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ORIGINAL RESEARCH ARTICLE

The Relationship between Industrial Internship Experience and the Work Readiness of Automotive Engineering Education Students in the Industry 4.0 Era

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ABSTRACT

The technological transformation associated with the Industry 4.0 era has increased demands on prospective workers, including technical skills, adaptability, problem-solving, communication, and readiness to enter professional environments. Industrial internships connect higher education learning with real workplace situations. This study aimed to examine the relationship between industrial internship experience and work readiness among students of the Automotive Engineering Education Study Program at Universitas Negeri Malang. The study employed a quantitative approach using a correlational survey design. Data were collected through Likert-scale questionnaires measuring industrial internship experience as variable X and work readiness as variable Y. Data were analyzed using Pearson correlation and simple linear regression. The results indicated a strong positive correlation between industrial internship experience and work readiness ($r = 0.787$, $p < 0.001$, $N = 55$). The regression model yielded a slope coefficient of 0.988, $t = 9.282$, $F = 86.152$, and $R^2 = 0.619$. The model explained 61.9% of the variance in work-readiness scores within the study sample. These findings highlight the relevance of structured industry-based learning experiences, while acknowledging that a correlational research design does not establish a causal relationship.

Keywords: *industrial internship experience; work readiness; vocational education; Automotive Engineering Education; Industry 4.0*

ABSTRAK

Perubahan teknologi pada era Revolusi Industri 4.0 meningkatkan tuntutan terhadap calon tenaga kerja, termasuk penguasaan keterampilan teknis, adaptasi, pemecahan masalah, komunikasi, dan kesiapan memasuki lingkungan profesional. Praktik industri mempertemukan pembelajaran perguruan tinggi dengan situasi kerja nyata. Penelitian ini bertujuan menguji hubungan antara pengalaman praktik industri dan kesiapan kerja mahasiswa Program Studi Pendidikan Teknik Otomotif Universitas Negeri Malang. Penelitian menggunakan pendekatan kuantitatif dengan survei korelasional. Data dikumpulkan melalui kuesioner skala Likert yang mengukur pengalaman praktik industri sebagai variabel X dan kesiapan kerja sebagai variabel Y. Analisis dilakukan menggunakan korelasi Pearson dan regresi linear sederhana. Hasil menunjukkan korelasi positif dan kuat ($r = 0{,}787$; $p < 0{,}001$; $N = 55$). Model regresi menghasilkan koefisien slope 0,988, $t = 9{,}282$, $F = 86{,}152$, dan $R^2 = 0{,}619$. Model menjelaskan 61,9% variasi skor kesiapan kerja pada sampel penelitian. Temuan ini menegaskan relevansi pengalaman belajar berbasis industri yang terstruktur, dengan tetap mempertimbangkan bahwa desain korelasional tidak membuktikan hubungan sebab-akibat.

Kata kunci: pengalaman praktik industri; kesiapan kerja; pendidikan vokasi; Pendidikan Teknik Otomotif; Revolusi Industri 4.0

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1. INTRODUCTION

The Fourth Industrial Revolution (Industry 4.0) is changing how organizations design products, manage production processes, deliver services, and develop workforce competencies. The integration of cyber-physical systems, device connectivity, automation, data processing, and digital technologies makes work processes increasingly interconnected. These changes require workers not only to understand technical procedures but also to interpret digital information, adapt to new equipment and workflows, communicate across functions, and engage in continuous learning. The concept of Industry 4.0 was initially discussed as a transformation of industrial systems through the integration of information technology and physical processes. In the context of vocational education, these changes direct attention to the alignment of learning experiences with dynamic work situations, rather than solely to the mastery of material in the lecture hall (Kagermann et al., 2013; Hermann et al., 2016).

Vocational education holds a strategic position because it connects academic knowledge with the skills required in the workplace. Engineering education graduates are expected to apply the concepts they have learned to complete tasks, diagnose problems, comply with safety standards, and work productively with others. As industrial processes become increasingly digital, the boundary between technical and non-technical skills becomes increasingly blurred. The abilities to operate devices, understand data, communicate, and assess risks cannot always be optimally developed through theoretical learning alone. Therefore, work readiness should be viewed as a multidimensional capacity formed through a combination of knowledge, experience, attitudes, self-efficacy, and an understanding of workplace culture. Studies on the employability skills of

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vocational graduates also position soft skills as an important element in the transition to employment (Abdullah-Al-Mamun, 2012; Robles, 2012).

