. Delta method standard errors, normal theory confidence intervals, ML estimator

Results of Indirect Effect Analysis

The results of the indirect path analysis presented in the Table 4 show how the related variables influence the quality of SMK graduates through the relevance of business and industrial sectors.

Effect of Variable X1 through Variable Z on Variable Y

The quality of school facilities shows a significant indirect effect on the quality of SMK graduates through the relevance to business and industrial sector's needs. The estimated coefficient for this effect is -0.156 (p = 0.015), with a 95% confidence interval ranging from -0.282 to -0.031. This indicates that the quality of school facilities can influence graduate quality through its impact on the relevance to business and industrial sectors, although the direction of the effect is negative. This suggests that improvements in facilities that are misaligned with business and industrial sectors needs may reduce their effectiveness in enhancing graduate quality.

Effect of Variable X2 through Variable Z on Variable Y

Teacher and instructor competence does not exhibit a significant indirect effect on SMK graduate quality through the relevance to business and industrial sectors. The estimated coefficient is 0.023 (p = 0.336), with a 95% confidence interval ranging from -0.024 to 0.069. This effect is neither strong nor statistically significant, indicating that although teacher competence may influence graduate quality directly, the indirect effect via business and industrial sectors relevance is relatively weak.

Effect of Variable X3 through Variable Z on Variable Y

Curriculum implementation also does not show a significant indirect effect on SMK graduate quality through the relevance to business and industrial sectors. The estimated coefficient is -0.007 (p = 0.545), with a 95% confidence interval between -0.028 and 0.015. This very small and non-significant effect suggests that curriculum implementation does not play a substantial role in improving graduate quality through alignment with business and industrial sector's needs.

Effect of Variable X4 through Variable Z on Variable Y

Learning innovation demonstrates a significant indirect effect on SMK graduate quality through business and industrial sectors relevance, with an estimated coefficient of -0.062 (p = 0.045), and a 95% confidence interval ranging from -0.123 to -0.001. This negative indirect effect implies that, while learning innovation aims to develop skills and methods relevant to business and industrial sectors, its actual impact on graduate quality through this relevance may be counterproductive—potentially due to a mismatch between the innovations applied and the specific demands of the business and industrial sectors.

Overall, the results of the indirect path analysis indicate that only a few variables—namely school facility quality and learning innovation—have a significant indirect effect on SMK graduate quality through the relevance to business and industrial sector's needs. However, the direction of these effects may differ from expectations, with some variables showing negative influences, highlighting potential mismatches between educational strategies and the actual needs of the industrial world.

Table 5: Total Effect Results

Total effects

							95% Confidence Interval	
			Estimate	Std. Error	z-value	p	Lower	Upper
X1	→	Y	0.420	0.111	3.783	< .001	0.202	0.638
X2	→	Y	0.606	0.107	5.691	< .001	0.398	0.815
X3	→	Y	-0.055	0.051	-1.090	0.276	-0.155	0.044
X4	→	Y	0.430	0.095	4.509	< .001	0.243	0.617

Note. Delta method standard errors, normal theory confidence intervals, ML estimator

Results of Total Effect Analysis

The results of the total effects analysis in Table 5 indicate that factors such as the quality of school facilities, teacher and instructor competence, and instructional innovation have a significant positive influence on the quality of vocational high school graduates. The quality of school facilities showed a significant effect with an estimated coefficient of 0.420 ($p < 0.001$), suggesting that better facilities enhance the overall quality of graduates. Similarly, the competence of teachers and instructors demonstrated a strong influence, with an estimated coefficient of 0.606 ($p < 0.001$), highlighting the critical role of high-quality teaching in preparing students for the workforce. Furthermore, instructional innovation also had a positive impact, with an estimated coefficient of 0.430 ($p < 0.001$), underscoring the importance of innovative learning approaches in boosting graduate competitiveness in the job market.

On the other hand, curriculum implementation did not exhibit a significant effect on graduate quality, with an estimated coefficient of -0.055 ($p = 0.276$). This suggests that while the curriculum may influence educational outcomes, other factors such as the quality of instruction and facilities play a more substantial role in enhancing student achievement. Overall, this analysis emphasizes the importance of facility quality, teaching competence, and instructional innovation in producing graduates who are better equipped to meet labor market demands.

Table 6: Path Coefficient Results

Path Coefficients

							95% Confidence Interval	
			Estimate	Std. Error	z-value	p	Lower	Upper
Z	→	Y	-0.385	0.147	-2.608	0.009	-0.674	-0.096
X1	→	Y	0.576	0.124	4.645	< .001	0.333	0.820
X2	→	Y	0.584	0.105	5.578	< .001	0.379	0.789
X3	→	Y	-0.049	0.050	-0.982	0.326	-0.146	0.049
X4	→	Y	0.492	0.096	5.110	< .001	0.304	0.681
X1	→	Z	0.406	0.060	6.801	< .001	0.289	0.524
X2	→	Z	-0.059	0.057	-1.035	0.301	-0.172	0.053
X3	→	Z	0.017	0.027	0.623	0.534	-0.037	0.071
X4	→	Z	0.161	0.051	3.144	0.002	0.061	0.262

Note. Delta method standard errors, normal theory confidence intervals, ML estimator

Path Coefficient

The path coefficient analysis results in Table 6 reveal that variable X1 has a significant positive effect on variable Y, with a coefficient of 0.576 ($p < 0.001$), indicating that better school facilities are associated with higher graduate quality. Variable X2 also demonstrates a significant positive effect on Y, with a coefficient of 0.584 ($p < 0.001$). Similarly, variable X4 shows a significant positive effect on Y, with a coefficient of 0.492 ($p < 0.001$). However, variable X3 does not exhibit a significant influence on Y, with a coefficient of -0.049 ($p = 0.326$).

