



Analysis of Factors Contributing to the Competency Gap Between Graduates and Industry Requirements: A Case Study of SMK Negeri 1 Motoling

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ABSTRACT

The alignment between the competencies of Vocational High School (SMK) graduates and the needs of industry is one of the key indicators of the success of vocational education in preparing job-ready workers. However, a competency gap (skill gap) remains evident, resulting in some graduates being unable to meet the competency requirements demanded by industry. This study aims to analyze the factors contributing to the mismatch between graduates' competencies and industry needs at SMK Negeri 1 Motoling. The research employed a quantitative approach using a survey method. Data were collected through questionnaires distributed to respondents consisting of final-year students and alumni and were analyzed using descriptive statistics and multiple linear regression. The findings indicate that several factors contribute to the competency gap among graduates, including curriculum relevance, the quality of industrial work practice (internship) implementation, soft skills mastery, the availability of learning facilities and infrastructure, and the intensity of school-industry partnerships. Among these factors, soft skills mastery and industry partnerships exert a more dominant influence than the other factors in improving the alignment between graduates' competencies and labor market requirements. These findings suggest that efforts to enhance the quality of vocational education should not only focus on technical competencies but also emphasize the development of non-technical skills and sustainable collaboration with business and industrial sectors. The study implies the need for more adaptive vocational education strategies that respond to the dynamic demands of industry in order to strengthen the relevance and competitiveness of vocational high school graduates.

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INTRODUCTION

Industrial transformation driven by digitalization, automation, artificial intelligence, and the knowledge-based economy has fundamentally changed the competencies required in the labor market. Modern industries no longer demand only technical skills (hard skills) but also adaptive competencies such as critical thinking, problem-solving, communication, collaboration, and digital literacy. These developments require vocational education systems to produce graduates whose competencies align with the continuously evolving needs of industry. From the perspective of Human Capital Theory proposed by Becker (1993), education and training are forms of investment intended to enhance individual productivity and increase the economic value of the workforce. Therefore, the alignment between graduates' competencies and industry requirements serves as a key indicator of the effectiveness of vocational education in producing competent and competitive human resources.

Despite the implementation of various policies aimed at strengthening vocational education, the phenomenon of skills mismatch remains a significant challenge in many countries, including Indonesia. Skills mismatch refers to a condition in which the competencies possessed by graduates do not fully correspond to those required by the labor market. This situation leads to reduced employment opportunities, increased retraining costs borne by employers, and lower workforce productivity. In the Indonesian context, graduates of Vocational High Schools (SMKs) continue to face difficulties in entering the labor market due to discrepancies between the competencies acquired during their education and the demands of the business and industrial sectors (DUDI). This phenomenon indicates that the implementation of the link and match policy between vocational schools and industry has not yet been fully optimized (Ningrum, 2025; Wibowo, 2016).

The issue of competency gaps among SMK graduates is not attributable to a single factor but rather results from the interaction of multiple interrelated factors. The literature suggests that curriculum relevance to industrial technological developments, the quality of industrial work practice (Prakerin) implementation, soft skills proficiency, the availability of practical training facilities, and the intensity of school-industry partnerships are critical determinants of graduates' work readiness. Curricula that fail to keep pace with technological advancements may produce competencies that are less relevant to industry needs (Putri et al., 2026; Sudalyo & Prasetyaningrum, 2024). Likewise, limited workplace experience may reduce graduates' ability to adapt to real-world working environments. Furthermore, numerous studies have demonstrated that employers increasingly emphasize the importance of soft skills as a complement to technical competencies during the recruitment process.

Previous studies have examined the relationship between vocational education and labor market needs from various perspectives. Several studies have highlighted the impact of education-job mismatch on employment opportunities and graduate earnings. Other studies have identified factors contributing to competency gaps, including weak collaboration between schools and industry, curricula that are insufficiently responsive to technological developments, and limited practical experience among students. In addition, many studies have emphasized the importance of implementing link-and-match programs, teaching factories, competency certification, and strengthened industry partnerships as strategies for improving the relevance of vocational education. These findings indicate that competency gaps constitute a multidimensional issue requiring a comprehensive analytical approach.

Nevertheless, existing studies still exhibit several limitations. Most research has been conducted at the national or regional level using aggregated data, thereby providing limited explanations regarding the causes of competency gaps at the individual school level. Furthermore, many studies focus primarily on the consequences of skills mismatch, such as unemployment and income disparities, rather than on identifying the causal factors emerging within educational institutions. Differences in geographical conditions, student characteristics, availability of industrial partners, and institutional resources may generate distinct causes of competency gaps across vocational schools. Therefore, there is a need for research that examines the phenomenon of competency mismatch in a more contextualized manner at the school level.

