

Innovative School Leadership, Teaching Factory Implementation, and Teacher Mentoring as Predictors of Soft Skills Development among Vocational Pharmacy Students

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Abstract: *The transformation of vocational education requires schools to produce graduates with both technical competencies and soft skills aligned with workplace demands. This study examines the predictive relationships of innovative principal leadership, Teaching Factory implementation, and supervising teacher mentoring with students' soft skills development in Pharmacy Departments of vocational schools in Pekalongan Regency. A quantitative approach with a cross-sectional ex post facto design was employed. The sample comprised 113 teachers from five vocational schools selected through total sampling. Data were collected using a Likert-scale questionnaire measuring students' communication, teamwork, leadership, professional attitudes, creativity, problem-solving, adaptability, and independence based on teachers' perceptions. Data were analyzed using descriptive statistics, assumption tests, and simple and multiple linear regression with SPSS. The results indicated that innovative principal leadership, Teaching Factory implementation, and supervising teacher mentoring were positively associated with students' soft skills, both individually and simultaneously. The regression model explained 78.6% of the variance in students' soft skills. These findings highlight the importance of integrating innovative leadership, industry-based learning, and teacher mentoring to enhance vocational graduates' workplace readiness.*

Keywords: innovative leadership; Teaching Factory; teacher mentoring; soft skills; vocational education

Abstrak: *Transformasi pendidikan vokasi menuntut sekolah kejuruan menghasilkan lulusan yang tidak hanya memiliki kompetensi teknis, tetapi juga soft skills yang sesuai dengan tuntutan dunia kerja. Penelitian ini bertujuan menguji hubungan prediktif kepemimpinan inovatif kepala sekolah, implementasi Teaching Factory, dan peran pembimbingan guru terhadap pengembangan soft skills siswa pada Program Keahlian Farmasi di sekolah menengah kejuruan Kabupaten Pekalongan. Penelitian menggunakan pendekatan kuantitatif dengan desain cross-sectional ex post facto. Sampel terdiri atas 113 guru dari lima sekolah menengah kejuruan yang dipilih melalui total sampling. Data dikumpulkan menggunakan kuesioner skala Likert dan dianalisis melalui analisis deskriptif, uji asumsi, serta regresi linier sederhana dan berganda menggunakan SPSS. Pengembangan soft skills diukur berdasarkan persepsi guru terhadap komunikasi, kerja sama tim, kepemimpinan, sikap profesional, kreativitas, pemecahan masalah, adaptabilitas, dan kemandirian siswa. Hasil penelitian menunjukkan bahwa ketiga variabel prediktor berhubungan positif dengan pengembangan soft skills, baik secara parsial maupun simultan. Model regresi menjelaskan 78,6% varians pengembangan soft skills siswa. Temuan ini menegaskan pentingnya integrasi kepemimpinan inovatif, pembelajaran berbasis industri, dan pembimbingan guru dalam memperkuat kesiapan kerja lulusan vokasi.*

Kata kunci: kepemimpinan inovatif; Teaching Factory; guru pembimbing; soft skills; pendidikan vokasi.

Introduction

Changing workplace demands in the twenty-first century have driven a transformation in vocational education from an emphasis on technical skills mastery toward the development of more comprehensive competencies. Vocational high schools (Sekolah Menengah Kejuruan/SMK) are no longer expected merely to produce graduates with strong *hard skills*, but also graduates who demonstrate essential nontechnical competencies (*soft skills*), including communication, collaboration, creativity, adaptability, and problem-solving. These competencies have become critical determinants of graduates' success in entering the workforce, as modern professional environments require individuals who can work flexibly, collaborate effectively, and respond adaptively to changing circumstances (Tomlinson, 2021; Succi & Canovi, 2021).

