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Analysis of Work Readiness of Automotive Engineering Students of SMKS Pembda Nias Regional School Reviewed in Terms of Hard and Soft Skills

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Abstract: Hard skills and soft skills are two fundamental components that simultaneously form the construct of work readiness. In the context of automotive engineering, hard skills refer to the mastery of specific technical skills such as engine failure diagnosis, transmission system repair, Electronic Control Unit (ECU) calibration, and a deep understanding of the working principles of automotive components. This study aims to analyze in depth the work readiness of Automotive Engineering students at SMKS Pembda Nias in terms of the hard and soft skills they possess. This study is a quantitative study using a correlational method. The results of this study; Transmission system repair skills were the most dominant indicator with an achievement level of 82.8%, followed by understanding vehicle electronic systems (82.60%), computer diagnostic tool skills (82%), automotive technology handling (81%), and mastery of engine failure diagnosis (80.40%). This good level of mastery indicates that students have sufficient technical competence to work in the automotive field. Meanwhile, the level of achievement of students' soft skills was also in the good category with an achievement level of 82.5%. Work ethic and professionalism were the most dominant indicators with an achievement level of 83.50%, followed by teamwork skills (82.90%), effective communication skills (82.60%), time management skills (82.30%), and adaptability to change (81.40%).

Keywords: Automotive engineering; Hard skills; Soft skills; Work readiness

Introduction

This introduction addresses the issue of graduate work readiness, a multidimensional concept encompassing technical skills (hard skills), adaptability, digital literacy, and interpersonal skills (soft skills). The issue of work readiness is a global issue, characterized by a skills gap reported by 87% of global companies (Lamri & Lubart, 2023; Kholifah et al., 2025; O'Toole et al., 2023), due to the difficulty of finding candidates with the right combination of skills. In the United States, 73% of companies feel that new graduates are not ready, especially in critical thinking and problem-solving (Siswati & Suratno, 2023; Laguna et al., 2025). A similar phenomenon also occurs in Japan and South Korea. In Indonesia, this problem is particularly pronounced in Vocational High Schools (SMK), where SMK graduates dominate the open unemployment rate (14.50% according to BPS, 2023 in Ariansyah et al. (2024). A study by the Khan et al. (2025) and Ho et al. (2025), identified causes such as misaligned curricula, limited facilities, instructor capacity, non-standard certification, and unsystematic industry collaboration. This situation is exacerbated by the fundamental transformation in the global automotive industry, which is moving towards electrification, shared mobility, autonomous driving,

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and digital connectivity (Ramos & Ruiz-Gálvez, 2024; Llopis-Albert et al., 2021). IEA projections indicate that 30% of new global vehicles will be electric by 2030, requiring a restructuring of workforce competencies. Germany and Japan have responded by integrating electronics, programming, IoT, AI, and robotics into their vocational curricula.

The Indonesian automotive industry is also striving to follow this trend, with a production target of 600,000 electric vehicles by 2030 (Ariyani et al., 2025; Habiburrahman et al., 2024). However, the Indonesian Automotive Industry Association (AIOI, 2023) indicates a significant gap between vocational high school (SMK) curricula and industry needs (72% of companies struggle to find graduates with relevant skills, particularly in electronic systems and electric/hybrid vehicles). A study by the Ministry of Industry (2022) further details this gap across hard skills (e.g., handling modern vehicle electronic systems) and soft skills (e.g., complex problem-solving, adaptability). The impact of this situation is high unemployment among vocational school graduates and the potential weakening of the national automotive industry's competitiveness, with an increase in the number of foreign workers in the technical sector (Ikome et al., 2022). The government responded through Presidential Instruction No. 9 of 2022 concerning the Revitalization of Vocational Schools, encouraging linkages and matches with industry. However, its implementation remains variable, particularly in Western Indonesia.

Previous research by Sutil-Martín & Otamendi (2021) has examined the job readiness of vocational school graduates, but few have comprehensively analyzed the balance of hard and soft skills, particularly in the context of the modern automotive industry and in specific geographic regions such as Western Indonesia (Fajaryati et al., 2021). Hard skills (technical mastery) and soft skills (communication, teamwork, adaptability) are fundamental components of job readiness, complementing each other (Hussein, 2024; Poláková et al., 2023; Pantaruk et al., 2025). Super's theory (vocational maturity) and Becker's theory of human capital emphasize the importance of integrating these two types of skills. Empirical studies (Siriwardhana & Moehler, 2023; Peers, 2015), confirm that a balance of hard and soft skills significantly increases graduates' employability in dynamic industries.