SMK Negeri 1 Motoling is a vocational education institution located in South Minahasa Regency, North Sulawesi, Indonesia, with characteristics that differ from vocational schools situated in major industrial areas. Limited access to large-scale industries, variations in industrial internship opportunities, and the dynamics of local labor market demands may influence the alignment between graduate competencies and workplace requirements. However, empirical studies specifically investigating the factors contributing to competency gaps among graduates of SMK Negeri 1 Motoling remain scarce. This condition creates an important research gap that warrants further investigation to obtain a deeper understanding of the factors influencing the alignment between graduate competencies and industry needs within a local context.

Addressing this research gap, the present study offers novelty by simultaneously examining five major factors that are presumed to influence the occurrence of skills mismatch: curriculum relevance, the quality of industrial work practice implementation, soft skills mastery, the availability of practical training facilities, and industry partnerships. Unlike previous studies that primarily adopt macro-level approaches or focus on the consequences of competency mismatch, this study places causal factors at the center of analysis at the educational institution level. Theoretically, this research contributes to the growing body of knowledge on skills mismatch within Indonesian vocational education. Practically, the findings are expected to provide a basis for schools, local governments, and industrial partners in formulating strategies to enhance the relevance of vocational education and improve graduate quality.

Based on the foregoing discussion, this study aims to analyze the factors contributing to the skill gap between graduate competencies and industry requirements at SMK Negeri 1 Motoling. Specifically, the study examines the influence of curriculum relevance, industrial work practice, soft skills, practical training facilities, and industry partnerships on the alignment between graduate competencies and labor market needs. The findings are expected to provide evidence-based recommendations for strengthening the implementation of the link-and-match concept between vocational education and industry requirements.

METHODS

This study employed a quantitative approach using a cross-sectional survey design. The quantitative approach was selected because the study aimed to identify and analyze the influence of several factors on the competency gap between graduates' competencies and industry requirements at SMK Negeri 1 Motoling. Through this approach, relationships among variables could be objectively measured using numerical data and subsequently analyzed through inferential statistical techniques (Utama et al., 2025).

A survey design was adopted because it enabled the researcher to collect data from a relatively large number of respondents within a limited period and to obtain an overview of

respondents' perceptions regarding factors influencing the alignment between graduate competencies and labor market needs. This study examined the effects of five independent variables—curriculum relevance, industrial work practice (Prakerin), soft skills, learning facilities, and industry partnerships—on the dependent variable, namely the alignment between graduate competencies and industry requirements. This research design was considered appropriate for achieving the study's objective of identifying the dominant factors contributing to competency gaps in vocational education.

The participants consisted of current students and alumni of SMK Negeri 1 Motoling. The involvement of both groups was intended to provide a more comprehensive understanding of the educational processes implemented by the school and the relevance of acquired competencies to labor market requirements.

A total of 180 respondents participated in the study, comprising 118 current students and 62 alumni. The student respondents were between 15 and 18 years old, while the alumni ranged from 19 to 25 years of age. Based on gender, the respondents consisted of 99 males (55.0%) and 81 females (45.0%).

The respondents represented several vocational programs offered by SMK Negeri 1 Motoling. Overall, 73 respondents (40.6%) were enrolled in the Computer and Network Engineering program, 51 respondents (28.3%) were from the Office Management and Business Services program, and 56 respondents (31.1%) were from the Accounting and Institutional Finance program. The distribution of respondents across different vocational programs indicates that the study encompassed students and alumni from diverse fields of specialization, thereby providing a reasonably representative overview of vocational education conditions at SMK Negeri 1 Motoling.

Purposive sampling was employed as the sampling technique. This method was selected because the study required respondents with direct experience related to vocational learning processes and workforce competency development. The selected students were twelfth-grade students who had completed most of their coursework and industrial work practice activities. The alumni included in the study were graduates from the previous three years (2022–2024), as they were considered to possess relevant experiences regarding the transition from education to employment.

Research data were collected using a structured questionnaire based on a five-point Likert scale, ranging from 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree), to 5 (strongly agree). The instrument was developed based on a review of the literature on vocational education, skills mismatch, work readiness, and industry partnerships (Mariah & Sugandi, 2013; Prasetyo et al., 2020).

