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The Effect of Literacy and Numeracy Skills and Field Work Experience on Employment Readiness Through Self-Efficacy Among Students at State Vocational High Schools in Batam

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Abstract: This study was motivated by the suboptimal work readiness of vocational high school graduates, as reflected in the low alignment between graduates' competencies and job fields, the length of time spent waiting for employment, and declining literacy and numeracy achievement based on data from the Education Report Card. This study aims to analyze the influence of literacy skills, numeracy skills, and Field Work Practice (PKL) experience on work readiness through self-efficacy among students at a public vocational high school in Batam. A quantitative approach with a descriptive-correlational design was used. The study population consisted of 385 12th-grade students in the Electrical Power Installation Technology (TITL) program at a public vocational high school in Batam who had completed their Field Work Practice. A sample of 196 students was selected using purposive sampling, justified based on the Slovin formula, the Rule of 10, and the Inverse Square Root method. Data were collected via a validated and reliable questionnaire and analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS) with SmartPLS 4.0 software. The results indicate that literacy skills (β = 0.202; p = 0.002), numeracy skills (β = 0.308; p = 0.000), and industrial work experience (β = 0.469; p = 0.000) each have a positive and significant effect on self-efficacy, while self-efficacy has a positive and significant effect on work readiness (β = 0.504; p = 0.000). Self-efficacy was also found to act as a partial mediator of the effects of literacy skills (β = 0.102; p = 0.012), numeracy skills (β = 0.155; p = 0.000), and industrial work experience (β = 0.236; p = 0.000) on work readiness. Industrial work experience emerged as the most dominant predictor of self-confidence, while self-confidence was the strongest determinant of work readiness. These findings indicate that improving the quality of industrial work experience, providing context-based literacy and numeracy instruction, and fostering students' self-confidence should be prioritized in vocational education to produce competent, confident, and work-ready graduates.

Keywords: Employment readiness; Field work experience; Literacy skills; Numeracy skills; Self-efficacy; Vocational education

Introduction

Vocational High School Vocational High School (SMK) education in Indonesia is designed to prepare graduates who are competent and ready to enter the workforce immediately after graduation. However, the persistently high unemployment rate among SMK graduates remains a serious national concern, with Statistics Indonesia (Central Bureau of Statistics) reporting that SMK graduates continue to record the highest open unemployment rate among all education levels. This condition indicates a persistent mismatch between the competencies developed during vocational

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schooling and the competencies demanded by industry (Ariyanto et al., 2023).

Work readiness is commonly understood as the extent to which an individual possesses the knowledge, skills, attitudes, and personal qualities required to perform effectively in the workplace (Fitri et al., 2023). Beyond technical mastery, work readiness is shaped by foundational competencies such as literacy and numeracy, as well as direct exposure to authentic work environments through industrial work practice Field Work (PKL). At public vocational high schools in Batam, particularly within the Electrical Power Installation Engineering Electrical Installation Technology concentration, Education Report Card (Rapor Pendidikan) data for 2024–2025 reveal a concerning pattern. At SMKN 7 Batam, the average literacy score declined by 4.03 points and the proportion of students below the minimum literacy competency nearly doubled, from 8.89% to 15.56%. At SMKN 5 Batam, although the average literacy score rose by 4.74 points, 15.56% of students still remained below the minimum competency threshold, indicating that overall literacy attainment is uneven and continues to pose a structural barrier to work readiness (Tan et al., 2025).

A similar pattern is evident in numeracy. Numeracy is defined as the capacity to apply mathematical concepts, procedures, facts, and tools to solve every day and technical problems; within the TITL field, it underlies the ability to read electrical diagrams, calculate current and voltage loads, and analyze measurement data. SMKN 7 Batam recorded a substantial decline in average numeracy scores (−5.08 points), with the Algebra domain a critical foundation for circuit calculations falling by 11.97 points. SMKN 5 Batam recorded only a marginal increase (+0.20 points) while the proportion of students above the minimum numeracy competency dropped by 13.34%. The only consistently positive indicator across both schools was an improvement in the Reasoning competency (Sudarsono et al., 2022).

Industrial PKL experience constitutes a third critical factor, allowing students to engage directly with industrial culture, apply technical competencies in authentic settings, and build professional networks (Setiyawan et al., 2023). Yet Education Report Card data also indicate weaknesses in the Link and Match ecosystem connecting schools and industry: at SMKN 7 Batam, the Link and Match index fell by 2.85 points, accompanied by sharp declines in job-placement unit (BKK) management (−15.58 points) and school-committee involvement (15.15 points); at SMKN 5 Batam, conditions were more concerning, with school-committee involvement falling by 26.25 points, graduate field-of-work alignment dropping 17.30 points into the Low category, and the average job-waiting period lengthening from 2.91 to 3.97 months.

Literacy, numeracy, and PKL experience as external factors do not always translate directly into work readiness. In practice, some students who possess adequate technical knowledge and work experience still display hesitancy and low confidence when confronted with real workplace situations, suggesting the presence of an internal psychological mechanism that mediates the relationship between competence and readiness. Self-efficacyan individual's belief in their capacity to organize and execute the courses of action required to attain a given level of performance (Desky & Yulastri, 2026) is widely regarded as this mechanism. Students with high self-efficacy tend to be more willing to make technical decisions, more persistent in the face of difficulty, and better prepared to enter the workforce (Zhou et al., 2023; Susanti et al., 2024; Abadiyah et al., 2025).