Based on the above description, this study aims to analyze the work readiness of Automotive Engineering students at the Nias Regional Government Vocational School (SMKS Pembda) in terms of hard and soft skills. This research is theoretically important for enriching the literature on underdeveloped, frontier, and outermost regions, and practically as a basis for developing adaptive vocational school policies and curricula, particularly in areas with structural limitations. The selection of SMKS Pembda Nias was based on its A accreditation, industrial collaboration, and representative location in the Nias Islands, although tracer study data indicates there is still room for improvement in graduates' job readiness (65% are absorbed within 6 months, below the national average of 75%). The study subjects were 122 grade XII Automotive Engineering students of SMKS Pembda Nias in the 2024/2025 academic year, who had undergone industrial work experience.

Method

Summary of Research Methods

This study uses a quantitative correlational method to examine the relationship between Hard Skills (X1) and Soft Skills (X2) and the Job Readiness of Automotive Engineering Students (Y) at a Private Vocational High School (SMK) in the Nias Regional Government. The study will be conducted at the Private Vocational High School (SMK) in the Nias Regional Government from May 12 to 24, 2025.

Population and Sample

The study population consists of all 139 12th-grade students of the Automotive Engineering Expertise Program at the Private Vocational High School (SMK) in the Nias Regional Government in the 2024/2025 academic year who have completed industrial work experience (Prakerin). The sample was determined using Proportional Stratified Random Sampling with the Taro Yamane formula and a precision level of 5%, resulting in a total of 103 students. The sample was divided proportionally per class.

Research Variables

Student Job Readiness (Y): Students' readiness to enter the workforce, measured through indicators such as ability to meet job demands, competitiveness, professional performance, physical/mental maturity, and productivity. Hard Skills (X1): Specific technical skills, measured through indicators such as mastery of engine fault diagnosis, transmission system repair, understanding of vehicle electronic systems, computer diagnostic tool skills, and handling modern automotive technology. Soft Skills (X2): Non-technical skills such as effective communication, teamwork, adaptability, time management, and work ethic/professionalism.

Research Instrument

Data were collected using a Likert-type questionnaire with five response alternatives (Very

Appropriate to Very Disagree), scored from 1-5. The instrument was structured based on a grid of indicators for each variable. A total of 120 questions were used (40 each for Y, X1, and X2).

Instrument Trial

The instrument was pilot-tested on 30 students outside the research sample to determine its validity and reliability using SPSS version 30. Validity Test: Items were declared valid if the corrected item-total correlation value was positive and greater than the product-moment table's r (α = 0.361). The test results indicated that all 120 items on the instrument were valid. Reliability Test: Using the Cronbach's Alpha formula. The test results showed a reliability value (ri) for Student Work Readiness (Y) of 0.992, Hard Skills (X1) of 0.985, and Soft Skills (X2) of 0.993. All instruments were declared reliable (very high) because the ri value was greater than the r table (0.361).

Data Collection Techniques

Data were collected using a closed-ended questionnaire distributed directly to respondents after instrument preparation and data source determination.

Data Analysis Techniques

Data were analyzed quantitatively using SPSS 30: Descriptive Analysis: Describing the frequency distribution of data and respondents' achievement levels for each variable using percentage, mode, median, and mean formulas. Achievement level categories were based on Gladushyna et al. (2021) (Very Good to Poor): Analysis Requirements Test: Normality Test: Using the coefficient of variance value (Strahl et al., 2025). Data were considered normal if the coefficient of variance was < 30%. Linearity Test: Testing the linear relationship between variables. A relationship is considered linear if the significance level is > 0.05. Independence Test (Multicollinearity): Test the correlation between independent variables (Hard Skills and Soft Skills) using product-moment correlation to ensure there is no multicollinearity.

Hypothesis Testing

Hypotheses 1 & 2 (Correlation Test and Simple Regression): Test the relationship and linear form between each independent variable (X1 against Y; X2 against Y) using Product-Moment Correlation and a t-test for significance. Hypothesis 3 (Multiple Regression): Determine the correlation and simultaneous influence (X1 and X2 together on Y) using multiple regression (Y = α + b1X1 + b2X2 +, F Test: Testing the influence of independent variables together on the dependent variable. The hypothesis is accepted if the significance is < 0.05, Coefficient of Determination (R^2): Measures the magnitude of the simultaneous contribution of independent variables to the dependent variable, Partial Correlation: Measures the relationship of each independent variable to the dependent variable separately, controlling for other variables. The level of correlation will guidelines (Very Low to Very Strong).