In terms of the relationship between these factors and variable Z, variable X1 presents a significant positive effect with a coefficient of 0.406 ($p < 0.001$), suggesting that better facilities can enhance the curriculum's alignment with industry and business needs. In contrast, variable X2 does not show a significant impact on curriculum relevance to industry needs, with a coefficient of -0.059 ($p = 0.301$), and variable X3 also shows no significant effect, with a coefficient of 0.017 ($p = 0.534$). Meanwhile, variable X4 exerts a significant positive influence on the relevance of the curriculum to industry needs, with a coefficient of 0.161 ($p = 0.002$).

Overall, the findings highlight that the quality of school facilities, teacher competence, and instructional innovation significantly affect both the quality of vocational high school graduates and the relevance of the curriculum to labor market demands. However, curriculum implementation and teacher competence do not have a direct significant effect on curriculum relevance to the business and industrial sectors.

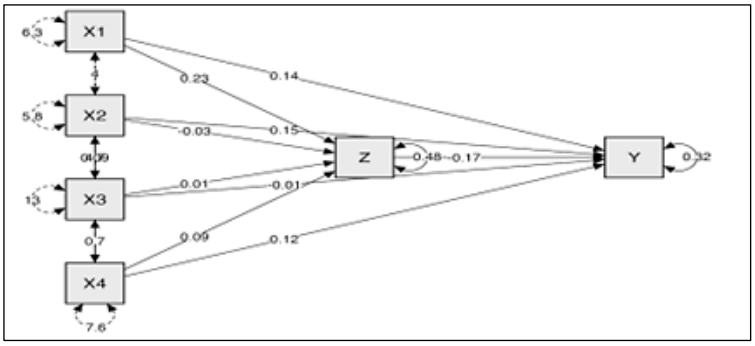

Figure 2: Path Plot Diagram

Path Plot

The path plot diagram in Figure 2, illustrates the structural relationships among four exogenous variables (X1 to X4), one mediating variable (Z), and the endogenous variable (Y). Based on the standardized path coefficients:

X1 (School Facilities) has a positive direct effect on Y (Graduate Quality) with a coefficient of 0.14, and also exhibits a positive indirect effect through Z(Curriculum Relevance) with a coefficient of 0.23. This suggests that improvements in school facilities not only enhance graduate quality directly but also contribute indirectly by improving curriculum alignment with industry needs.

X2 (Teacher and Instructor Competence) shows a positive direct effect on Y with a coefficient of 0.15, while its indirect effect via Z is negative and weak (-0.03). This indicates that teacher competence plays a role in improving graduate quality, although it does not significantly support curriculum relevance from the industry's perspective.

X3 (Curriculum Implementation) has a very minimal direct effect on Y (-0.01) and an almost negligible indirect effect via Z (0.01). This implies that the implementation of the curriculum has little to no measurable impact on either graduate quality or curriculum relevance.

X4 (Instructional Innovation) exerts a moderate direct effect on Y with a coefficient of 0.12, and a positive indirect effect through Z with a coefficient of 0.09. This indicates that innovative teaching practices improve graduate outcomes both directly and by making the curriculum more relevant to industry needs.

The mediating variable Z (Curriculum Relevance to Industry Needs) has a direct effect on Y (Graduate Quality) with a coefficient of -0.17, which is unexpected and suggests potential misalignment or other intervening factors that reduce its positive impact. The coefficient of determination for Y ($R^2 = 0.32$) indicates that 32% of the variance in graduate quality can be explained by the combined effects of the exogenous variables and the mediator.

Reaction Level of the Evaluation

Students' Perceptions of the Quality of Vocational Practice Facilities

Vocational practice facilities play a strategic role in shaping the competencies of Vocational High School (SMK) graduates. The availability and quality of workshops, laboratories, practice rooms, and modern technology-based equipment are

crucial in determining the effectiveness of vocational learning processes. Adequate facilities not only support the acquisition of technical skills but also enhance students' learning motivation, boost their confidence, and improve their ability to adapt to real-world work environments. Based on interviews with students from five SMKs implementing the Center of Excellence (SMK PK) Program in Metro City, positive perceptions of the adequacy and modernity of practice facilities emerged as key indicators of a meaningful learning experience relevant to the needs of the job market. At SMK Negeri 1 Metro, which offers marketing major, students appreciated the presence of practice rooms that mimic real retail and promotional environments; equipped with marketing simulation tools, display media, and digital technology. These facilities were considered effective in helping students grasp practical aspects of marketing, ranging from product promotion to customer interaction. However, they also expressed a desire for improvements in equipment maintenance and modernization, particularly in areas related to e-commerce and digital marketing, to better align with current industry demands.