Work readiness is not merely a statement that a person wishes to work after graduation. The construct encompasses the ability to understand job tasks and expectations, apply relevant skills, act responsibly, adjust behavior to organizational norms, and interact professionally. Caballero et al. (2011) developed the Work Readiness Scale to measure the readiness of college graduates to enter employment, while also demonstrating the need to define the construct clearly. The distinction between work readiness and employability is also important: work readiness emphasizes the capacity to perform a work role during the transition stage, whereas employability may include broader abilities to obtain, maintain, and develop employment. This conceptual distinction prevents researchers from interpreting a single questionnaire score as a complete picture of a person's future career (Caballero et al., 2011; Dara et al., 2026).

One educational approach that can enrich work readiness is workplace-integrated learning, including industrial internships, apprenticeships, and work-integrated learning. Through such experiences, students face tasks with real contexts, deadlines, quality standards, risks, and consequences. They can observe how technical knowledge is applied, how decisions are made when information is incomplete, and how coordination takes place within a team. However, the mere existence of a work placement does not automatically guarantee meaningful learning. The quality of the experience is determined by task relevance, supervisor guidance, opportunities to try out work, feedback, reflection, and the connection between industrial activities and the study program's learning outcomes. Jackson (2015) emphasized that skill development in work-integrated learning is influenced by activity design and placement conditions, while Young et al. (2024) highlighted the need for an evaluation framework that explains what, where, and how work-integrated learning takes place.

Research on industrial internships and work readiness has been conducted in various educational contexts. Supriyanto et al. (2022), for example, examined internship experience and work motivation among automotive vocational students using a PLS-SEM approach. Larosa et al. (2022) reported a positive relationship between industrial internship experience and the work readiness of machining engineering students. Irwansyah et al. (2020) also examined the links between industrial internships, employability, and work readiness among vocational high school students. In the context of diploma education, Naufalin et al. (2024) investigated the work readiness of Generation Z by considering internship programs and digital literacy. These studies provide an empirical basis that structured work experience deserves consideration in the formation of work readiness, but differences in educational level, field of expertise, instruments, participant characteristics, and analytical models limit the possibility of directly equating the results.

Systematic reviews also position internships and work experience as important themes in employability research. Nurjanah et al. (2022) summarized the work readiness of vocational high school graduates in facing the Industry 4.0 era and demonstrated the relevance of aligning competencies with the needs of the world of work. Sartika et al. (2024), through a bibliometric and systematic review, discussed the effect of internship experience on the employability of vocational students. Megasari et al. (2025) linked internship experience, soft skills, and self-efficacy as interrelated factors in vocational readiness. Although these reviews help build a conceptual framework, specific evidence regarding Automotive Engineering Education students in a particular study program remains important because the characteristics of internships, the

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industrial environment, and the goals of engineering education graduates may differ from those of secondary school students or business students.

The Automotive Engineering Education Study Program prepares not only prospective workers in the service or manufacturing sectors but also prospective automotive engineering educators and trainers. Therefore, industrial internship experience can carry two layers of meaning. First, students gain technical experience related to maintenance, repair, vehicle electrical systems, service processes, and production activities relevant to automotive competencies. Second, students can observe the application of procedures, safety standards, work documentation, time management, communication with customers or colleagues, and professional practices that can later serve as learning contexts. Such experiences have the potential to strengthen understanding of the relationship between theory, practice, and workplace culture. However, these benefits should be understood as a pedagogically plausible mechanism, not as an impact that is fully measured by a single internship experience score.

In this study, industrial internship experience is positioned as a variable related to work readiness. Internship experience cannot be understood simply as the length of time students spend in industry; its quality may also be reflected in engagement in work, alignment of tasks with the field of study, opportunities to apply skills, supervisor support, and understanding of rules and responsibilities. Meanwhile, work readiness is students' perception of their capacity to meet job demands. Because both variables were measured through questionnaires, the results primarily represent the relationship between respondents' assessments of their experience and their own readiness, rather than a direct measurement of job performance after graduation. This clarification is important so that the interpretation of the results remains commensurate with the methods and instruments used.

The research gap addressed here is not a claim that no previous research exists on industrial internships and work readiness. On the contrary, prior evidence shows that this topic has been widely examined among vocational high school students, vocational college students, and non-automotive study programs. A more measurable gap lies in the need to add correlational evidence from Automotive Engineering Education students at Universitas Negeri Malang, focusing on industrial internship experience and work readiness in the context of industrial change. The contribution of this study is contextual and empirical: it tests the direction and strength of the relationship in a specific target group and then discusses its implications for the design of industrial internships and the development of work readiness. This study does not claim to build a new theory or to prove that industrial internships are the sole determinant of work readiness.

2. RESEARCH METHODS

This study employed a quantitative approach with a correlational survey method. This design was used to assess the statistical relationship between two variables without experimental treatment. The independent variable (X) was industrial internship experience, while the dependent variable (Y) was student work readiness. The analysis focused on patterns of association and the predictive ability of the model, not on testing cause-and-effect relationships.