Results and Discussion

Data Description

This section presents a statistical description of the research variables: Student Work Readiness (Y), Hard Skills (X1), and Soft Skills (X2), based on data from 103 respondents.

Table 1. Description of research data Y, X1, and X2

Statistics				
		Student Work Readiness (Y)	Hard Skill (X1)	Soft Skill (X2)
N	Valid	103	103	103
	Missing	0	0	0
Mean		165.99	163.28	165.00
Std. Error of Mean		2.943	2.952	3.126
Median		165.00	160.00	166.00
Mode		160	160	160
Std. Deviation		29.868	29.96	31.727
Variance		892.069	897.63	1006.588
Skewness		-2.012	-1.663	-1.759
Std. Error of Skewness		.238	.238	.238
Kurtosis		6.293	4.78	4.295
Std. Error of Kurtosis		.472	.472	.472
Range		160	160	160
Minimum		40	40	40
Maximum		200	200	200
Sum		17097	16818	16995

By examining Table 1 above, a histogram of Student Work Readiness can be depicted as shown in Figure 1.

Student Work Readiness (Y)

Based on the Student Work Readiness variable data, the distribution of scores is shown as follows: from a minimum of 40 to a maximum of 200 from 103 respondents (N = 103), with an average score of 165.99, a median of 165, a frequently occurring score (mode) of 160, a standard deviation of 29.86, and a variance of 892.06. To present Student Work Readiness data in the form of a frequency distribution and histogram, it is necessary to determine the number of classes and their class intervals as follows:

Many classes (k) = 1 + 3.30 Log N
= 1 + 3.30 Log 103
= 1 + 3.30 x 2.01
= 1 + 6.64 = 7.60 taken 8

$$\text{Interval} = \frac{\text{Highest Value} - \text{Lowest Value}}{\text{Many classes}} \quad (1)$$

$$= \frac{200 - 40}{8} = 20$$

To clarify the number of interval classes, the calculated interval classes are arranged in a frequency distribution list, as shown in Table 2. By paying attention to Table 2, a histogram of Student Work Readiness can be depicted as shown in Figure 2.

Table 2 and Figure 1 show that 45 out of 103 students scored above the average (43.70%), 30 out of 103 students scored above the average (29.10%), and 28 out of 103 students scored below the average (27.20%). The achievement level of the students' Job Readiness scores falls into the good category. These results indicate that the Job Readiness of students at the Nias Regional Government Private Vocational School is in the good category.

Table 2. Frequency distribution of student work readiness variable scores (Y)

Interval Class	Frequency	Percentage (%)
40–59	3	2.90
60–79	0	0
80–99	1	1.00
100–119	1	1.00
120–139	7	6.80
140–159	16	15.50
160–179	45	43.70
180–200	30	29.10
Total	103	100

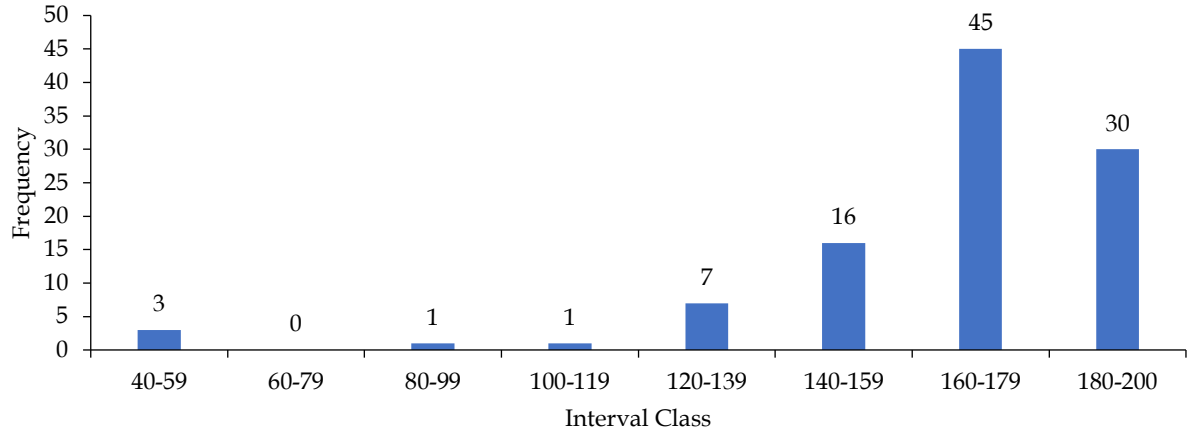

Figure 1. Histogram of student job readiness

Hard Skill (X1)