Although previous studies have separately examined the relationships between literacy, numeracy, PKL experience, self-efficacy, and work readiness (Yang, 2023; Risna et al., 2026) research that simultaneously models all five constructs within a single empirical framework particularly in the context of TITL vocational students remains scarce. This study therefore aims to analyze the direct effects of literacy skills, numeracy skills, and PKL experience on self-efficacy, the effect of self-efficacy on work readiness, and the mediating role of self-efficacy in the relationships between the three exogenous variables and work readiness among public vocational high school students in Batam, using a Structural Equation Modeling–Partial Least Squares (SEM-PLS) approach (Harianto et al., 2025).

Method

This study employed a quantitative approach with a descriptive-correlational design to analyze the influence of literacy skills, numeracy skills, and Field PKL experience on work readiness through self-efficacy among students at public vocational high schools in Batam City. The study was conducted during the even semester of the 2025/2026 academic year with a population of 385 twelfth-grade students in the Electrical Power Installation Technology (TITL) program who had completed their PKL program. The research sample consisted of 196 students selected using purposive sampling based on the Slovin formula, the 10-Times Rule, and the Inverse Square Root Method. Data were collected via a questionnaire that met validity and reliability requirements to measure literacy skills, numeracy skills, OTP experience, self-efficacy, and work readiness. In the research model, literacy skills,

numeracy skills, and OTP experience were defined as exogenous variables, self-efficacy as the mediating variable, and work readiness as the endogenous variable. Data analysis was conducted using Structural Equation Modeling–Partial Least Squares (SEM-PLS) with the assistance of SmartPLS 4.0, as this method is capable of analyzing complex causal relationships, testing mediation effects, and is suitable for prediction-oriented models. The analysis stages included an evaluation of the measurement model (outer model) through validity and reliability testing, as well as an evaluation of the structural model (inner model) using path coefficients, the coefficient of determination (R^2), effect size (f^2), predictive relevance (Q^2), and the bootstrapping procedure to test the significance of direct and indirect effects among the variables (Puspitasari & Bahtiar, 2022; Risna et al., 2026).

Table 1. Population of TITL students at Public SMKs in Batam who had completed PKL

School	Grade	N	PKL Status	Population Status
SMKN 5	XII	188	Completed	Included
SMKN 7	XII	197	Completed	Included
SMKN 11	XI	108	Pre-PKL	Excluded
SMKN 9	X	41	Not yet	Excluded

The sample size was determined through purposive sampling, triangulated using three estimation approaches. First, the Slovin formula at a 5% margin of error yielded a minimum of $n = 385 / (1 + 385 \times 0.05^2) \approx 196$ respondents. Second, following the 10-Times Rule (Vaesar et al., 2026; Sari et al., 2026), the minimum PLS sample size is ten times the largest number of indicators pointing to a single construct (5 indicators on X2, X3, and Y), requiring only 50 respondents. Third, the Inverse Square Root Method indicated that detecting a minimum path coefficient of 0.11–0.20 at 80% power and $\alpha = 0.05$ requires 146–247 respondents. The final sample of 196 students therefore satisfied all three criteria, comprising 88 students (44.90%) from SMKN 5 Batam and 108 students (55.10%) from SMKN 7 Batam, distributed relatively evenly across five TITL classes in each school.

Research Instrument

Data were collected using a structured questionnaire measuring five constructs: literacy skills, numeracy skills, PKL experience, self-efficacy, and work readiness. The instrument was developed based on theoretical indicators of each construct, validated through expert judgment (content validity), and refined through two stages of empirical try-out involving construct validity (convergent and discriminant validity) and reliability testing prior to its administration to the main research sample (Arwizet et al., 2026).

Data Collection and Analysis

Questionnaires were distributed both offline (face-to-face at school) and online (Google Form) to reach all sampled respondents. Data analysis followed the two-stage SEM-PLS procedure: evaluation of the outer (measurement) model through outer loadings, Average Variance Extracted (AVE), cross-loading, the Heterotrait-Monotrait Ratio (HTMT), Cronbach's Alpha, and Composite Reliability; and evaluation of the inner (structural) model through the coefficient of determination (R^2), path coefficients, and hypothesis testing via bootstrapping (5,000 resamples) with a one-tailed significance criterion of t-statistics > 1.96 and p-value < 0.05. Mediation analysis followed Hair et al. (2022), in which simultaneous significance of the direct and indirect paths indicates partial mediation, whereas a non-significant direct path combined with a significant indirect path indicates full mediation. The conceptual research framework is presented in Figure 1.

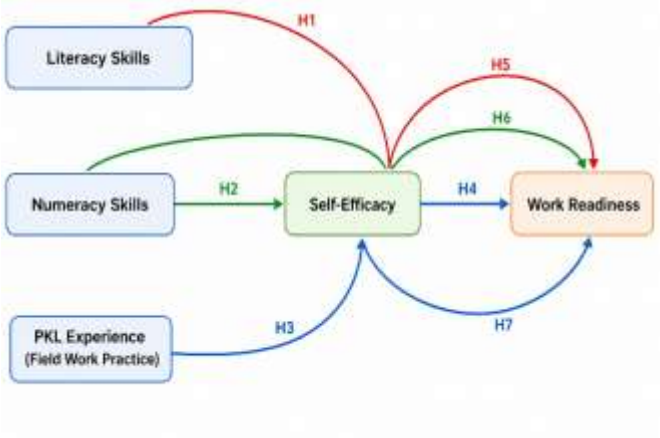

Figure 1. Conceptual framework of the study

Result and Discussion

Respondent Profile

Of the 196 respondents, 88 students (44.90%) were from SMKN 5 Batam and 108 students (55.10%) were from SMKN 7 Batam, with a relatively even distribution across each school's five TITL classes, indicating that the sample adequately represented the population of twelfth-grade TITL students in both schools.