At SMK Negeri 3 Metro, which specializes in Mechanical Engineering, the strength lies in the availability of engineering workshops and practice equipment such as lathes, milling machines, and other manufacturing tools. Students felt these facilities enabled them to master both basic and advanced skills comprehensively. Nonetheless, they recommended the addition of CNC machines and the latest automation technologies in response to the industrial transformation driven by the Fourth Industrial Revolution. In contrast, SMK Muhammadiyah 1 Metro, which offers a Visual Communication Design (VCD) major, relies on facilities such as computer laboratories, design studios, and graphic design software. Students viewed these facilities as adequate for supporting the development of creativity and design skills. However, they proposed updates to graphic design software and the addition of high-tech printing tools to enhance their competitiveness in the digital creative industry.

Meanwhile, SMK Muhammadiyah 2 Metro, which also offers Mechanical Engineering, was regarded as a best-practice case due to its successful integration of practical facilities with an adaptive curriculum and strong partnerships with the business and industrial sectors. The development of a Teaching Factory served as a backbone for creating a contextual learning environment that closely mirrors real work settings. Students gained hands-on experience through the use of modern tools, industry-based projects, and direct training from industry partners. This approach significantly improved students' job readiness and positioned them to be more competitive in both national and global labor markets. SMK Muhammadiyah 3 Metro, with a major in Health Sciences, is equipped with facilities such as basic nursing laboratories, medical simulation tools, and clinical practice rooms that support the learning process. Although some tools were not fully advanced, the project-based, simulation-oriented, and guided practice learning strategies implemented by teachers were perceived as effective in maximizing existing resources. This indicates that the quality of learning is not solely dependent on the completeness of facilities but also on the pedagogical innovation of teachers in optimizing practical instruction.

These findings indicate that students' perceptions of the quality of vocational practice facilities are influenced by three key aspects: the adequacy and modernity of equipment, alignment with industry needs, and teachers' ability to integrate facilities into active and contextual learning strategies. Therefore, improving the quality of vocational practice facilities should be carried out comprehensively and sustainably, involving the modernization of equipment, strengthening of supporting infrastructure, and enhancement of teachers' pedagogical capacity. Strengthening and expanding collaboration between schools and industry partners is essential to ensure that the provided facilities truly reflect the demands and standards of the professional world. In this way, the SMK Center of Excellence Program can serve as an effective platform for preparing graduates who not only possess high-level technical competencies but are also competitive in the national and global job markets, with strong professional character.

Interactivity and Teaching Innovation Reflect the Relevance of Instructional Content

This study identified that the five Vocational High Schools (SMKs) implementing the Center of Excellence Program (SMK PK) in Metro City have adopted contextual learning approaches aligned

with industry needs, tailored to the specific characteristics of each department. SMK Negeri 1 Metro and SMK Muhammadiyah 1 Metro actively engaged students in real-world project simulations using challenge-based learning, collaboration with industry professionals, and the integration of digital technologies. Students not only learned theoretical concepts but also applied them in digital marketing and visual design projects that reflect current industry trends. This learning environment fostered active student participation and reinforced essential soft skills such as communication, creativity, and teamwork.

Meanwhile, SMK Muhammadiyah 2 Metro and SMK Negeri 3 Metro demonstrated a learning model centered on hands-on practice and real-world problem-solving. Integration of case studies from partner workshops and the implementation of problem-based assignments served as key strategies to link the curriculum with the demands of the manufacturing and automotive industries. Although challenges remain in aligning school schedules with industrial internships, both schools have continued to innovate by creating contextual learning spaces supported by instructors with field experience. These efforts highlight the importance of curriculum flexibility and teacher competence enhancement in producing job-ready graduates.

On the other hand, SMK Muhammadiyah 3 Metro emphasized strengthening digital literacy and 21st-century skills as a key strategy in vocational education. Despite limited infrastructure, the school utilized video simulations, specialized software, and internal teacher training to maintain instructional quality. Pedagogical innovations not only addressed resource limitations but also demonstrated that creativity and collaboration—including with alumni working in the industry—can serve as catalysts for improving graduate quality. Overall, the findings underscore the importance of synergy between contextual approaches, technology integration, and industry collaboration in the implementation of adaptive SMK PK programs that align with labor market demands.

Behaviour Level of the Evaluation

Implementation of an Integrated Curriculum Aligned with Workforce Demands

The curriculum implementation at SMK Negeri 1 Metro is well-aligned with the demands of the workforce, as evidenced by curriculum development efforts that synchronize student competencies with current industry trends. The curriculum encompasses both technical skills and soft skills required by employers, including communication, leadership, and teamwork. Furthermore, internship programs and collaborations with the business and industrial sectors provide students with opportunities to apply their skills in real-world settings. The active involvement of industry partners in curriculum evaluation ensures that instructional materials and practice tools remain relevant to industry needs, enhancing students' preparedness to adapt to the dynamic labor market.

Similarly, the implementation of the curriculum at SMK Negeri 3 Metro is marked by close collaboration with the business and industrial sectors through the development of a competency-based curriculum that is both adaptive and contextual. Students are encouraged to participate in internships integrated directly into the learning process, allowing them to acquire industry-relevant skills. Instructional materials are designed based on industrial standards, with an emphasis on practical skills that can be readily applied in the workplace. The involvement of industry professionals in training and certification programs further strengthens the quality of education at this institution, making the curriculum more responsive and aligned with the fast-changing demands of the workforce.