Based on the Hard Skill variable data, the distribution of scores is known to be spread out from a minimum of 40 to a maximum of 200. From 103 respondents (N = 103), the mean score is 163.28, the median is 160, the mode is 160, the standard deviation is 29.961, and the variance is 897.636. To present Hard Skill data in the form of a frequency distribution and histogram, it is necessary to determine the number of classes and their class intervals as follows:

Number of Classes (k) = 1 + 3.30 Log N
= 1 + 3.30 Log 103
= 1 + 3.30 x 2.01
= 1 + 6.64 = 7.60 taken 8

$$\text{Interval} = \frac{\text{Highest Value} - \text{Lowest Value}}{\text{Many classes}} \quad (2)$$

$$= \frac{200 - 40}{8} = 20$$

To clarify the number of interval classes, the calculated interval classes are arranged in a frequency distribution list, as shown in Table 3.

Table 3. Frequency distribution of hard skill variable scores

Class Interval	Frequency	Percentage (%)
40–59	2	1.90
60–79	1	1
80–99	1	1
100–119	2	1.90
120–139	6	5.80
140–159	24	23.30
160–179	39	37.90
180–200	28	27.20
Total	103	100

By paying attention to Table 3, the Hard Skill histogram can be depicted as shown in Figure 2.

Table 3 and Figure 2 show that 39 out of 103 students scored within the average range (37.90%), 28

out of 103 students scored above the average range (27.20%), and 36 out of 103 students scored below the average range (34.9%). The achievement level for Hard Skill scores falls into the good category. These results indicate that Hard Skills at the Nias Regional Government Private Vocational School is in the Good category.

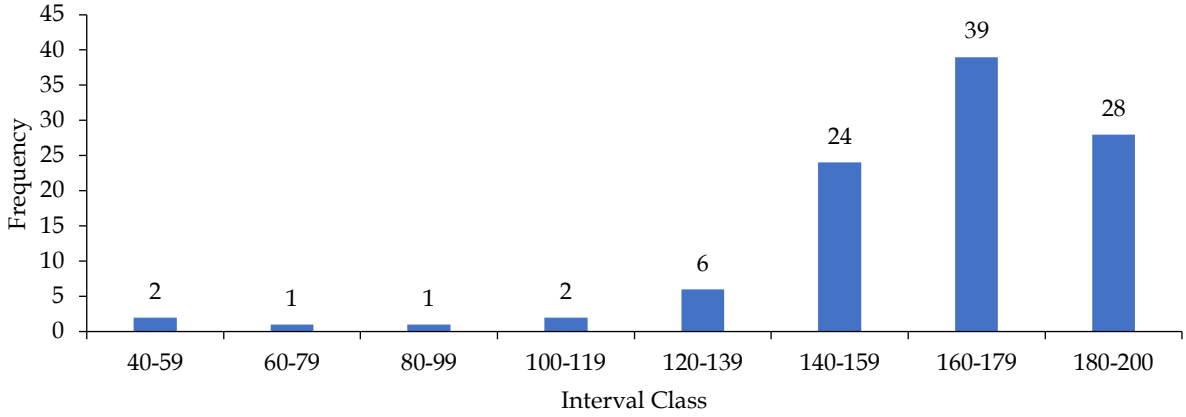

Figure 2. Hard skill histogram

Soft Skills (X2)

Based on the Soft Skills variable data, the scores are distributed from a minimum of 40 to a maximum of 200. From 103 respondents (N = 103), the mean score is 165, the median is 166, the mode is 160, the standard deviation is 31.72, and the variance is 1006.58. To present Soft Skills data in the form of a frequency distribution and histogram, it is necessary to determine the number of classes and their class intervals as follows.

Number of Classes (k) = 1 + 3.30 Log N
= 1 + 3.30 Log 103
= 1 + 3.30 x 2.01
= 1 + 6.64 = 7.60 taken 8

$$\text{Interval} = \frac{\text{Highest Value} - \text{Lowest Value}}{\text{Many classes}} \quad (3)$$

$$= \frac{200 - 40}{8} = 20$$

To clarify the number of interval classes, the calculated interval classes are arranged in a frequency distribution list, as shown in Table 4.

Table 4. Frequency distribution of soft skills

Class Interval	Frequency	Percentage (%)
40–59	2	1.90
60–79	1	1.0
80–99	2	1.90
100–119	3	2.90
120–139	6	5.80
140–159	9	8.70
160–179	44	42.70
180–200	36	35.10
Total	103	100

By paying attention to Table 4, the Soft Skill histogram can be depicted as shown in Figure 3.