The research was conducted at the Bachelor's (S1) Automotive Engineering Education Study Program, Universitas Negeri Malang, Indonesia, from December 10, 2024 to February 23, 2025. The research targets were students of the 2021 cohort who had completed or were participating in the industrial internship program. The main questionnaire was distributed to 55 students via

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Google Forms. Data from the 55 respondents were used in the Pearson correlation and simple linear regression analyses.

The research instrument was a questionnaire with a Likert response scale. The industrial internship experience instrument consisted of 25 items, and the work readiness instrument also consisted of 25 items, according to the validity table presented in the source document. The questionnaire was used to collect respondents' assessments of the experiences they had undergone and their readiness to enter the world of work. Because the full details of the indicators and the wording of all items are not reproduced in the article, the interpretation of the constructs is limited to the variable names and the recorded instrument information. Future research should transparently present operational definitions, indicators, sample items, score ranges, and procedures for constructing composite scores.

Item validity was tested by comparing each item's correlation coefficient with the r-table value of 0.361. The reported results indicate that all 25 items of the industrial internship experience instrument were valid, and the items of the work readiness instrument had correlation coefficients above that threshold. The reliability of both instruments was tested using Cronbach's alpha. The alpha value was 0.978 for the industrial internship experience instrument and 0.982 for the work readiness instrument, indicating very high internal consistency.

Data were analyzed using IBM SPSS Statistics version 25. Assumption checks included normality, linearity, and heteroscedasticity. The linearity test yielded a deviation from linearity value of 0.102, while the Glejser heteroscedasticity test yielded a significance value of 0.865. Both values were greater than 0.05, indicating no significant deviation from linearity or heteroscedasticity based on the tests used.

Hypothesis testing used Pearson product-moment correlation to assess the direction and strength of the linear relationship between X and Y. Simple linear regression analysis was also used to describe the predictive relationship in the form of the equation $Y = a + bX + \varepsilon$. The correlation coefficient indicates the degree of association, whereas the regression coefficient describes the average change in the predicted Y score associated with a one-unit change in the X score within the model. The coefficient of determination R^2 was used to explain the proportion of variance in Y scores accounted for by the linear model. The significance level was set at $\alpha = 0.05$. Significance values displayed by the software as 0.000 are reported in the article as $p < 0.001$, because a probability should not be interpreted as exactly zero.

Data were collected through questionnaires administered to the students who served as research respondents. The data were analyzed in aggregate and presented as group statistics, so the discussion focuses on patterns of relationships between constructs rather than on the identities or individual answers of respondents

.3. RESULTS AND FINDINGS

The main results show a strong positive relationship between industrial internship experience and student work readiness. Pearson correlation yielded $r = 0.787$ with $N = 55$ and $p < 0.001$. This coefficient indicates that respondents with higher industrial internship experience scores tended to

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have higher work readiness scores. This result supports the hypothesis of a significant positive relationship between the two variables.

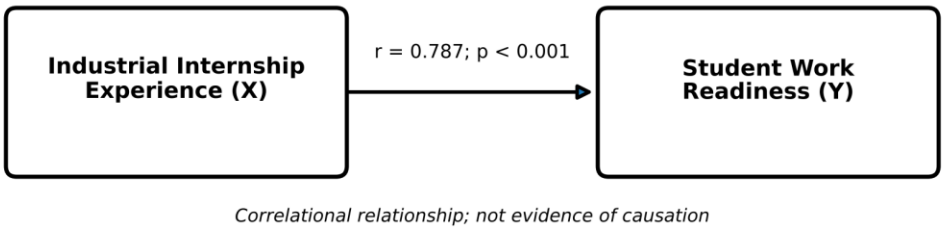


Figure 1. Conceptual model of the relationship between industrial internship experience and work readiness.

A summary of the instrument coefficients reported in the source output is presented in Table 1.

Variable	Number of items	Cronbach's alpha
Industrial internship experience (X)	25	0.978
Work readiness (Y)	25	0.982

Note: Cronbach's alpha indicates the internal consistency of the instruments in the test sample.

The main correlation and regression results are summarized in Table 2.

Analysis	Statistic	Value
Pearson correlation	r; p; N	0.787; < 0.001; 55
Simple linear regression	Equation	$Y = 1.840 + 0.988X + \varepsilon$
Slope coefficient	b; t	0.988; 9.282
Model test	F; p	86.152; < 0.001
Coefficient of determination	R^2; adjusted R^2	0.619; 0.612

Source: results of the study's statistical analysis; N = 55.