At SMK Muhammadiyah 1 Metro, the curriculum implementation is highly focused on enhancing student competencies in line with labor market needs. The curriculum is continuously updated to reflect the latest technological advancements and both local and national industry requirements. This school adopts a project-based learning model that enables students to engage directly with industry through structured work placements. In addition, internships embedded within the curriculum provide students with practical experiences that are directly relevant to industrial work environments. Industry partners are actively involved in curriculum planning and the assessment of student learning outcomes, ensuring the instructional content remains current and aligned with labor market expectations. SMK Muhammadiyah 2 Metro demonstrates a strong commitment to integrating its curriculum with the demands of the workforce. The implementation of

the Merdeka Curriculum is reflected in the development of School-Based Curriculum, which emphasizes vocational concentrations relevant to industry. This addictiveness allows students to continuously develop competencies in line with emerging trends. Regular curriculum evaluations ensure that instructional content, teaching methods, and learning outcomes remain aligned with industry standards. Strong cooperation with the business and industrial sectors is evident—from joint curriculum development and the provision of internship placements to the supply of industry-standard training tools and laboratory facilities.

SMK Muhammadiyah 3 Metro also adopts a robust approach in aligning its curriculum with workforce demands. The educational programs combine competency-based learning with the enhancement of soft skills required in the workplace. In addition to having an adaptive and flexible curriculum, the school maintains strong partnerships with various industry players through formal agreements (MoUs), enabling students to access internship opportunities and industrial certifications. Curriculum development is based on industry standards, and teacher training on the latest industrial technologies further supports student mastery of relevant and applicable skills. As vocational schools implementing the Center of Excellence (SMK-PK) Program, the five schools demonstrate a comprehensive and sustained effort to prepare students for the competitive labor market. Strategic collaboration between schools and the business and industrial sectors is a key element in designing curricula that are relevant, adaptive, and contextual—addressing both technical (hard) and non-technical (soft) skill development. Through ongoing curriculum evaluations, reinforced partnerships with industry, and responsiveness to industrial dynamics and demands, these SMKs exhibit the capacity to produce graduates who are competent, professional, and ready to compete at national and global levels.

Learning and Results Level of the Evaluation

Student Competency Application in Industrial Work Practice (Internships)

The application of student competencies within the context of Industrial Work Practice across the five vocational schools implementing the Center of Excellence Program demonstrates a strong commitment to preparing students with relevant and professional skills for the workforce. One of the key approaches is the early introduction to real work environments, reflected through learning activities integrated with internship preparation. Students receive training to understand organizational structures, hierarchical systems, and interpersonal dynamics within the workplace. This approach aims to ensure that students can adapt quickly, interact professionally, and exhibit strong work ethics—both during and after their internship experiences. Collaboration between all Center of Excellence vocational schools and the business and industrial sectors has been progressing well, although some components of this partnership still require reinforcement. Industrial internship programs, equipment support, and job placement rates have been successfully implemented. However, other contributions such as scholarships and funding from industry partners have yet to be optimized. These collaborations are conducted through various channels, including industrial visits, official correspondence, and the involvement of industry representatives in workshops and internship programs. Challenges encountered include scheduling conflicts between schools and industry partners, as well as differences in academic backgrounds between teachers and industry practitioners—necessitating more intensive coordination and flexibility from both parties.

On another front, vocational schools are implementing Teaching Factory and Project-Based Learning (PBL) models, which have shown positive outcomes in improving the quality of teaching and learning. Significant improvements are observed in student engagement and the relevance of instructional content that is more aligned with industrial realities. Industry practitioners play a crucial role in supplying tools and materials not available at schools, as well as in delivering training and motivating students to enhance their practical skills. A supportive school environment, characterized by harmonious and collaborative relationships among school members, further strengthens the innovative and productive learning process. At SMK Muhammadiyah 2 Metro, the integration of industry-oriented curricula and the emphasis on developing practical competencies during internships are also key

priorities. Students not only gain technical skills through hands-on experiences in the industry but are also equipped with social and soft skills critical for workplace success. Strengthening students' adaptability and professional interaction abilities is a core focus during the internship period. This is ensured through close monitoring of student performance in the field and regular evaluations of how well their acquired skills align with industry needs.

Overall, the implementation of student competencies in the Industrial Work Practice environment across the five schools illustrates that vocational education integrated with the industrial sector goes beyond the mere transfer of knowledge. It focuses equally on fostering professional attitudes and social competencies that are essential for student success in the workforce. Through continuous evaluation and ongoing improvement, this program aims to ensure that every graduate possesses industry-relevant competencies and is well-prepared to compete in the global job market.

Discussion

Reaction Level: Students' Perceptions of Vocational Practice Facilities

The results at the reaction level reveal that students generally hold positive perceptions of the quality and adequacy of vocational practice facilities in the five schools implementing the Center of Excellence (SMK PK) program in Metro City. Vocational practice facilities—including workshops, laboratories, practice rooms, and technology-based equipment—play a strategic role in shaping students' competencies and readiness for work. These facilities not only enhance technical proficiency but also stimulate learning motivation, foster self-confidence, and enable students to adapt to real-world industrial settings. Students at SMK Negeri 1 Metro (Marketing Department) highlighted the benefits of realistic retail simulation spaces that support learning about promotion and customer interaction. However, they emphasized the need for modernization in digital marketing tools and e-commerce systems. Similarly, students at SMK Negeri 3 Metro (Mechanical Engineering) appreciated the comprehensiveness of their workshops but recommended the inclusion of CNC and automation technology to stay aligned with Industry 4.0 standards.