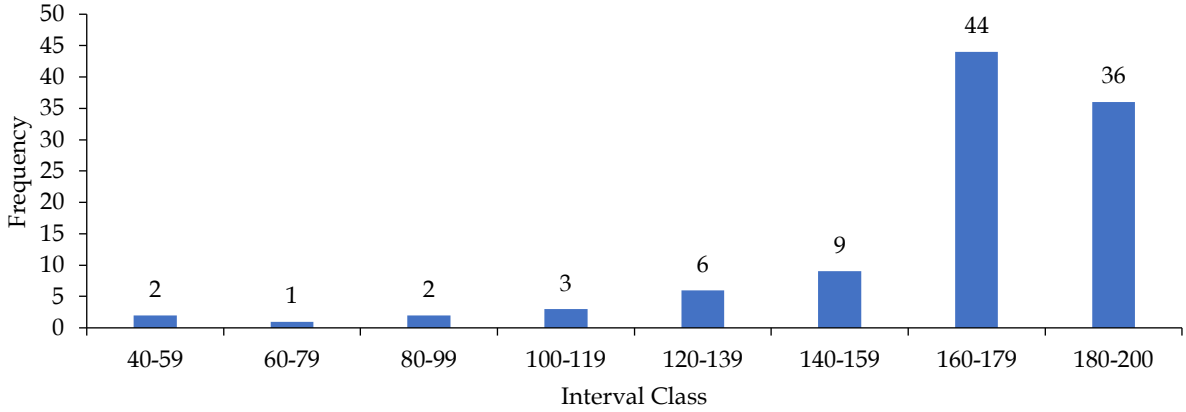

Figure 3. Soft skill histogram

Table 4 and Figure 3 show that 44 out of 103 students scored above the average (42.70%), 36 out of 103 students scored above the average (35.10%), and 23 out of 103 students scored below the average (22.20%). These results indicate that soft skills at the Nias Regional Government Private Vocational School are categorized as good.

Discussion

This discussion analyzes the hypotheses that show a positive and significant relationship between hard skills and soft skills and the work readiness of Nias Regional Government Private Vocational School students, both individually and collectively.

Relationship between Hard Skills and Student Work Readiness

The results indicate that hard skills have a positive and significant relationship with student work readiness, with a correlation coefficient (r) of 0.838 and contributing 70.20% to the variance in work readiness ($p< 0.001$). This means that the better the mastery of hard skills, the higher the student's job readiness. Students' hard skills mastery level was in the good category (87.34%), which is consistent with Azhenov et al. (2023). Dominant indicators included the ability to repair transmission systems (82.80%) and understanding vehicle electronic systems (82.60%), indicating adequate technical competence. Theoretically, hard skills are specific, measurable technical abilities acquired through education or training (Marzuki et al., 2024) emphasized hard skills as the foundation of job readiness, while Human Capital that investing in hard skills increases productivity and job readiness. Empirical research by Suyatmo et al. (2024) and Cipta & Wahyuni (2024), also supports this positive and significant relationship, indicating that hard skills provide essential confidence and technical competence.

The Relationship between Soft Skills and Student Employment Readiness

A positive and significant relationship was found between soft skills and student employment readiness, with a correlation coefficient (r) of 0.766 and a 58.7% contribution to the variance in employment readiness ($p< 0.001$). This means that the better the soft skills, the higher the student's employment readiness. Students' soft skill mastery was also in the good category (85.90%). The dominant indicators were work ethic and professionalism (83.50%) and teamwork skills (82.90%), indicating the importance of non-technical skills. Soft skills are defined as non-technical interpersonal and intrapersonal abilities (Suryahadikusumah et al., 2022). McDonald et al. (2024) highlights the transferable and universal nature of soft skills. Rahayu et al. (2024) and Campos et al. (2020), emphasize the crucial role of soft skills in career success and adaptation. Stek & Schiele (2021) and Ercantan et al. (2024), view soft skills as important differentiators in the job market and "enablers" of hard skills. Social capital theory (Haputhanthrige et al., 2024; Leana & Pil, 2006; Mohammed & Ozdamli, 2024), also reinforces how soft skills build networks that support careers.