The questionnaire consisted of six constructs. Curriculum relevance was measured using six items covering the alignment of learning materials with industry needs, curriculum updates, and competency-based learning implementation. Industrial work practice was measured using five items addressing internship duration, quality of supervision, suitability of placement, real workplace experience, and workforce skill development. Soft skills were measured using eight items covering communication skills, teamwork, problem-solving ability, adaptability, work ethics, and responsibility. Learning facilities were measured using five items related to the availability of laboratories, practical equipment, learning resources, internet access, and technology utilization. Industry partnerships were measured using five items assessing the intensity of school–industry collaboration, industry involvement in curriculum development,

guest lecturer programs, competency certification initiatives, and graduate recruitment opportunities. The dependent variable, graduate competency alignment with industry requirements, was measured using seven items covering technical competencies, work readiness, adaptability, and the relevance of competencies to job demands.

Prior to the main study, the instrument was validated by three experts specializing in vocational education and research methodology. A pilot test was subsequently conducted involving 30 respondents outside the main sample. The validity test results indicated that all questionnaire items had item-total correlation coefficients (r-values) greater than 0.30 and were therefore considered valid. Reliability testing using Cronbach's Alpha yielded coefficients ranging from 0.78 to 0.92, indicating satisfactory internal consistency. The Cronbach's Alpha values were 0.82 for curriculum relevance, 0.80 for industrial work practice, 0.91 for soft skills, 0.78 for learning facilities, 0.84 for industry partnerships, and 0.92 for graduate competency alignment.

Data were analyzed using IBM SPSS Statistics version 27. The first stage involved descriptive statistical analysis to describe the characteristics of the respondents and the distribution of responses for each research variable. The descriptive statistics included frequencies, percentages, means, and standard deviations.

The second stage involved testing the validity and reliability of the research instrument. Construct validity was assessed using item-total correlation analysis, while reliability was evaluated using Cronbach's Alpha coefficients.

The third stage involved Pearson correlation analysis to identify relationships among the study variables. Subsequently, multiple linear regression analysis was conducted to examine the effects of curriculum relevance, industrial work practice, soft skills, learning facilities, and industry partnerships on the alignment between graduate competencies and industry requirements. Partial effects were tested using t-tests, whereas simultaneous effects were examined using the F-test. All statistical analyses were performed at a significance level of 5% ($\alpha = 0.05$).

The regression model employed in this study was formulated as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon$$

where Y represents the alignment between graduate competencies and industry requirements; X_1 denotes curriculum relevance; X_2 represents industrial work practice; X_3 refers to soft skills; X_4 indicates learning facilities; and X_5 represents industry partnerships. Furthermore, β_0 is the regression constant, β_1 – β_5 are the regression coefficients, and ε denotes the error term.

Through these analytical procedures, the study sought to identify the dominant factors contributing to the competency gap between vocational school graduates and industry requirements at SMK Negeri 1 Motoling.

RESULTS AND DISCUSSION

Respondent Characteristics

This study involved 180 respondents consisting of 118 current students and 62 alumni of SMK Negeri 1 Motoling. The characteristics of the respondents are presented in Table 1.

Table 1. Respondent Characteristics

Characteristic	Category	Frequency	Percentage (%)
Respondent Status	Current Students	118	65,6
	Alumni	62	34,4
Gender	Male	99	55,0

	Female	81	45,0
Age	15–18 Years	118	65,6
	19–25 Years	62	34,4
Study Program	Computer and Network Engineering	73	40,6
	Office Management and Business Services	51	28,3
	Accounting and Institutional Finance	56	31,1
Graduation Year (Alumni)	2022	16	25,8
	2023	20	32,3
	2024	26	41,9

Table 1 shows that the majority of respondents were current students, accounting for 65.6% of the sample, while alumni represented 34.4%. Based on gender, male respondents were more dominant than female respondents. The respondents were drawn from all vocational programs offered by the school, with the largest proportion originating from the Computer and Network Engineering program. This distribution indicates that the respondents represented a variety of fields of specialization available at SMK Negeri 1 Motoling.

Descriptive Statistics of Research Variables

Descriptive statistics were employed to provide an overview of respondents' perceptions regarding the research variables.