Meanwhile, SMK Muhammadiyah 1 Metro (Visual Communication Design) and SMK Muhammadiyah 3 Metro (Health Sciences) showed that adequate facilities—when combined with creative pedagogical strategies—can produce meaningful learning outcomes even when resources are limited. In contrast, SMK Muhammadiyah 2 Metro stood out for its strong integration of teaching factories with industrial collaboration, enabling students to gain authentic work-based experiences. These findings align with Kirkpatrick's first level of evaluation—reaction, indicating that positive student perceptions are a precursor to deeper learning engagement and behavioral changes. The students' satisfaction largely depends on three dimensions: (a) facility adequacy and modernity, (b) alignment with industrial standards, and (c) teacher capacity to integrate facilities into contextual learning. Thus, continuous modernization, pedagogical innovation, and sustainable industry partnerships are essential for maintaining student motivation and satisfaction in vocational education.

Learning Level: Interactivity and Teaching Innovation

At the learning level, the data demonstrate that contextual and project-based learning (PjBL) approaches effectively enhance students' understanding, engagement, and soft skills development. SMK Negeri 1 Metro and SMK Muhammadiyah 1 Metro have successfully implemented challenge-based and digital learning activities that mirror real-world professional tasks, such as marketing campaigns and design production. These approaches cultivate critical thinking, collaboration, and creativity—core competencies emphasized by Vygotsky's sociocultural theory and Gardner's multiple intelligences framework. At SMK Negeri 3 Metro and SMK Muhammadiyah 2 Metro, the integration of real-world case studies and problem-based assignments strengthens students' mastery of industrial standards, particularly in manufacturing and engineering. Although challenges remain—such as schedule mismatches between schools and industry internships—teachers' field experience and curriculum flexibility help maintain instructional relevance. SMK Muhammadiyah 3 Metro illustrates how digital literacy enhancement

can mitigate resource limitations. Through internal teacher training and collaboration with alumni, the school maintains instructional quality and fosters an innovative learning culture. Collectively, these practices confirm that learning innovation and interactivity act as key drivers of student competence, aligning with Kirkpatrick's second evaluation level—learning, where knowledge acquisition and skill mastery are clear indicators of program effectiveness.

Behaviour Level: Implementation of Industry-Oriented Curriculum

At the behavior level, the implementation of an adaptive and industry-oriented curriculum demonstrates a strong alignment with workforce demands. All five SMKs consistently incorporate internships, industry collaboration, and competency-based learning as integral components of their curriculum. Schools such as SMK Muhammadiyah 2 Metro and SMK Negeri 3 Metro show exemplary practices by involving industry professionals in curriculum evaluation, certification processes, and hands-on training. This behavioral transformation—where schools actively integrate industry engagement into curriculum design—reflects a practical application of Kirkpatrick's third level—behavior. Teachers act as facilitators who translate industrial standards into classroom and workshop instruction, ensuring that learning outcomes are directly applicable to the workplace. However, the results also indicate that curriculum implementation (X3) did not show a significant direct effect on graduate quality in the quantitative model. This suggests that while schools have adopted contextual curricula, the variation in execution quality and industrial synchronization may limit its measurable impact. Strengthening curriculum monitoring systems, increasing teacher-industry co-teaching, and expanding internship placements could further bridge this gap between intended and actual behavioral changes.

Results Level: Competency Application and Graduate Quality

At the results level, findings indicate that the quality of school facilities (X1), teacher and instructor competence (X2), and instructional innovation (X4) significantly influence the overall quality of graduates (Y). The results of the structural model indicate that three variables—school facilities, teacher competence, and instructional innovation—had a significant positive effect on graduate quality. Specifically, the quality of school facilities contributed strongly to graduate outcomes, with a standardized coefficient of 0.576 ($p < .001$). Teacher competence demonstrated the highest influence, with a coefficient of 0.584 ($p < .001$), highlighting the critical role of pedagogical and professional mastery in shaping students' employability. Instructional innovation also had a meaningful positive effect, with a coefficient of 0.492 ($p < .001$), underscoring the importance of creative and adaptive teaching strategies in vocational education.

In contrast, curriculum implementation did not show a statistically significant direct effect on graduate quality. This finding suggests that curriculum documents alone are insufficient to ensure desired outcomes without being accompanied by effective instructional delivery, pedagogical adaptation, and active collaboration with industry partners. Interestingly, the mediating variable representing curriculum relevance to industry exhibited a negative relationship with graduate quality (standardized coefficient = –0.385, $p = 0.009$). This implies that while the curriculum may be designed to align with industrial standards, its practical integration and responsiveness to current industry dynamics may still be limited. In other words, certain aspects of curriculum reform have not yet translated into tangible improvements in graduate performance or employability.

The indirect effect analysis revealed that school facilities and learning innovation significantly influence graduate quality through curriculum relevance, but the direction of the effects was unexpectedly negative. This indicates that certain modernizations or innovations may not yet fully correspond to specific industrial needs, underscoring the importance of continuous dialogue between schools and industry partners to harmonize competencies and job requirements. The total effect analysis reinforces that facility quality, teacher competence, and instructional innovation remain the most influential predictors of graduate quality, with coefficients of 0.420, 0.606, and 0.430, respectively (all $p < .001$). These findings align with previous studies in Southeast

Asia (13,47) showing that human and physical capital investments in vocational institutions significantly determine graduates' employability.