The strengthening of *soft skills* in vocational education has become increasingly important because industries consider not only technical competence but also graduates' work readiness and interpersonal abilities. A gap between the competencies developed by educational institutions and the demands of the workplace remains evident, particularly in communication, leadership, and teamwork. Therefore, vocational education needs to strengthen the development of students' socio-personal competencies (Succi & Canovi, 2021). Graduates' success in entering the workforce is also influenced by the combination of professional knowledge and socio-personal skills that support graduate employability (Tomlinson, 2021). Accordingly, vocational education needs to establish learning environments that continuously integrate technical and nontechnical competencies (Kyndt et al., 2021). In addition, career adaptability has become an important dimension for young people in navigating the increasingly complex and dynamic nature of the contemporary labor market (Hirschi, 2022).

In Pharmacy, strengthening *soft skills* is essential because pharmaceutical practice requires accuracy, responsibility, ethical conduct, communication skills, teamwork, and adherence to professional standards. Pharmacy competency frameworks emphasize professionals' abilities to communicate effectively, collaborate with healthcare teams, and provide safe services (Meilianti et al., 2021; Udoh et al., 2021). Communication competence is also a key component of pharmacy education and practice (Sawicki & Maravent, 2024). Therefore, vocational pharmacy graduates must develop both technical and professional competencies.

One educational management factor that plays an important role in strengthening students' competencies is school leadership. Within the paradigm of modern education, school principals are no longer merely administrators but also change leaders who are capable of directing innovation within school organizations. Innovative school leadership is associated with the ability to establish a vision for change, foster a culture of innovation, encourage creativity among school community members, and develop educational strategies that are responsive to societal and industry needs (Kim & Hong, 2021).

Innovative school leadership can serve as a driving force for change through the development of new ideas, the strengthening of collaboration, and the creation of innovative learning environments (Sungdong et al., 2025). Furthermore, innovation-oriented leadership contributes to strengthening teachers' organizational commitment by fostering a positive organizational culture (Sutiyatno et al., 2022). In the context of vocational education, school principals have a strategic role in establishing stronger connections between schools and the world of work through policies and collaborative strategies with industry (OECD, 2021). Strategic leadership through organizational transformation and the strengthening of collaborative networks is also an important factor in improving the quality of vocational education (Norman et al., 2025).

In addition to school leadership, work experience-based learning approaches are important for developing the competencies of vocational students. One model designed to bridge school-based learning and industry requirements is the *Teaching Factory* (TeFa). This model brings industrial work systems into the school environment through production and service activities that apply professional standards. Through the implementation of the *Teaching Factory*, students gain authentic experience in completing tasks, working in teams, managing responsibilities, and addressing problems that resemble those encountered in real-world workplaces.

Work-based learning provides authentic experiences that enable learners to develop competencies through direct engagement in real work contexts (Billett, 2021). Workplace learning environments in vocational education also make an important contribution to the development of students' professional competencies by providing opportunities to integrate knowledge, skills, and work attitudes (Gessler & Howe, 2021). The relationship between educational institutions and the world of work is an important element in improving the relevance and quality of vocational education (Aarkrog & Wahlgren, 2022). Furthermore, work-based learning has been shown to contribute to the development of employability competencies and skills required by industry (Choi & Kim, 2022). Therefore, the implementation of the *Teaching Factory* is not limited to improving students' technical skills but also serves as a strategic mechanism for developing their *soft skills* through authentic work experiences.

The successful implementation of the *Teaching Factory* is also strongly influenced by the role of supervising teachers. Supervising teachers serve as facilitators, mentors, and professional role models who assist students in developing work attitudes, responsibility, communication skills, and the ability to reflect on their learning experiences. Teachers play an important role in fostering students' competency development through meaningful and contextualized learning experiences (Darling-Hammond et al., 2021). Workplace-based learning is also more effective when learners receive support from teachers and supervisors who are able to provide guidance, supervision, and feedback throughout the learning process (Virtanen et al., 2021).

Educational technology supports supervising teachers in providing effective mentoring within Teaching Factory learning environments. The integration of pedagogy, technology, and content enables teachers to design adaptive learning experiences and strengthen competency development (Mishra & Koehler, 2021). Moreover, technology-enhanced environments facilitate twenty-first-century competencies, including communication, collaboration, creativity, and problem-solving, which contribute to students' soft skills development (Sailer et al., 2022).