Descriptive Analysis of Research Variables

Table 2. Recapitulation of respondent achievement level (TCR) for all variables

Variable	Items	TCR (%)	Category
Literacy Skills	7	78.69	High
Numeracy Skills	9	75.93	High
PKL Experience	14	83.79	Very High
Self-Efficacy	11	83.00	Very High
Work Readiness	14	84.66	Very High

Descriptive statistics were computed for every instrument item, including the Respondent Achievement Level Respondents' Achievement Levels (TCR), calculated as the mean score divided by the ideal maximum score, then categorized (Mardiana et al., 2026) into five interval classes ranging from Very Low (0–20%) to Very High (81–100%). The recapitulation of TCR values for all five research variables is presented in Table 2.

PKL experience, self-efficacy, and work readiness fell into the Very High category, while literacy and numeracy skills fell into the High category, indicating that TITL students generally possess an adequate capacity to enter the electrical-industry workforce, although literacy and numeracy still warrant further strengthening. The frequency distribution of total scores for each variable, visualized in Figure 2, is positively skewed toward the higher score intervals for all five variables, consistent with the high mean and median values reported above (Mardiana et al., 2026; Nurjanah et al., 2022).

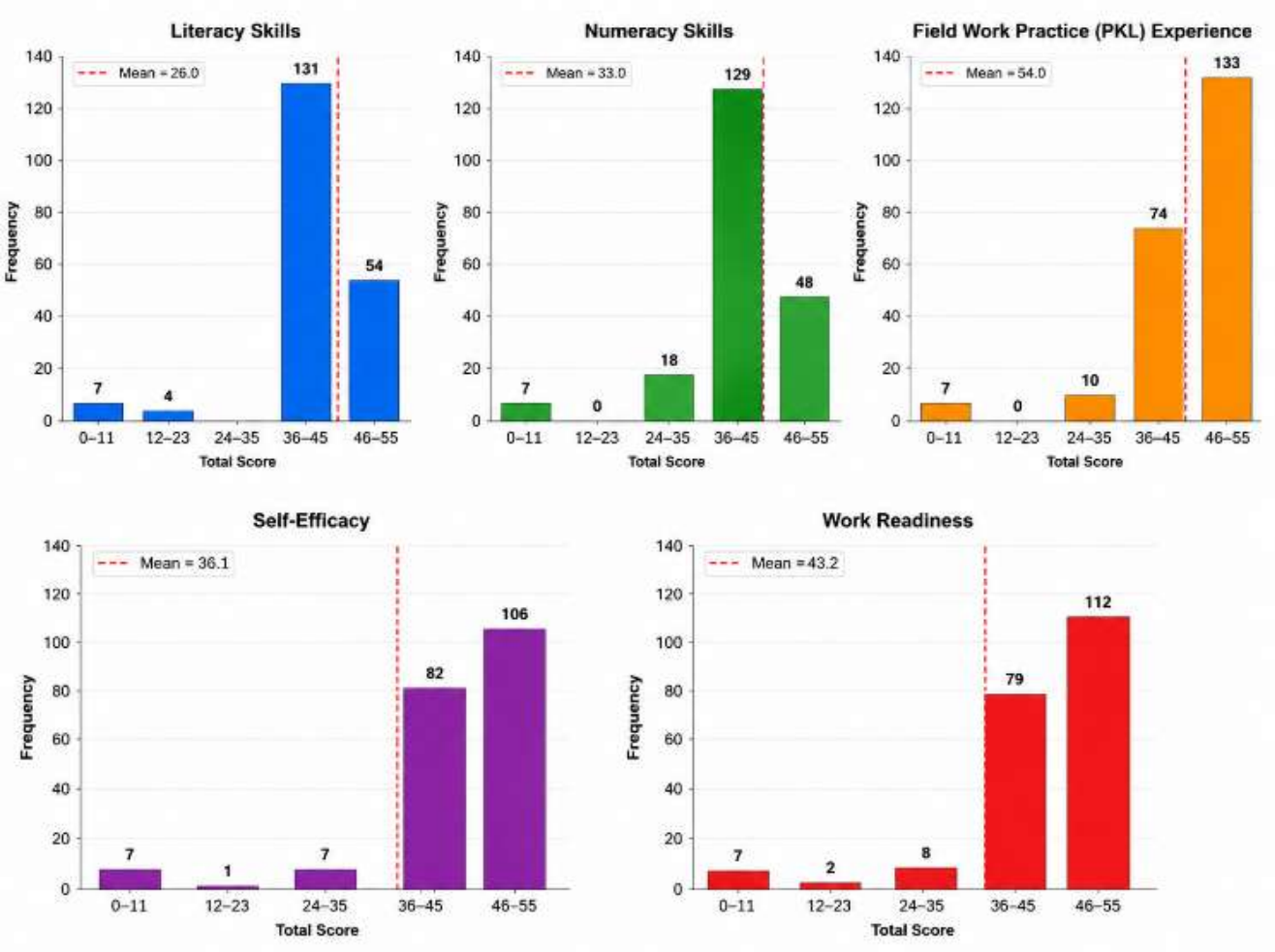

Figure 2. Frequency distribution of total scores for each research variable

Measurement (Outer) Model Evaluation

Convergent validity was first assessed through outer loadings using a cut-off value of 0.60. In the initial estimation, item L4 (literacy), P1–P3 (PKL experience), and K1 and K4 (work readiness) failed to meet this threshold and were removed. After re-estimation, all remaining indicators exceeded 0.60, ranging from 0.603 (P6) to 0.860 (K8), as shown in the full structural model in Figure 3, confirming that every item meaningfully reflects its intended latent construct (Ningsih et al., 2025).