Synthesis and Implications

The findings across the four levels of the Kirkpatrick Model demonstrate that the Center of Excellence (SMK-PK) Program has contributed meaningfully to improving the quality of vocational education through enhanced facilities, strengthened teacher competence, and increased pedagogical innovation. Despite these achievements, the persistent gap between curriculum implementation and industry relevance highlights the need for a more dynamic and continuous feedback loop between schools and industry partners. To further strengthen the program's impact, several strategic directions emerge. Facility modernization must be aligned more closely with the latest industrial technologies and standards to ensure that learning environments accurately mirror real-world workplace demands. Teacher professional development should be reinforced through sustained up skilling initiatives that address both technical and instructional competencies, enabling educators to adapt to evolving vocational requirements. Additionally, deeper and more institutionalized collaboration with industry is essential. Integrating industry stakeholders into curriculum design, learning assessment, and certification processes will help ensure long-term program relevance and support stronger employability outcomes for graduates. Overall, the evaluation indicates that the SMK Center of Excellence Program has achieved measurable progress in preparing competent, adaptive, and industry-ready graduates. Nevertheless, continuous efforts to enhance curriculum relevance, improve innovation quality, and strengthen collaborative governance remain crucial for advancing Indonesia's vocational education system toward greater responsiveness, sustainability, and global competitiveness.

Conclusion

This study reveals that the quality of school facilities, teacher competence, and instructional innovation significantly influence both the quality of vocational high school graduates and the relevance of the curriculum to the needs of the business and industrial sectors. Adequate facilities—such as practical equipment and information technology—enhance students' practical skills, while high teacher competence contributes to improved teaching quality and better curriculum alignment with industry requirements. Furthermore, creative and responsive instructional innovations have also been shown to strengthen the curriculum's relevance to current industrial developments.

Although curriculum implementation and teacher competence do not have a direct impact on the relevance to the business and industrial sectors, these factors still play an important role in improving the quality of graduates in accordance with industry standards. Overall, the findings highlight the importance of integrating quality facilities, teacher competence, relevant curricula, and innovative learning approaches to support the Vocational Excellence Program in vocational schools and to produce graduates who are competitive in the labor market.

Abbreviations

SMK PK: Sekolah Menengah Kejuruan Pusat Keunggulan (Vocational High School Center of Excellence), DUDI: Dunia Usaha dan Dunia Industri (Business and Industry Sector), PjBL: Project-Based Learning, TVET: Technical and Vocational Education and Training.

Acknowledgment

The authors would like to express their sincere gratitude to the Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia for the implementation of the Vocational Center of Excellence Program, which served as the foundation of this study. Appreciation is also extended to the principals, teachers, and students of the participating vocational schools for their valuable cooperation and insights during the research process. Special thanks are given to the research assistants and colleagues who provided constructive feedback throughout the preparation of this manuscript. Finally, the authors gratefully acknowledge the support of their respective institutions for facilitating this research and for their commitment to advancing vocational education in Indonesia.

Author Contributions

Joni Wuryanto: Conceptualization, data collection, quantitative analysis, manuscript drafting. Anan

Sutisna: Methodology design, validation, supervision, and revision of theoretical framework. Yetti Supriyati Saefudin: Qualitative analysis, literature review, and critical review of discussion and conclusion sections. All authors have read and approved the final manuscript for publication.

Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article. All authors confirm that the content is original, has not been published elsewhere, and is not under consideration by any other journal.

Declaration of Artificial Intelligence (AI) Assistance

During the preparation of this work, the authors used ChatGPT (OpenAI, GPT-5 model) to improve the readability, language clarity, and academic tone of the manuscript. After using this tool, the authors reviewed and edited the content as needed, taking full responsibility for the final version of the manuscript.

Ethics Approval

The research procedure followed ethical standards for educational research as approved by the Ethics Committee of the Faculty of Education, Universitas Negeri Jakarta. Informed consent was obtained from all participants, and data confidentiality was maintained throughout the study.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. The study was self-funded by the authors as part of academic research at the Educational Research and Evaluation Program, Universitas Negeri Jakarta.