Although research on school leadership, the *Teaching Factory*, and the role of teachers in vocational education has expanded, most existing studies have examined these three factors separately. Research on school leadership has primarily focused on school organizational effectiveness, studies of the *Teaching Factory* have largely emphasized industry readiness and students' technical skills, while research on teachers has tended to focus on instructional effectiveness. This situation indicates a limited body of research that integrates innovative school leadership, *Teaching Factory* implementation, and the role of supervising teachers as factors that simultaneously contribute to the strengthening of students' *soft skills*, particularly within the context of Pharmacy programs in vocational high schools.

Although previous studies have examined school leadership, Teaching Factory, and teacher roles in vocational education, these factors have mostly been investigated separately. This study addresses this gap by integrating innovative school leadership, Teaching Factory implementation, and supervising teacher mentoring as simultaneous predictors of students' soft skills, particularly in Pharmacy programs at vocational high schools. This integrated model

represents the novelty of the study by combining organizational, learning, and mentoring perspectives. Therefore, this study aims to analyze these effects and contribute theoretically to vocational education management while providing practical strategies for developing professional, adaptable, and workplace-ready graduates.

Methods

This study employed a quantitative approach using a cross-sectional survey design with an ex post facto approach. This design was selected because data were collected at a single point in time through questionnaires without any intervention, manipulation, or random assignment by the researchers. The study examined statistical relationships and predictive contributions among variables based on existing conditions. The independent variables consisted of innovative school leadership (X_1), *Teaching Factory* implementation (X_2), and the role of supervising teachers (X_3), while the dependent variable was students' *soft skills* development (Y). The study was conducted at vocational high schools (Sekolah Menengah Kejuruan/SMK) offering Pharmacy programs in Pekalongan Regency, Indonesia. Data collection was conducted from October 2025 to February 2026, including instrument preparation, data collection, analysis, and research reporting.

The population consisted of all teachers involved in Pharmacy programs at five vocational high schools in Pekalongan Regency. The population included 113 teachers from SMK Muhammadiyah Bligo, SMK Muhammadiyah Karanganyar, SMK Yapenda 2 Wiradesa, SMK Muhammadiyah Talun, and SMKYMI Wonopringgo. A total sampling technique was applied because the population size was limited and all members of the defined population were included as respondents. Therefore, the final sample consisted of 113 teachers representing the five participating schools. The findings of this study are therefore interpreted within the context of the selected vocational pharmacy schools and should not be generalized beyond similar populations without further investigation.

The research instrument was a structured questionnaire using a five-point Likert scale ranging from strongly agree (SA) to strongly disagree (SD). The questionnaire was developed based on relevant theoretical frameworks and previous studies concerning innovative leadership, *Teaching Factory* implementation, teacher mentoring roles, and students' soft skills development. The soft skills variable (Y) consisted of six dimensions: communication skills, teamwork and collaboration, leadership, ethics and professional attitudes, creativity and problem-solving, and adaptability and independence. The innovative school leadership variable (X_1) included innovative vision, creativity and initiative, risk-taking, collaboration and empowerment, and innovation implementation and sustainability. The *Teaching Factory* implementation variable (X_2) comprised planning, implementation, evaluation, and collaboration and partnerships. The role of supervising teachers variable (X_3) consisted of learning facilitator, academic and social mentor, motivator and inspirer, and mediator and social counselor dimensions.

Prior to the main data collection, the instrument underwent validity and reliability testing. Content validity was examined through expert review to ensure the relevance and clarity of items, while construct validity was assessed using Pearson product-moment correlation. Items were considered valid when the correlation coefficient exceeded the critical value at the 5% significance level. Reliability was evaluated using Cronbach's alpha, with values above 0.70 indicating acceptable internal consistency. The reliability coefficients were 0.992 for students' *soft skills*, 0.990 for innovative school leadership, 0.988 for *Teaching Factory* implementation, and 0.973 for supervising teacher roles. Although these values indicate excellent reliability, the

possibility of item similarity was considered by reviewing item consistency to ensure that the instrument maintained adequate construct representation.