Table 3. Convergent Validity (AVE) and reliability of research constructs

Construct	AVE	α	rho_a	rho_c
Literacy Skills	0.514	0.811	0.818	0.864
Numeracy Skills	0.545	0.897	0.908	0.915
PKL Experience	0.559	0.920	0.928	0.933
Self-Efficacy	0.559	0.920	0.924	0.933
Work Readiness	0.616	0.942	0.945	0.950

Convergent validity was further confirmed by Average Variance Extracted (AVE) values exceeding the 0.50 threshold for all constructs: literacy skills (0.514), numeracy skills (0.545), PKL experience (0.559), self-efficacy (0.559), and work readiness (0.616), indicating that each construct explains more than 50% of the variance in its indicators Table 3.

Discriminant validity was confirmed through cross-loading analysis, in which every indicator loaded most strongly on its own construct, and through the Heterotrait-Monotrait Ratio (HTMT), with all inter-construct values below the conservative threshold of 0.85 (Sudianti et al., 2025); the highest value was found between self-efficacy and work readiness (HTMT = 0.846), still within the acceptable limit. Reliability testing further showed Cronbach's Alpha ranging from 0.811 (literacy skills) to 0.942 (work readiness) and Composite Reliability values consistently above 0.80 for all constructs (Table 3), confirming that the instrument was free from random measurement error. Model fit evaluation produced an SRMR of 0.081 and an NFI of 0.638, indicating an acceptable fit for the proposed structural model (Desky et al., 2025a).

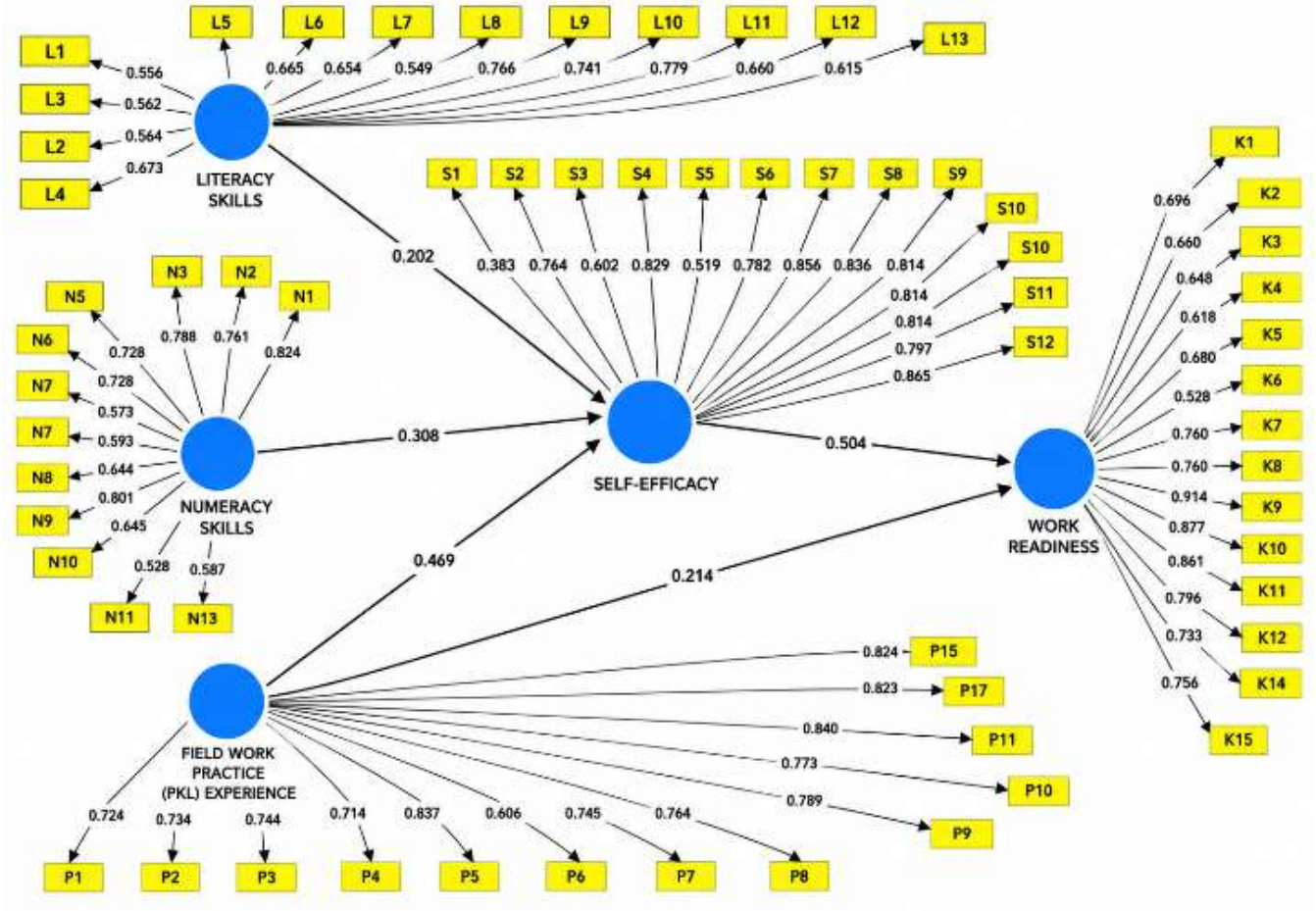

Figure 3. SmartPLS structural model with outer loadings and path coefficients

Structural (Inner) Model Evaluation

The coefficient of determination (R^2) showed that the three exogenous variables jointly explained 67.9% of the variance in self-efficacy (R^2 adjusted = 0.679, strong category), while self-efficacy together with the exogenous variables explained 43.4% of the variance in work readiness (R^2 adjusted = 0.434, moderate category), indicating that other factors outside the model also contribute to students' work readiness (Roemintoyo & Budiarto, 2023; Taali et al., 2024; Tananda et al., 2026).