The Joint Relationship of Hard Skills and Soft Skills with Students' Job Readiness

Hypothesis testing shows that hard skills and soft skills together have a positive and significant relationship with students' job readiness, with a correlation coefficient (R) of 0.860 (an improvement from the original reading of 0.779) and a contribution of 73.90% (an improvement from the original reading of 60.70%) to the variance in job readiness ($p < 0.001$). This indicates that the combination of these two skills is very powerful in determining job readiness. The students' job readiness level was in the very good category (87.50%), which also aligns with Indrawati et al. (2023). Job readiness is a multidimensional concept encompassing knowledge, skills, and attitudes for an effective transition into the workforce (Bodilsen et al., 2025). These findings indicate that hard skills and soft skills complement each other, and a holistic vocational education approach, which integrates both in a balanced way, is the optimal strategy for producing competent and competitive graduates (Cantoni et al., 2024; Costa & Cipolla, 2025; Luo & Li, 2025). The remaining 26.10% of the variation in work readiness is influenced by factors other than these two variables.

Research Limitations

This study has limitations, including: Response Control: Respondents' sincerity and honesty in completing the questionnaire are difficult to directly control; Response Subjectivity: There is a possibility of subjective elements in responses that the researcher could not monitor, even though the responses were assumed to be representative; Limited Scope: The study was only conducted in one vocational high school (a private vocational school from the Nias Regional Government) with 103 students due to limited funding and time. For broader generalization, further research is needed in other vocational high schools (public and private) on Nias Island.

Conclusion

The conclusion of this study is that hard skills and soft skills play complementary roles in shaping students' work readiness. Although hard skills contribute

significantly individually, their combination produces a synergistic effect that optimally prepares students for the workforce. This demonstrates that a holistic vocational education approach, which integrates the development of technical and non-technical skills in a balanced manner, is the right strategy for producing competent graduates who are ready to compete in the workforce.

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References

Ariansyah, K., Wismayanti, Y. F., Savitri, R., Listanto, V., Aswin, A., Ahad, M. P. Y., & Cahyarini, B. R. (2024). Comparing Labor Market Performance of Vocational and General School Graduates in Indonesia: Insights from Stable and Crisis Conditions. *Empirical Research in Vocational Education and Training*, *16*(1). https://doi.org/10.1186/s40461-024-00160-6

Ariyani, L., Aminullah, E., Hermawati, W., Febrianda, R., Rosadi, A. H. Y., & Dinaseviani, A. (2025). The Global Innovation System View for Electric Vehicles in Indonesia: Facilitating the Transition to Electric Mobility in Society. *Sustainable Futures*, *9*, 100741. https://doi.org/10.1016/j.sftr.2025.100741

Azhenov, A., Kudysheva, A., Fominykh, N., & Tulekova, G. (2023). Career Decision-Making Readiness Among Students' in the System of Higher Education: Career Course Intervention. *Frontiers in Education*, *8*. https://doi.org/10.3389/feduc.2023.1097993

Bodilsen, S. T., Nielsen, S. A., & Rosholm, M. (2025). Measuring Employment Readiness for Hard-to-Place Individuals. *Humanities and Social Sciences Communications*, *12*(1). https://doi.org/10.1057/s41599-025-04943-4

Campos, D. B. D., Resende, L. M. M. D., & Fagundes, A. B. (2020). The Importance of Soft Skills for the Engineering. *Creative Education*, *11*(08), 1504–1520. https://doi.org/10.4236/ce.2020.118109

Cantoni, F., Ricciardi, A., Bisogni, P. G., & Zsifkovits, H. (2024). The Unravelled Role of Soft Skills in the Logistics and Supply Chain Management Field. *Journal of Innovation & Knowledge*, *9*(4), 100615. https://doi.org/10.1016/j.jik.2024.100615

Cipta, G. K. A., & Wahyuni, D. (2024). Productive Competence, Internship, and Family Support on Student Work Readiness Mediated by Self-Efficacy. *Mimbar Ilmu*, *29*(1), 77–87. https://doi.org/10.23887/mi.v29i1.70525

Costa, M. F. B., & Cipolla, C. M. (2025). Critical Soft Skills for Sustainability in Higher Education: A Multi-Phase Qualitative Study. *Sustainability*, *17*(2), 377. https://doi.org/10.3390/su17020377

Ercantan, K., Eyupoglu, Ş. Z., & Ercantan, Ö. (2024). The Entrepreneurial Leadership, Innovative Behaviour, and Competitive Advantage Relationship in Manufacturing Companies: A Key to Manufactural Development and Sustainable Business. *Sustainability*, *16*(6), 2407. https://doi.org/10.3390/su16062407

Fajaryati, N., Budiyono, B., Akhyar, M., & Wiranto, W. (2021). Instrument Development for Evaluating Students' Employability Skills. *Journal of Physics: Conference Series*, *1842*(1), 012035. https://doi.org/10.1088/1742-6596/1842/1/012035