Data analysis was conducted using IBM SPSS Statistics version 25. The analysis included descriptive statistics, assumption testing, and hypothesis testing. Descriptive analysis was performed using mean, standard deviation, and frequency distributions. Prior to regression analysis, assumption tests were conducted, including normality, linearity, multicollinearity, and heteroscedasticity testing. Normality was assessed using the Kolmogorov–Smirnov test, linearity was examined through the *Test for Linearity*, multicollinearity was evaluated using tolerance values and Variance Inflation Factor (VIF), with tolerance values above 0.10 and VIF values below 10 indicating no multicollinearity problems, and heteroscedasticity was assessed using the Glejser test.

Hypothesis testing was conducted using simple and multiple linear regression analyses. Simple linear regression was used to examine the bivariate statistical relationships between each independent variable and students' *soft skills*. Multiple linear regression was conducted to examine the simultaneous predictive contribution of innovative school leadership, *Teaching Factory* implementation, and supervising teacher roles. The statistical significance level was set at 0.05. The multiple regression analysis included t-tests to examine the unique contribution of each predictor, F-tests to assess the overall model significance, R^2 and adjusted R^2 values to determine explained variance, and standardized beta coefficients to compare the relative contribution of each predictor within the model.

Result and Discussion

The descriptive statistical analysis was conducted to examine the characteristics of the research variables before hypothesis testing. As presented in Table 1, all variables demonstrated relatively favorable tendencies, indicating that respondents perceived innovative school leadership, *Teaching Factory* implementation, supervising teachers' mentoring role, and students' *soft skills* development positively.

Table 1. Descriptive Statistics of the Research Variables

Variable	N	Mean	SD	Minimum	Maximum
Strengthening of Students' <i>Soft Skills</i> (Y)	113	319.09	68.488	117	440
Innovative School Leadership (X_1)	113	211.88	43.758	81	298
<i>Teaching Factory</i> Implementation (X_2)	113	169.78	35.379	63	237
Role of Supervising Teachers (X_3)	113	170.23	33.988	83	240

Source: Primary data processed by the authors, 2026.

The regression assumptions were subsequently examined before conducting hypothesis testing. The analysis focused on regression residuals to ensure that the model met the requirements for statistical inference. The results assumption testing are presented in Table 2.

Table 2. Regression Assumption Testing

Test	Indicator	Result	Interpretation
Normality	Monte Carlo Sig.	0.146	Normal residual distribution
Linearity X_1 –Y	Deviation from Linearity	0.121	Linear relationship
Linearity X_2 –Y	Deviation from Linearity	0.651	Linear relationship
Linearity X_3 –Y	Deviation from Linearity	0.244	Linear relationship
Multicollinearity X_1	Tolerance/VIF	0.609 / 1.641	No multicollinearity
Multicollinearity X_2	Tolerance/VIF	0.674 / 1.483	No multicollinearity
Multicollinearity X_3	Tolerance/VIF	0.548 / 1.825	No multicollinearity
Heteroscedasticity	Glejser Test	Sig. > 0.05	No heteroscedasticity

Although the Kolmogorov-Smirnov test produced an Asymp. Sig. value of 0.003, the Monte Carlo estimation resulted in a significance value of 0.146 (>0.05). The Monte Carlo approach was considered as the basis for decision-making because it provides a resampling-based estimation that is more robust in evaluating residual normality, particularly when the sample size may influence asymptotic estimation. Therefore, the residuals were considered normally distributed, and the regression model fulfilled the normality assumption.

The linearity tests showed that all relationships between independent variables and students' *soft skills* were linear because the Deviation from Linearity values exceeded 0.05. Furthermore, tolerance values above 0.10 and VIF values below 10 indicated that the model did not experience multicollinearity problems. The Glejser test also showed that all predictors had significance values above 0.05, indicating the absence of heteroscedasticity. Therefore, the regression model was considered appropriate for further analysis.