Hypothesis testing was conducted via bootstrapping with 5,000 resamples, using the criteria t-statistics > 1.96 and p-value < 0.05. The results of the direct-effect testing are summarized in Table 4.

All four direct-effect hypotheses were supported, indicating that PKL experience, numeracy skills, literacy skills, and self-efficacy significantly contributed to the proposed structural relationships. Among the predictors of self-efficacy, PKL experience exerted the strongest influence (β = 0.469), followed by numeracy skills (β = 0.308) and literacy skills (β = 0.202), suggesting that

authentic workplace exposure plays the most prominent role in strengthening students' confidence in their ability to perform occupational tasks, solve practical problems, and adapt to real workplace demands. This finding indicates that direct engagement in workplace environments enables students to apply theoretical knowledge, develop practical competencies, receive feedback, and gain meaningful experiences that gradually strengthen their self-belief. Self-efficacy subsequently emerged as the strongest determinant of work readiness (β = 0.504), demonstrating that students with stronger beliefs in their capabilities are more likely to feel prepared to enter, perform, and adapt to professional environments. These findings emphasize that work readiness is influenced not only by students' cognitive and practical competencies but also by their psychological readiness and confidence to apply those competencies in authentic occupational situations. The mediating role of self-efficacy was further examined using an indirect-effect bootstrapping procedure to determine whether self-efficacy acts as an explanatory mechanism linking PKL experience, numeracy skills, and literacy skills to work readiness. The results of this mediation analysis are presented in Table 5, providing further evidence regarding the extent to which these predictor variables influence work readiness through the development of students' self-efficacy (Hafid & Kamaludin, 2024).

Table 4. Direct effect hypothesis testing results

Hypothesized Path	β	t-stat	p-value	Result
Literacy Skills → Self-Efficacy (H1)	0.202	2.849	0.002	Supported
Numeracy Skills → Self-Efficacy (H2)	0.308	5.315	0.000	Supported
PKL Experience → Self-Efficacy (H3)	0.469	6.240	0.000	Supported
Self-Efficacy → Work Readiness (H4)	0.504	6.097	0.000	Supported

Table 5. Indirect effect (Mediation) hypothesis testing results

Hypothesized Path	β	t-stat	p-value	Result
PKL Experience → SE → Work Readiness (H5)	0.236	5.570	0.000	Supported
Literacy Skills → SE → Work Readiness (H6)	0.102	2.255	0.012	Supported
Numeracy Skills → SE → Work Readiness (H7)	0.155	3.641	0.000	Supported

Because both the direct paths toward self-efficacy and the indirect paths toward work readiness were statistically significant for all three exogenous variables, self-efficacy was confirmed as a partial mediator (Hair et al., 2022) in every relationship tested: PKL experience → self-efficacy → work readiness (H5), literacy skills → self-efficacy → work readiness (H6), and numeracy skills → self-efficacy → work readiness (H7). The PKL–self-efficacy pathway produced the largest indirect effect (β = 0.236), followed by numeracy skills (β = 0.155) and literacy skills (β = 0.102), reaffirming that authentic industrial experience is the most powerful pathway through which self-efficacy translates into work readiness, while literacy and numeracy also contribute meaningfully through both mediated and unmediated routes (Irfan et al., 2025).

Discussion

The finding that literacy skills positively and significantly predict self-efficacy (H1) supports (Deviana et al., 2025) functional literacy theory, which holds that literacy extends beyond reading and writing to the capacity to use information purposefully in real-life and workplace contexts. Within vocational education, literacy enables students to independently comprehend technical manuals, standard operating procedures, and occupational health and safety documents, which in turn strengthens their confidence in performing assigned tasks consistent with Fiona et al. (2025) account of mastery experiences as a primary source of self-efficacy, and with prior findings that literacy supports students' capacity to process workplace information independently (Ermawalis et al., 2025).

Numeracy skills also significantly predicted self-efficacy (H2), reflecting that the ability to read electrical diagrams, calculate loads, and reason quantitatively builds students' confidence in solving technical problems systematically, in line with Sulistiobudi & Kadiyono (2023), who linked numeracy competence to technical self-confidence among electrical-engineering vocational students.

PKL experience exerted the strongest direct effect on self-efficacy among the three exogenous predictors (H3), corroborating (Nabilah & Ulya, 2025), who emphasized that direct industrial exposure builds contextual understanding of the workplace that classroom learning alone cannot provide. Repeated exposure to authentic problem-solving, professional culture, and successful task completion during PKL constitutes precisely the kind of mastery experience that (Kholifah et al., 2025) identified as the most influential source of self-efficacy (Anggraeni et al., 2024).

Self-efficacy, in turn, significantly predicted work readiness (H4), consistent with social cognitive theory

(Falah et al., 2024; Urrofik et al., 2025), which posits that self-belief shapes the effort, persistence, and adaptive strategies individuals deploy when facing new challenges precisely the qualities required when transitioning from school to industry. This finding aligns with Ariansyah et al. (2022), who similarly identified self-efficacy as a key proximal determinant of SMK students' work readiness.