References

1. Sparrow R, Dartanto T, Hartwig R. Indonesia under the new normal: challenges and the way ahead. Bull Indones Econ Stud. 2020;56(3):269–299.
2. Yusuf M, Sutanti S. The influence of entrepreneurship education and environment on students' entrepreneurial interest. Jurnal Muhammadiyah Manajemen Bisnis. 2020;1(2):77–84.
3. Sinurat RPP. Analysis of factors causing poverty as an effort toward poverty alleviation in Indonesia. Jurnal Registratie. 2023;5(2):87–103.
4. Feriyanto N, El Aiyubbi D, Nurdany A. The impact of unemployment, minimum wage, and real gross regional domestic product on poverty reduction in Indonesian provinces. Asian Economic and Financial Review. 2020;10(10):1088–1099.
5. Artina N. The influence of Indonesian labor force, remittances, and inflation on economic growth in Indonesia. Forbiswira: Forum Bisnis dan Kewirausahaan. 2022;11(2):338–357.
6. Gibbons M. Higher education relevance in the 21st century. Washington DC: World Bank; 1998. https://eric.ed.gov/?id=ED453721
7. Budiharto B, Triyono T, Suparman S. School literacy as an effort to create a learning society and improve educational quality. Seuneubok Lada: Jurnal Ilmu Sejarah, Sosial, Budaya, dan Kependidikan. 2018;5(2):153–166.
8. Apriana D, Kristiawan M, Wardiah D. Headmaster's competency in preparing vocational school students for entrepreneurship. International Journal of Scientific and Technology Research. 2019;8(8):1316–1330.
9. Ministry of Education and Culture of Indonesia. Strategic plan of the Ministry of Education and Culture 2020–2024. Jakarta: Kemendikbud; 2020. https://kemendikdasmen.go.id/detail/rencanastrategis
10. Ramdhani S. Optimizing the link and match program for the future of vocational education students. Adiba: Journal of Education. 2024;4(2):254–258.
11. Hakim MN, Abidin AA. Merdeka Mengajar platform: Technology integration in vocational education and teacher professional development. Kharisma: Jurnal Administrasi dan Manajemen Pendidikan. 2024;3(1):68–82.
12. Suartini T. Influence of learning model implementation on quality assurance-based vocational education. SAGE Open. 2019;9(2):2158244019851552.
13. Ardiansyah RA, Cahyaka HW. Android-based mobile learning as instructional media for human resource, materials, and equipment management subjects. Jurnal Kajian Pendidikan Teknik Bangunan. 2023;9(2):67–73.
14. Wardhani PSN, Nastiti D. Implementation of entrepreneurship education in fostering students' entrepreneurial interest. Prima Magistra: Jurnal Ilmiah Kependidikan. 2023;4(2):177–191.
15. Hanafiah H, Ruslani E, Suryana S, Nugraha J. Implementation of curriculum management in the SMK Pusat Keunggulan electrical engineering program at SMK Negeri 1 Rangkasbitung. Jurnal Wahana Pendidikan. 2024;11(1):139–148.
16. Lince L. Implementation of the Merdeka Curriculum to improve learning motivation in vocational high schools designated as centers of excellence. In: Proceedings of the National Education Seminar; 2022 May; Indonesia. 2022;1(1):38–49.
17. Sudjimat DA. Developing skilled and character-driven human resources through the implementation of the IPJBL model in vocational education in the Industry 4.0 era. Malang: Universitas Negeri Malang Press; 2022. https://um.ac.id/mencetak-sdm-terampil-dan-berkarakter-melalui-implementasi/