The Relationship between Innovative School Leadership and Students' Soft Skills

The simple linear regression analysis demonstrated that innovative school leadership was positively associated with students' *soft skills* development. The regression coefficient was positive ($B = 1.173$), with $t = 11.933$ and $p < 0.001$, indicating that stronger innovative leadership practices were associated with higher levels of students' nontechnical competencies. The hypothesis that innovative school leadership is related to students' *soft skills* development was therefore supported.

Table 3. Simple Linear Regression Result of Innovative School Leadership

Predictor	B	t	Sig.	Decision
Innovative School Leadership → Soft Skills	1.173	11.933	< 0.001	H1 supported

Source: Primary data processed by the authors, 2026.

This finding suggests that innovative school leadership contributes to creating organizational conditions that support students' professional and interpersonal development. In vocational education, principals act not only as administrators but also as change leaders who establish strategic directions, encourage innovation, and develop collaborative school cultures. Innovative leadership enables schools to formulate visions aligned with changing workplace demands and strengthen learning environments that support twenty-first-century competencies (Kim & Hong, 2021).

Furthermore, innovation-oriented leadership contributes to educational improvement by encouraging teacher creativity, organizational adaptability, and continuous improvement practices (Matondang et al., 2024; Hidayat & Dimyati, 2023). In vocational education contexts, principals have an important role in connecting school programs with industry requirements through collaborative strategies and organizational transformation (Organisation for Economic Co-operation and Development, 2021; Norman et al., 2025). Therefore, innovative school leadership provides the institutional foundation required for developing students' professional character and workplace readiness.

The Relationship between Teaching Factory Implementation and Students' Soft Skills

The regression analysis showed that *Teaching Factory* implementation was positively associated with students' *soft skills* development. The analysis produced a positive regression coefficient ($B = 1.366$), with $t = 10.492$ and $p < 0.001$, indicating that stronger implementation

of *Teaching Factory* was related to stronger development of students' professional and interpersonal competencies.

Table 4. Simple Linear Regression Result of Teaching Factory Implementation

Predictor	B	t	Sig.	Decision
Teaching Factory Implementation → Soft Skills	1.366	10.492	<0.001	H2 supported

Source: Primary data processed by the authors, 2026.

The relationship between *Teaching Factory* and *soft skills* development can be explained through the authentic learning experiences provided by this model. Unlike conventional classroom learning, *Teaching Factory* exposes students to workplace-like situations where they must complete tasks, collaborate with others, communicate effectively, manage responsibilities, and solve practical problems.

This mechanism is consistent with experiential learning theory, which emphasizes that competency development occurs through direct engagement with meaningful work contexts (Billett, 2021). Work-based learning also enables students to understand professional standards and industrial culture while integrating theoretical knowledge with practical experience (Aarkrog & Wahlgren, 2022; Gessler & Howe, 2021). Previous studies have shown that *Teaching Factory* contributes to creativity, competence development, and innovation among vocational students through production and service activities (Firdaus et al., 2021). For Pharmacy students, this approach is particularly relevant because pharmaceutical practice requires accuracy, responsibility, service standards, and ethical conduct. Authentic pharmaceutical learning experiences can strengthen work readiness and interpersonal competencies required in professional environments (Choi & Kim, 2022). Therefore, *Teaching Factory* functions not only as a technical learning strategy but also as a mechanism for cultivating professional *soft skills*.

The Relationship between Supervising Teachers' Mentoring Role and Students' Soft Skills

The regression analysis indicated that supervising teachers' mentoring role was positively associated with students' *soft skills* development. The regression coefficient was positive ($B = 1.523$), with $t = 12.155$ and $p < 0.001$, supporting the hypothesis that effective teacher mentoring contributes to students' professional and interpersonal competency development.

Table 5. Simple Linear Regression Result of Supervising Teachers' Mentoring Role

Predictor	B	t	Sig.	Decision
Supervising Teachers' Mentoring Role → Soft Skills	1.523	12.155	<0.001	H3 supported

Source: Primary data processed by the authors, 2026.

The contribution of supervising teachers can be understood from their multiple roles as facilitators, mentors, motivators, and professional role models. During vocational learning activities, teachers provide guidance, feedback, and reflection that enable students to transform practical experiences into professional competencies.