The partial-mediation findings (H5–H7) extend this picture by showing that self-efficacy functions as a psychological bridge connecting literacy, numeracy, and PKL experience to work readiness, without fully accounting for their influence. This is consistent with prior SEM-PLS-based vocational education research suggesting that competence-related variables affect readiness through both cognitive/technical and psychological channels simultaneously (Putri et al., 2024). Practically, this implies that strengthening technical competencies alone is insufficient; vocational schools must also deliberately cultivate students' self-belief through mastery oriented PKL placements, contextual literacy and numeracy instruction embedded in productive subjects, and constructive feedback strategies, in close collaboration with industry partners to ensure that PKL placements are relevant, well-supervised, and genuinely confidence-building (Desky & Yulastri, 2026).

This study is limited to TITL students in two public vocational schools in Batam and relies on self-reported questionnaire data, which may be subject to social desirability bias. Future research should consider broader vocational fields, longitudinal designs to track self-efficacy development over the PKL period, and qualitative exploration of how specific PKL practices cultivate mastery experiences (Desky et al., 2025b).

Conclusion

This study demonstrates that literacy skills, numeracy skills, and industrial work practice (PKL) experience each have a positive and significant effect on the self-efficacy of public vocational high school students in Batam, with PKL experience emerging as the most dominant predictor ($\beta = 0.469$). Self-efficacy, in turn, has a positive and significant effect on work readiness ($\beta = 0.504$) and partially mediates the effects of literacy skills, numeracy skills, and PKL experience on work readiness, with the PKL–self-efficacy pathway producing the strongest indirect effect ($\beta = 0.236$). These findings confirm that self-efficacy functions as a key psychological mechanism linking students' competencies and work experience to their readiness for employment. Theoretically, the study contributes an integrated empirical model linking literacy, numeracy, work-practice experience, self-efficacy, and work readiness within the TITL vocational context. Practically, the findings imply that schools should strengthen contextual literacy and numeracy instruction within productive subjects, improve the quality and supervision of PKL placements through stronger industry partnerships, and design learning strategies such as project and problem-based learning with constructive feedback that deliberately build students' self-efficacy alongside their technical competence. Future research is recommended to extend this model to other vocational fields, employ longitudinal designs, and explore the qualitative mechanisms through which PKL experiences shape students' self-belief.

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Author Contributions
R.K. conceived and designed the study, collected and analyzed the data, and prepared the original manuscript. D.I., M.G., T.S.W., and A.H.A.D. supervised the research process, validated the methodology, and reviewed the manuscript. All authors read, revised, and approved the final version of the manuscript.

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Conflicts of Interest
There is no conflict of interest.

References

Abadiyah, L., Yayuk, E., & Restian, A. (2025). The Effect of Field Work Practice on Vocational Students ' Work Readiness and Career Motivation. *Jurnal Eduscience (JES)*, *12*(4), 1200–1208. https://doi.org/10.36987/jes.v12i4.7334

Anggraeni, C. D., Nurhasanah, S., & Arifiani, R. S. (2024). The Effect Of Internship Experience on Job Readiness with Self-Efficacy as Moderation. *JAMANIKA*, *04*(03). https://doi.org/10.22219/jamanika.v4i3.36129

Ariansyah, F., Septiati, E., & Octaria, D. (2022). Pengembangan Media Pembelajaran Interaktif Berbasis Android pada Materi Peluang untuk Siswa SMA. *Indiktika: Jurnal Inovasi Pendidikan Matematika*, *4*(2), 36–48. https://doi.org/10.31851/indiktika.v4i1.7120

Ariyanto, A., Amiruddin, A., & Amir, F. (2023). Pengaruh Pembelajaran Kompetensi Dasar

Keterampilan, Praktik Kerja Lapangan, dan Self Efficacy Terhadap Kesiapan Kerja Siswa di SMK Negeri Takalar Tahun 2023. *UNM Journal of Technology and Vocational*, *7*(2), 204-211. https://doi.org/10.26858/ujtv.v7i2.2097

Arwizet, K., Purwanto, W., Dewi, I. P., & Desky, A. H. A. (2026). Development of a Web-Based CBT Worksheet for Routine Motorcycle Maintenance. *Jurnal Penelitian Pendidikan IPA*, *12*(6), 223–230. https://doi.org/10.29303/jppipa.v12i6.15243

Desky, A. H. A., & Yulastri, A. (2026). Validity of Animated Video-Based Learning Media Development Using Adobe After Effect Application in Grade IV Elementary School. *Jurnal Penelitian Pendidikan IPA*, *12*(2), 507–514. https://doi.org/10.29303/jppipa.v12i2.10424

Desky, A. H. A., Effendi, H., & Maksum, H. (2025a). Development of Project Based Learning E-Modules on Android Based Embedded System Subjects. *Jurnal Penelitian Pendidikan IPA*, *11*(10), 362–371. https://doi.org/10.29303/jppipa.v11i10.12358

Desky, A. H. A., Ganefri, G., Yulastri, A., Ta'ali, T., Effendi, H., & Fiandra, Y. A. (2025b). Entrepreneurship-Based School Management Model to Increase Entrepreneurial Interest of Vocational Education Students at SMK Negeri 5 Padang. *Al Qalam: Jurnal Ilmiah Keagamaan dan Kemasyarakatan*, *19*(1), 297. https://doi.org/10.35931/aq.v19i1.4306