Table 2. Descriptive Statistics of Research Variables

Variable	Mean	SD	Min	Max	Kategori
Curriculum Relevance	3,79	0,63	2,00	5,00	Tinggi
Industrial Work Practice	3,71	0,67	2,00	5,00	Tinggi
Soft Skills	4,08	0,58	2,30	5,00	Tinggi
Learning Facilities	3,51	0,75	1,80	5,00	Sedang-Tinggi
Industry Partnerships	3,43	0,80	1,80	5,00	Sedang
Alignment of Graduate Competencies with Industry Requirements	3,65	0,71	2,00	5,00	Tinggi

Based on Table 2, the soft skills variable obtained the highest mean score ($M = 4.08$), while industry partnerships recorded the lowest mean score ($M = 3.43$). These findings indicate that respondents perceived graduates' non-technical competencies to be relatively strong. However, the quality of school–industry partnerships still requires further improvement to enhance the alignment between graduate competencies and labor market demands.

Instrument Testing Results

Validity Test

The validity test results indicated that all questionnaire items satisfied the validity criterion, with item–total correlation coefficients exceeding 0.30. Therefore, all items were considered valid and suitable for use in the main data collection process.

Table 3. Summary of Validity Test Results

Variable	Number of Items	Range of Item–Total Correlations (r)	Interpretation
Curriculum Relevance	6	0,472–0,768	Valid
Industrial Work Practice	5	0,505–0,742	Valid
Soft Skills	8	0,548–0,831	Valid
Learning Facilities	5	0,438–0,714	Valid
Industry Partnerships	5	0,487–0,763	Valid
Alignment of Graduate Competencies	7	0,562–0,851	Valid

All instrument items were declared valid, as their item–total correlation coefficients exceeded the established minimum threshold ($r > 0.30$).

Reliability Test

Table 4. Reliability Test Results

Variable	Cronbach's Alpha	Interpretation
Curriculum Relevance	0,81	Reliabel
Industrial Work Practice	0,79	Reliabel
Soft Skills	0,90	Highly Reliable
Learning Facilities	0,77	Reliabel
Industry Partnerships	0,83	Reliabel
Alignment of Graduate Competencies	0,91	Highly Reliable

The Cronbach's Alpha coefficients for all variables exceeded 0.70, indicating that the research instrument demonstrated good internal consistency.

Correlation Analysis Results

Table 5. Correlation Matrix of Research Variables

Variable	X1	X2	X3	X4	X5	Y
X1	1					
X2	0,523**	1				
X3	0,491**	0,548**	1			
X4	0,437**	0,421**	0,453**	1		
X5	0,575**	0,516**	0,594**	0,447**	1	
Y	0,604**	0,646**	0,728**	0,231*	0,691**	1

Table 5 shows that most of the independent variables were positively correlated with the alignment between graduate competencies and industry requirements. The strongest correlations were found for Soft Skills ($r = 0.728$) and Industry Partnerships ($r = 0.691$). In contrast, Learning Facilities exhibited a relatively weak correlation with graduate competency alignment ($r = 0.231$), indicating that the availability of learning facilities is not directly associated with the degree to which graduates' competencies align with industry needs.

Multiple Linear Regression Analysis Results

Table 6. Results of Multiple Linear Regression Analysis

Variable	B	t	Sig.
Constant	0,887	3,024	0,003
Curriculum Relevance (X1)	0,193	2,914	0,004
Industrial Work Practice (X2)	0,224	3,487	0,001

		Soft Skills (X3)	0,361	6,125	0,000
		Learning Facilities (X4)	0,071	1,216	0,226
		Industry Partnerships (X5)	0,287	4,682	0,000
R ²	=	0,671			
Adjusted R ²	=	0,662			
F	=	70,543			
Sig.	=	0,000			

Based on Table 6, the regression model was statistically significant overall ($F = 70.543$, $p < 0.001$). The Adjusted R^2 value of 0.662 indicates that 66.2% of the variance in the alignment between graduate competencies and industry requirements can be explained by curriculum relevance, industrial work practice, soft skills, learning facilities, and industry partnerships. The remaining 33.8% is attributable to other factors not included in the research model.

At the individual level, Curriculum Relevance ($\beta = 0.193$, $p = 0.004$), Industrial Work Practice ($\beta = 0.224$, $p = 0.001$), Soft Skills ($\beta = 0.361$, $p < 0.001$), and Industry Partnerships ($\beta = 0.287$, $p < 0.001$) had significant positive effects on the alignment between graduate competencies and industry requirements. In contrast, Learning Facilities ($\beta = 0.071$, $p = 0.226$) did not demonstrate a statistically significant effect.

Among the independent variables, Soft Skills exerted the strongest influence, followed by Industry Partnerships, Industrial Work Practice, and Curriculum Relevance. These findings suggest that non-technical competencies and strong collaboration with industry play a more critical role in enhancing the alignment between graduate competencies and labor market requirements than the mere availability of learning facilities.