18. Ahmanda W, Maulana A, Murtinugraha RE, Arifah S. Implementation of the SMK Pusat Keunggulan program based on the 8+I link and match concept. Jurnal Pendidikan Teknik Bangunan. 2022;2(2):59–74.
19. Mukti F, Nuzuar N, Sumarto S. Implementation of the SMK Pusat Keunggulan program through partnerships with industry at SMKS 6 Pertiwi Curup. Jurnal Pendidikan Vokasi. 2023;13(1):45–56.
20. Yusuf F. Philosophical paradigm of vocational education in the field of information systems: A philosophy of science review and theoretical reconstruction. Bandung: CV Ruang Tentor; 2022. https://books.google.co.id/books?hl=id&lr=&id=4Mi6EAAAQBAJ&oi=fnd&pg=PP1&dq=Paradigma+filsafat+pendidikan+vokasi+pada+bidang+keilmuan+sistem+informasi:+tinjauan+filsafat+ilmu+dan+rekonstruksi+teori.+Bandung:+CV+Ruang+Tentor%3B+2022.&ots=1UeO0Qumfe&sig=X2S3JAIs24b_OIyoJhkuafcyNww&redir_esc=y#v=onepage&q=Paradigma%20filsafat%20pendidikan%20vokasi%20pada%20bidang%20keilmuan%20sistem%20informasi%3A%20tinjauan%20filsafat%20ilmu%20dan%20rekonstruksi%20teori.%20Bandung%3A%20CV%20Ruang%20Tentor%3B%202022.&f=false
21. Gadell J. Charles Allen Prosser: His work in vocational and general education. St. Louis: Washington University in St. Louis; 1972. https://www.proquest.com/openview/e255a68bdeb61e4d8e27b004a468df04/1?pq-origsite=gscholar&cbl=18750&diss=y
22. Kholis N, Kartowagiran B, Mardapi D. Development and validation of an instrument to measure vocational high school performance. European Journal of Educational Research. 2020;9(3):955–966.
23. Ministry of Education and Culture of Indonesia. Innovations in learning models for vocational high schools. Jakarta: Bureau of Communication and Public Services, Ministry of Education and Culture; 2018. https://repositori.kemendikdasmen.go.id/18352/1/2018_Warta_Balitbang_Edisi_1.pdf
24. Jaya H. Development of a virtual laboratory for practicum activities and character education facilitation in vocational high schools. Jurnal Pendidikan Vokasi. 2016;2(1):1–10.
25. Mardiyati BD, Yuniawati R. Differences in career adaptability between general senior high school and vocational high school students. Jurnal Psikologi Pendidikan. 2015;4(2):85–94.
26. Utari H, Triana YS. Student monitoring information system using SMS gateway. RESTI Journal (Systems Engineering and Information Technology). 2019; 3(3); 328-335.
27. Setiyawan A, Prasetya TA, Hastawan AF. Usability evaluation of an SMS gateway-based assignment and monitoring information system for internship students using Raspberry Pi. IOP Conference Series: Earth and Environmental Science. 2021;700(1):012021.
28. Suwanto I. Behavioral counseling with self-management techniques to enhance career maturity of vocational high school students. Jurnal Bimbingan Konseling Indonesia. 2016;1(1):1–5.
29. Windaningrum F. Analysis of the relevance of vision, mission, objectives, and curriculum between SMKN 1 Kedawung Sragen and SMKN 1 Bawen Semarang. Semarang: Universitas Negeri Semarang; 2019;2 (2):123-140.
30. Ministry of Education and Culture of Indonesia. Understanding the SMK Pusat Keunggulan program. Jakarta: Kemendikbud; 2023. https://merdekabelajar.kemdikbud.go.id/upload/file/146_1638311883.pdf
31. Ministry of Education and Culture of Indonesia. Training module for competency enhancement based on 21st-century skills. Jakarta: Kemendikbud; 2019. https://repositori.kemendikdasmen.go.id/17032/
32. Yusro M, Yuliatmojo P, Triwardana D, Wiyantoro H, Sulistiyo C, Haryanto M. Assistance in developing Merdeka Curriculum teaching modules toward SMK Pusat Keunggulan. Proceedings of the National Seminar on Community Service. 2023;4(1):333–340.
33. Muharrom M, Aslan A, Jaelani J. Implementation of the Merdeka Curriculum in Islamic religious education subjects at SMK Pusat Keunggulan Muhammadiyah, Sintang City. Jurnal Ilmu Pendidikan and Kearifan Lokal. 2023;1 (3):441-453.
34. Muryanti M, Harsono SU, Rohmah W. Instructional leadership of principals at SMK Pusat Keunggulan in SMK Negeri 1 Sukoharjo. Jurnal Manajemen Pendidikan. 2022;14(2):101–112.
35. Hidayah N. Management of vocational high schools as centers of excellence. Kapita Selekta. 2023;1:132–145.
36. Prihastomo TA, Tefa AA, Natalia FMPA, Cyprianus LK, Riadi TJH. ATMI: building vocational education for the nation. Yogyakarta: PT Kanisius; 2021. https://books.google.co.id/books?hl=id&lr=&id=1lcnEAAAQBAJ&oi=fnd&pg=PR7&dq=Prihastomo+TA,+Tefa+AA,+Natalia+FMPA,+Cyprianus+LK,+Riadi+TJH.ATMI:+merakit+pendidikan+vokasi+untuk+bangsa.+Yogyakarta:+PT+Kanisius%3B+2021.&ots=lhNGIirshs&sig=6QpRO4K9-kB6R-fq6uoaiWSVv8s&redir_esc=y#v=onepage&q&f=false
37. Aditya DY, Kencanawaty G. Policy analysis of the SMK Pusat Keunggulan program in Indonesia using the CIPP model. Jurnal Bintang Manajemen. 2024;2(1):85–100.
38. Rahman A, Zebua WA, Kusuma AA. Policy formulation of the SMK Pusat Keunggulan program in Indonesia. Proceedings of the National Research Seminar, LPPM UMJ. 2022;1(1):45–53.
39. Novika F. Assistance in strategic planning development and activity evaluation toward SMK Pusat Keunggulan. Indonesian Journal of Engagement, Community Services, Empowerment and Development. 2022;2(1):149–156.
40. Khasanah U. Link and match program with business and industry as an effort to place graduates at SMK Muhammadiyah Delanggu. Journal Islam Science. 2020;7(2):79–87.
41. Supriyadi A, Rusmawati RD. Implementation of link and match program development through an practice handbook. Technium Social Sciece Journal. 2022;32:95–102.

42. Lestari P, Roesminingsih E. Development of Berpijar application to strengthen link and match between vocational schools and industry. Edu Learning: Journal of Education and Learning. 2023;2(1):61–72.
43. Lisdiantini N, Azis A, Syafitri EM, Thousani HF. Effectiveness analysis of the SMK Pusat Keunggulan program for synchronizing link and match between higher education and industry. Ecobisma Journal Economic Bussines Management. 2022;9(2):22–31.
44. Rahmadani PN, Arthur R, Maulana A. Integration of vocational literacy concepts to develop critical thinking skills among vocational high school students: a literature review. Journal Pendidik West Science. 2023;1(12):817–826.
45. Ningsih S, Dukalang HH. Application of the successive interval method in multiple linear regression analysis. Jambura Journal Mathematic. 2019;1(1):43–53.
46. John RCS. Applied linear regression models. 1983. https://www.tandfonline.com/doi/pdf/10.1080/00224065.1983.11978875
47. Järvelä S, Nguyen A, Vuorenmaa E, Malmberg J, Järvenoja H. Predicting regulatory activities for socially shared regulation to optimize collaborative learning. Computers in Human Behavior. 2023;144:107737.

How to Cite: Wuryanto J, Sutisna A, Saefudin YS. Evaluating Indonesia's Vocational Centre of Excellence Program with the Kirkpatrick Model: Linking Facilities, Resources, and Student Outcomes. Int Res J Multidiscip Scope. 2026; 7(1): 679-697. DOI: 10.47857/irjms.2026.v07i01.08512