Desky, A. H. A., Jalinus, N., Ernawati, E., Fadhilah, F., Taali, T., & Fitri Ananda, Y. (2026). Synergizing Technological Innovation, Quality Management, and Inclusivity in Transforming Industry Responsive Technical and Vocational Education and Training TVET. *JURNAL HURRIAH: Jurnal Evaluasi Pendidikan dan Penelitian*, *7*(1), 40-46. https://doi.org/10.56806/jh.v7i1.380

Deviana, B., Zen, Z., Rayendra, R., J, F. Y., Mirshad, E., & Desky, A. H. A. (2025). Development of E-modules Based on Quantum Learning in Projek IPAS for Class X Vocational High School. *Jurnal Penelitian Pendidikan IPA*, *11*(9), 583–591. https://doi.org/10.29303/jppipa.v11i9.12179

Ermawalis, E., J, F. Y., Darmansyah, D., Rayendra, R., Mirshad, E., & Desky, A. H. A. (2025). Media in Improving Teachers Professional Competence at SMAN 5 Batam. *Jurnal Penelitian Pendidikan IPA*, *11*(9), 592–598. https://doi.org/10.29303/jppipa.v11i9.12180

Falah, M. J., Purwantono, P., Afnison, W., & Efendi, F. (2024). Pengaruh Pengetahuan Tentang Dunia Kerja dan Pengalaman Praktik Industri terhadap Kesiapan Kerja Siswa Kelas XII Jurusan Permesinan SMK Negeri 1 Sumatera Barat. *ARZUSIN*, *4*(4), 774-789. https://doi.org/10.58578/arzusin.v4i4.3480

Fiona, F., Darmansyah, D., Zen, Z., J, F. Y., Mirshad, E., & Desky, A. H. A. (2025). The Effect of Applying the Archerys ID Model Instructional Design and Learning Motivation on Physics Learning Outcomes at SMAN 4 Batam. *Jurnal Penelitian Pendidikan IPA*, *11*(9), 609–619. https://doi.org/10.29303/jppipa.v11i9.12181

Fitri, F., Ruslan, R., Arfandi, A., Mappalotteng, A. M., & Miru, A. S. (2023). Pengaruh Keterampilan Kebekerjaan dan Efikasi Diri Terhadap Kesiapan Kerja Siswa SMK Negeri 2 Gowa. *UNM Journal of Technology and Vocational*, *7*(3), 212–220. https://doi.org/10.26858/ujtv.v7i3.50792

Hafid, D., & Kamaludin, M. (2024). Literasi Numerasi pada Perangkat Pembelajaran di SMK. *Jurnal Pendidikan Indonesia*, *5*(8), 613–619. https://doi.org/10.59141/japendi.v5i8.3284

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). *Book Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R*. Springer. https://doi.org/10.1007/978-3-030-80519-7

Harianto, A., Buwani, B., Faradina, E., & Tuwoso, T. (2025). Factors Affecting Work Readiness of Vocational School Graduates: A Systematic Literature Review. *International Journal of Studies in International Education*, *2*(2), 90–106. https://doi.org/10.62951/ijsie.v2i2.281

Irfan, D., Wahyuni, T. S., Hadi, A., & Arrasyidi, A. H. (2025). The Effect of Gamification in Computer Science Learning on Student Motivation and Learning Outcomes at SMP Negeri 27 Padang. *Jurnal Penelitian Pendidikan IPA*, *11*(9), 957–966. https://doi.org/10.29303/jppipa.v11i9.12543

Kholifah, N., Nurtanto, M., Mutohhari, F., Abi, M., Mutiara, I., Setiawan, D., & Nugroho, I. (2025). Social Sciences & Humanities Open Factors Influencing Student Career Choice in Vocational Education in Indonesia: A Mediating Effect of Self-Efficacy. *Social Sciences & Humanities Open*, *11*(December 2024), 101369. https://doi.org/10.1016/j.ssaho.2025.101369

Mardiana, A. L., Arwizet, K., Mardizal, J., Desky, A. H. A., & Mardiana, A. L. (2026). Development of a Job Sheet for Mechanical Measuring Instruments Using Virtual Learning and Project-Based Learning in the Motorcycle Engineering Department at SMK Negeri 2 Palembang. *Jurnal Penelitian Pendidikan IPA*, *12*(5), 105–117. https://doi.org/10.29303/jppipa.v12i5.15136

Nabilah, S., & Ulya, L. L. (2025). Self-Efficacy as a Predictor of Work Readiness Among Vocational High School Students. *Edukasi*, *19*(1), 20–29. https://doi.org/10.15294/edukasi.v19i1.29898

Ningsih, W., Darmansyah, D., Zen, Z., J, F. Y., Mirshad, E., & Desky, A. H. A. (2025). The Effect of the Application of BSCS 5E Instructional Design on Communication Skills and Student Learning Outcomes in Physics Subjects at SMAN 16 Batam. *Jurnal Penelitian Pendidikan IPA*, *11*(10), 372–381. https://doi.org/10.29303/jppipa.v11i10.12183

Nurjanah, I., Ana, A., & Masek, A. (2022). Systematic Literature Review: Work Readiness of Vocational High School Graduates in Facing the Industrial 4.0 Era. *Jurnal Pendidikan Teknologi dan Kejuruan*, *28*(2), 139–153. https://doi.org/10.21831/jptk.v28i2.48552

Puspitasari, N. A., & Bahtiar, M. D. (2022). Pengaruh Pengalaman Prakerin , Self Efficacy dan Internal Locus of Control Terhadap Kesiapan Kerja Siswa SMK di Bidang Akuntansi. *Jurnal Pendidikan Akuntansi (JPAK)*, *10*(1), 31–43. https://doi.org/10.26740/jpak.v10n1.p31-43