DISCUSSION

Interpretation of the Main Findings

The findings of this study indicate that curriculum relevance, industrial work practice, soft skills, and industry partnerships significantly influence the alignment between graduate competencies and industry requirements. In contrast, learning facilities did not demonstrate a significant effect on graduate competency alignment. This finding suggests that the availability of educational facilities alone does not necessarily enhance the relevance of graduate competencies unless it is accompanied by high-quality learning processes, meaningful industrial work experiences, and the development of students' soft skills.

Soft skills emerged as the most influential factor affecting the alignment between graduate competencies and industry requirements. This result indicates that contemporary industries demand not only technical competencies but also communication skills, teamwork, adaptability, and problem-solving abilities. In the era of digital transformation and automation, adaptability has become one of the most critical competencies required in the workplace.

Industry partnerships were also found to exert a strong influence on graduate competency alignment. This finding suggests that the more intensive the collaboration between schools and industry, the greater the opportunity for schools to align their curricula with industry needs, provide authentic workplace experiences, and enhance students' work readiness. Effective school-industry partnerships enable vocational institutions to respond more rapidly to technological changes and evolving labor market demands, thereby improving the relevance and competitiveness of their graduates.

Comparison with Previous Studies

The findings of this study indicate that a curriculum that is insufficiently adaptive, limited opportunities for structured industrial work experience, and inadequate mastery of soft skills are the primary factors contributing to the competency gap between graduates of SMK Negeri 1 Motoling and industry requirements. These findings are consistent with the studies of Framesthi et al. (2025) and Suparyati and Habsya (2024), which demonstrated that curricula that fail to keep pace with technological developments, coupled with inadequate quality of industrial internships, significantly contribute to vocational graduates' skills mismatch in the labor market. The prominence of deficiencies in soft skills identified in this study also supports the findings of Fatihaturrizqi et al. (2025), who emphasized that adaptability, critical thinking, and complex problem-solving are among the competencies experiencing the most significant gaps in the era of industrial transformation. Furthermore, the consequences of skill mismatch observed in this study are consistent with the findings of Syuhada and Hasanah (2025), who reported that vocational high school graduates constitute a substantial proportion of unemployed individuals due to competencies that do not align with labor market demands. However, this study found that the availability of basic practical learning facilities and infrastructure was not the primary obstacle. Instead, the limited access to partnerships with large-scale industries in the surrounding region emerged as the most significant challenge in improving the alignment between graduate competencies and industry needs.

Research Contributions

Theoretically, this study contributes to the literature on skills mismatch in vocational education by demonstrating that competency gaps among graduates are influenced not only by curriculum-related factors but also by non-technical competencies and institutional relationships with industry. These findings broaden the understanding of the application of Human Capital Theory within the context of vocational education in Indonesia, highlighting the importance of both technical and employability skills in enhancing graduate competitiveness and labor market relevance.

From a practical perspective, the study provides valuable insights for SMK Negeri 1 Motoling regarding priority areas that should be strengthened to improve the alignment between graduate competencies and industry requirements. For teachers and school administrators, the findings may serve as a basis for developing project-based learning initiatives, enhancing the quality of industrial work practice programs, and strengthening the development of students' soft skills to better prepare them for workforce demands.

This study also addresses a research gap identified in the introduction, namely the limited availability of contextual studies examining the determinants of competency gaps at the individual vocational school level, particularly in North Sulawesi. By focusing on a specific vocational education institution, the study provides empirical evidence that contributes to a more nuanced understanding of skills mismatch within local vocational education settings.

CONCLUSION

Based on the findings of this study, vocational schools should strengthen the integration of soft skills development into the learning process through project-based learning, teaching factory programs, and collaborative learning approaches. In addition, partnerships with industry should be expanded through internship programs, industry guest lecturers, curriculum alignment

initiatives, and competency certification programs that reflect current industry requirements. Local governments and educational stakeholders should also promote the strengthening of the link-and-match ecosystem between vocational schools and business and industrial sectors. Policy support focused on the development of twenty-first-century competencies and increased access to authentic workplace experiences will contribute to reducing competency gaps among vocational school graduates. Future research is recommended to involve a larger number of vocational schools and incorporate perspectives from industry representatives to obtain a more comprehensive understanding of the factors contributing to skills mismatch in Indonesian vocational education. Such studies would provide broader empirical evidence and enhance the generalizability of findings across different vocational education contexts.

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