Gladushyna, O., Striethol, R., & Steinmann, I. (2021). Disentangling General Achievement Levels and Subject-Specific Strengths and Weaknesses in Mathematics, Reading, and Science. *Educational Assessment, Evaluation and Accountability*, *33*(1), 203–227. https://doi.org/10.1007/s11092-020-09352-6

Habiburrahman, M., Nurcahyo, R., Ma'aram, A., & Natsuda, K. (2024). Driving the Transport Electrification: Exploring Stakeholders' Perceptions and Actions in the Indonesian Automotive Industry Transition to Electric Mobility. *Sustainability*, *16*(14), 5855. https://doi.org/10.3390/su16145855

Haputhanthrige, V., Asghar, I., Saleem, S., & Shamim, S. (2024). The Impact of a Skill-Driven Model on Scrum Teams in Software Projects: A Catalyst for Digital Transformation. *Systems*, *12*(5), 149. https://doi.org/10.3390/systems12050149

Ho, C. S. M., Chiu, S. W., & Liu, L. C. (2025). Middle Leaders as Catalysts for Faux Comprehension and Pseudo-Understanding: Teacher Sensemaking Challenges in Curriculum Reform. *International Journal of Educational Research*, *131*, 102580. https://doi.org/10.1016/j.ijer.2025.102580

Hussein, M. G. (2024). Exploring the Significance of Soft Skills in Enhancing Employability of Taif University

Postgraduates: An Analysis of Relevant Variables. *Sage Open*, *14*(3). https://doi.org/10.1177/21582440241271941

Ikome, J. M., Laseinde, O. T., & Katumba, M. G. K. (2022). The Future of the Automotive Manufacturing Industry in Developing Nations: A Case Study of its Sustainability Based on South Africa's Paradigm. *Procedia Computer Science*, *200*, 1165–1173. https://doi.org/10.1016/j.procs.2022.01.316

Indrawati, C. D. S., Subarno, A., Winarno, W., Permansah, S., Wirawan, A. W., & Rusmana, D. (2023). Influence of Work Motivation, Interpersonal Skills, and Knowledge Construction on the Work Readiness of Vocational Students. *Education Research International*, *2023*, 1–10. https://doi.org/10.1155/2023/4956337

Khan, H. F., Qayyum, S., Beenish, H., Khan, R. A., Iltaf, S., & Faysal, L. R. (2025). Determining the Alignment of Assessment Items with Curriculum Goals Through Document Analysis by Addressing Identified Item Flaws. *BMC Medical Education*, *25*(1). https://doi.org/10.1186/s12909-025-06736-4

Kholifah, N., Nurtanto, M., Sutrisno, V. L. P., Majid, N. W. A., Subakti, H., Daryono, R. W., & Achmadi, A. (2025). Unlocking Workforce Readiness Through Digital Employability Skills in Vocational Education Graduates: A PLS-SEM Analysis Based on HUMAN CAPITAL THEORY. *Social Sciences & Humanities Open*, *11*, 101625. https://doi.org/10.1016/j.ssaho.2025.101625

Laguna, R. F. D., Aguinaga, D. L., Torres, D. E. C., & Cueto, B. A. L. (2025). Soft Skills and the Use of Industry 4.0 as Determinants of Professional Development in Engineering Graduates: A SEM Approach. *Sustainable Futures*, *10*, 100742. https://doi.org/10.1016/j.sftr.2025.100742

Lamri, J., & Lubart, T. (2023). Reconciling Hard Skills and Soft Skills in a Common Framework: The Generic Skills Component Approach. *Journal of Intelligence*, *11*(6), 107. https://doi.org/10.3390/jintelligence11060107

Leana, C. R., & Pil, F. K. (2006). Social Capital and Organizational Performance: Evidence from Urban Public Schools. *Organization Science*, *17*(3), 353–366. https://doi.org/10.1287/orsc.1060.0191

Llopis-Albert, C., Rubio, F., & Valero, F. (2021). Impact of Digital Transformation on the Automotive Industry. *Technological Forecasting and Social Change*, *162*, 120343. https://doi.org/10.1016/j.techfore.2020.120343

Luo, H., & Li, W. (2025). Impact of Microlearning on Developing Soft Skills of University Students Across Disciplines. *Frontiers in Psychology*, *16*. https://doi.org/10.3389/fpsyg.2025.1491265

Marzuki, S. N., Muljan, M., Haslinda, H., & Affandi, L. (2024). Soft Skill and Hard Skill Development Model in Improving the Quality of Human Resources in the Higher Education Environment. *QALAMUNA: Jurnal Pendidikan, Sosial, dan Agama*, *16*(1), 571–582. https://doi.org/10.37680/qalamuna.v16i1.5070