Putri, D. A., Reniati, R., & Wahyudin, N. (2024). The Influence of Internship Experience, Self-Efficacy, and Work Motivation on Work Readiness of Bangka Belitung University Students. *International Journal of Economics, Business, and Entrepreneurship*, *7*(2), 155-166. https://doi.org/10.23960/ijebe.v7i2.287

Risna, M., Arwizet, K., & Desky, A. H. A. (2026). Development of an Electronic Job Sheet for Forward-Reverse Circuits in The Electrical Installation Technology Program. *Jurnal Penelitian Pendidikan IPA*, *12*(5), 286–295. https://doi.org/10.29303/jppipa.v12i5.15267

Roemintoyo, R., & Budiarto, M. K. (2023). Project-Based Learning Model to Support 21st Century Learning: Case Studies in Vocational High Schools. *Journal of Education Research and Evaluation*, *7*(4), 662–670. https://doi.org/10.23887/jere.v7i4.63806

Sari, N., Wulansari, R. E., Dewi, I. P., Desky, A. H. A., & Sari, N. (2026). The Effect of Android-Based Learning and Learning Motivation on Learning Outcomes in Computer Science in the 10th Grade at SMK Negeri 1 Sumatera Barat. *Jurnal Penelitian Pendidikan IPA*, *12*(6), 260–266. https://doi.org/10.29303/jppipa.v12i6.15001

Setiyawan, H., Suharno, S., & Pambudi, N. A. (2023). The Influence of Digital and Vocational Information Literacy on Student Learning Outcomes. *Jurnal Pendidikan Vokasi*, *13*(2), 192–204. https://doi.org/10.21831/jpv.v13i2.53999

Sudarsono, B., Tentama, F., Mulasari, S. A., Sukesi, T. W., Sulistyawati, S., Ghozali, F. A., Yuliansyah, H., Nafiati, L., & Sofyan, H. (2022). Development of Integrated Project-Based (PjBL-T) Model to Improve Work Readiness of Vocational High School Students. *Jurnal Pendidikan Vokasi*, *12*(3), 222–235. https://doi.org/10.21831/jpv.v12i3.53158

Sudianti, N., J, F. Y., Zen, Z., Mirshad, E., Arrasyidi, A. H., & Sudianti, N. (2025). The Effectiveness of Using Chemistry Literacy-Based Learning Videos on the Problem-Solving Ability of Grade X Students at SMA Negeri 16 Batam. *Jurnal Penelitian Pendidikan IPA*, *11*(10), 382–388. https://doi.org/10.29303/jppipa.v11i10.12182

Sulistiobudi, R. A., & Kadiyono, A. L. (2023). Heliyon Employability of Students in Vocational Secondary School: Role of Psychological Capital and Student-Parent Career Congruences. *Heliyon*, *9*(2), e13214. https://doi.org/10.1016/j.heliyon.2023.e13214

Susanti, I., Mustiningsih, M., & Wiyono, B. B. (2024). The Influence of Industrial Work Practice, Self Efficacy and Advesrity Quotient on the Work Readiness of XII Grade Students at Vocational High School in Malang. *Proceedings Series of Educational Studies, The 3rd International Conference on Educational Management and Technology (ICEMT) 2024*, 163-175. Retrieved from https://conference.um.ac.id/index.php/pses/article/view/9664

Taali, T., Desky, A. H. A., Pratama, A. J., & Setiawan, H. (2024). Effectiveness of Blended Learning Model in Microprocessor Course with Google Classroom. *Jurnal Penelitian Pendidikan IPA*, *10*(7), 3674–3680. https://doi.org/10.29303/jppipa.v10i7.7754

Tan, J., Li, J., & Yi, X. (2025). How Can General Self-Efficacy Facilitate Undergraduates' Employability? A Multiple Mediation Model. *Behavioral Sciences*, *15*(4), 514. https://doi.org/10.3390/bs15040514

Tananda, O., Purwanto, W., Maksum, H., Giatman, M., & Desky, A. H. A. (2026). Development of a Flipbook-Based E-Module with Project-Based Learning (PjBL) Model in the Subject of Ship Outfit Construction (3D Modelling) at SMKN 5 Batam. *Jurnal Penelitian Pendidikan IPA*, *12*(5), 953–959. https://doi.org/10.29303/jppipa.v12i5.15035

Urrofik, S. A. A., Arbarini, M., Suminar, T., & Cahyani, A. D. (2025). Competency-Based Training and Self-Efficacy on Work Readiness Through Employability Skills in The Center for Vocational Training and Productivity and Productivity. *Jurnal Imiah Pendidikan dan Pembelajaran*, *9*(1), 129–140. https://doi.org/10.23887/jipp.v9i1.86823

Vaesar, S. S., Giatman, M., Rizal, F., & Desky, A. H. A. (2026). The Effect of PjBL Model Assisted by Revit Application on Students' Building Drawing Learning Outcomes in the DPIB Department at SMK Negeri 4 Palembang. *Jurnal Penelitian Pendidikan IPA*, *12*(5), 183–193. https://doi.org/10.29303/jppipa.v12i5.15181

Yang, H. (2023). The Role of Digital Technology in the

Animation Curriculum. *International Journal of Education and Humanities*, *8*(2), 61-67. https://doi.org/10.54097/ijeh.v8i2.7591

Zhou, D., Peng, Z., & Zhou, H. (2023). The Influence of Career Decision-Making Self-Efficacy on Employability of Higher Vocational Students: Mediated by Emotional Intelligence. *Front. Educ.*, *8*, 1274430. https://doi.org/10.3389/feduc.2023.1274430