Meaningful teacher support plays an important role in students' social and emotional development (Darling-Hammond et al., 2021). In workplace-based learning, continuous supervision and feedback from teachers help students develop professional attitudes and workplace competencies (Virtanen et al., 2021). Therefore, teacher mentoring serves as a bridge between technical learning activities and the development of professional behavior, including responsibility, communication, teamwork, and adaptability. Furthermore, teachers' ability to

integrate educational technology can strengthen mentoring processes by supporting innovative learning environments and adaptive guidance strategies (Mishra & Koehler, 2021).

Simultaneous Predictive Model of Innovative School Leadership, Teaching Factory Implementation, and Supervising Teachers' Mentoring Role on Students' Soft Skills

Multiple regression analysis was conducted to examine the combined contribution of innovative school leadership, *Teaching Factory* implementation, and supervising teachers' mentoring role in predicting students' *soft skills* development.

Table 6. Multiple Regression Model Predicting Students' Soft Skills

Model Summary				Regression Coefficients						
R	R ²	Adjusted R ²	F	Predictor		B	Beta	t	Sig.	
0.886	0.786	0.780	133.318	Innovative School Leadership		0.607	0.388	6.829	<0.001	
				Teaching Factory Implementation		0.663	0.342	6.343	<0.001	
				Supervising Teachers' Mentoring Role		0.676	0.335	5.602	<0.001	

The regression model demonstrated that the three predictors jointly explained 78.6% of the variation in students' *soft skills* development. The remaining variation may be associated with other factors outside the research model. All predictors showed significant contributions, indicating that students' *soft skills* development in vocational pharmacy education is a multidimensional process involving organizational leadership, authentic workplace learning, and teacher mentoring.

Among the predictors, innovative school leadership showed the highest standardized contribution ($\beta = 0.388$). This finding indicates that leadership provides the structural foundation for implementing effective vocational learning systems. Principals influence school vision, resource allocation, collaboration networks, and organizational culture, which subsequently support the implementation of *Teaching Factory* programs and mentoring practices (Sutiyatno et al., 2022).

However, leadership alone is insufficient to develop students' *soft skills*. Effective leadership must be translated into authentic learning experiences through *Teaching Factory* implementation and strengthened through continuous teacher mentoring. This integrated model supports previous findings that employability competencies develop through interactions among learning experiences, educational environments, and professional contexts (Noe et al., 2022). Furthermore, strong collaboration between schools and industries contributes to preparing graduates who are adaptive and responsive to workplace demands (Zhang & Wang, 2023). Therefore, vocational education management should adopt an integrated strategy that combines innovative leadership, industry-oriented learning, and systematic teacher mentoring to develop graduates who possess both technical competence and professional *soft skills*.

Conclusion

This study demonstrates that innovative school leadership, *Teaching Factory* implementation, and supervising teachers' mentoring role are positively associated with students' *soft skills* development in Vocational High School (VHS) Pharmacy programs in Pekalongan Regency. The integrated regression model indicates that these three predictors jointly provide substantial predictive contribution to students' *soft skills* development, with innovative school leadership showing the strongest relative contribution among the predictors.

These findings suggest that the development of vocational students' non-technical competencies is supported by the interaction of organizational leadership, industry-oriented learning experiences, and teacher mentoring practices.

The findings provide theoretical implications for vocational education management by emphasizing the importance of integrating leadership, workplace-based learning, and mentoring systems in developing students' professional competencies. Practically, VHS administrators can utilize these findings to strengthen school leadership practices, optimize *Teaching Factory* implementation, and enhance supervising teachers' mentoring capacity. However, this study has several limitations, including its focus on only five Pharmacy programs in vocational high schools within one regency, the use of teacher self-report perceptions as the primary data source, and the cross-sectional non-experimental design, which limits causal interpretation. Future studies are recommended to involve broader geographical areas, incorporate multiple data sources such as students, teachers, and industry partners, and employ longitudinal or experimental approaches to further examine the development of vocational students' *soft skills*.

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