McDonald, N., Lovric, K., & Cosby, A. (2024). Skill Development in Current and Future Workers to Thrive in the Digital Aquaculture Industry. *Aquaculture Journal*, *4*(1), 15–27. https://doi.org/10.3390/aquacj4010002

Mohammed, F. S., & Ozdamli, F. (2024). A Systematic Literature Review of Soft Skills in Information Technology Education. *Behavioral Sciences*, *14*(10), 894. https://doi.org/10.3390/bs14100894

O'Toole, J., Snuggs, E., Benati, K., & Lindsay, S. (2023). How Has the Experience of Covid-19 Impacted Graduate Readiness for a protean career? A qualitative investigation of Final Year Business Students' Industry Placement Experience During the Pandemic. *The International Journal of Management Education*, *21*(3), 100888. https://doi.org/10.1016/j.ijme.2023.100888

Pantaruk, S., Khuadthong, B., Imjai, N., & Aujirapongpan, S. (2025). Fostering Future-Ready Professionals: The Impact of Soft Skills and Internships on Hospitality Employability in Thailand. *Social Sciences & Humanities Open*, *11*, 101371. https://doi.org/10.1016/j.ssaho.2025.101371

Peers, C. (2015). What is 'Human' in Human Capital Theory? Marking a Transition from Industrial to Postindustrial Education. *Open Review of Educational Research*, *2*(1), 55–77. https://doi.org/10.1080/23265507.2014.996767

Poláková, M., Suleimanová, J. H., Madzík, P., Copuš, L., Molnárová, I., & Polednová, J. (2023). Soft Skills and Their Importance in the Labour Market under the Conditions of Industry 5.0. *Heliyon*, *9*(8), e18670. https://doi.org/10.1016/j.heliyon.2023.e18670

Rahayu, S., Meirawan, D., Muktiarni, M., Ghinaya, Z., & Sabitri, Z. (2024). Analyzing Transferable Skills of Vocational Students to Align with Industry Demands. *Jurnal PenSil*, *13*(1), 34–46. https://doi.org/10.21009/jpensil.v13i1.39803

Ramos, M. R., & Ruiz-Gálvez, M. E. (2024). The Transformation of the Automotive Industry Toward Electrification and Its Impact on Global Value Chains: Inter-Plant Competition, Employment, and Supply Chains. *European Research*

on Management and Business Economics, *30*(1), 100242. https://doi.org/10.1016/j.iedeen.2024.100242

Siriwardhana, S., & Moehler, R. C. (2023). Enabling Productivity Goals Through Construction 4.0 Skills: Theories, Debates, Definitions. *Journal of Cleaner Production*, *425*, 139011. https://doi.org/10.1016/j.jclepro.2023.139011

Siswati, B. H., & Suratno, S. (2023). The Contribution of Cognitive Ability and Critical Thinking Skills on the Problem Solving Skills of Biology Education Profession Students Using Case Method Learning. *Biosfer*, *16*(2). https://doi.org/10.21009/biosferjpb.34633

Stek, K., & Schiele, H. (2021). How to Train Supply Managers – Necessary and Sufficient Purchasing Skills Leading to Success. *Journal of Purchasing and Supply Management*, *27*(4), 100700. https://doi.org/10.1016/j.pursup.2021.100700

Strahl, F., Jansen, T., Kilian, J., Reble, R., Schneider, R., & Möller, J. (2025). Context Counts: Unveiling the Impact of Achievement Level on Teachers' Text Assessment. *Learning and Instruction*, *95*, 102046. https://doi.org/10.1016/j.learninstruc.2024.102046

Suryahadikusumah, A. R., Harum, A., & Prabiastuti, H. Y. (2022). A Construct Validity of the Transferable Skills Scale for Assessment of Career Guidance. *Bisma The Journal of Counseling*, *6*(3), 371–378. https://doi.org/10.23887/bisma.v6i3.52955

Sutil-Martín, D. L., & Otamendi, F. J. (2021). Soft Skills Training Program Based on Serious Games. *Sustainability*, *13*(15), 8582. https://doi.org/10.3390/su13158582

Suyatmo, S., Ekohariadi, E., & Wardhono, A. (2024). Identify Factors that Influence Hard Skill Competency and Soft Skill Competency Through the Quality of Teaching in Aviation Vocational Education. *IJORER: International Journal of Recent Educational Research*, *5*(3), 599–611. https://doi.org/10.46245/ijorer.v5i3.584