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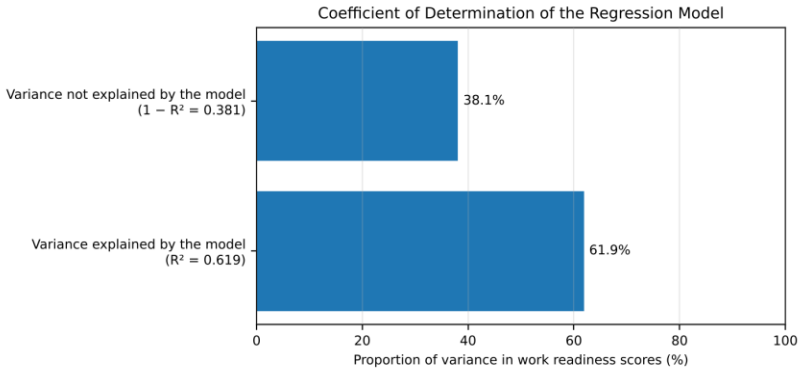


Figure 2. Proportion of variance in work readiness scores explained by the regression model ($R^2 = 0.619$).

The results of the analysis assumption checks are summarized in Table 3.

Check	Result	Interpretation
Deviation from linearity	p = 0.102	Not significant at α = 0.05
Glejser test	p = 0.865	No significant heteroscedasticity

Note: test decisions are based on a 0.05 significance level.

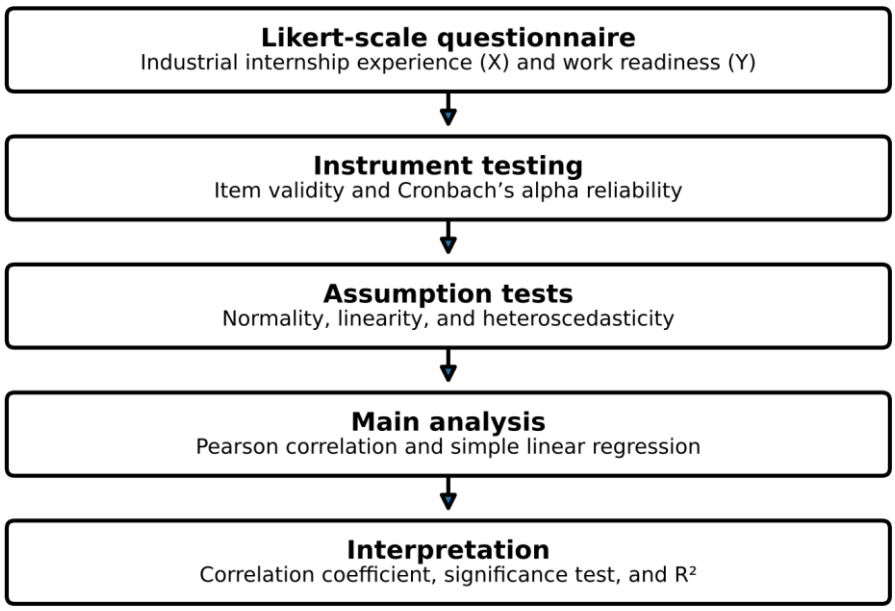


Figure 3. Research data collection and analysis flow.

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A positive correlation does not mean that every student with a good internship experience is necessarily ready for work, nor does it indicate that internship experience explains all differences in work readiness. The correlation coefficient describes the pattern of the relationship across the group of respondents as a whole. Individual variation remains possible because students may differ in motivation, self-efficacy, prior work experience, social support, academic achievement, access to technology, and learning opportunities. In addition, when both variables are measured by self-report at the same time, the correlation may be influenced by respondents' general perceptions, a tendency to give consistent answers, or other unmeasured factors. Therefore, the results should be read as evidence of a strong association within the context of the sample, not as a guarantee of individual work outcomes.

The simple linear regression analysis reported in the source yielded the equation $Y = 1.840 + 0.988X + \varepsilon$. The slope coefficient of 0.988 indicates that a one-unit increase in the industrial internship experience score is associated with a 0.988-unit increase in the work readiness score predicted by the model, assuming the scale and model specification used in the analysis. This coefficient is not a percentage and cannot be interpreted as a 98.8 percent increase in work readiness. The intercept of 1.840 is the predicted value of Y when X equals zero; its substantive meaning depends on the score range and coding of the instrument. If a score of zero is not possible on the questionnaire scale, the intercept is more appropriately viewed as a mathematical parameter of the model than as an empirical condition of students.

The t-test for the regression coefficient yielded a value of 9.282 with $p < 0.001$. The F-test of the regression model yielded a value of 86.152 with $p < 0.001$. Both results indicate that the simple linear regression model is statistically significant. The slope coefficient of 0.988 indicates that a one-unit increase in the industrial internship experience score is associated with a 0.988-unit increase in the work readiness score predicted by the model.

The reported coefficient of determination is $R^2 = 0.619$. This means that, in this single-predictor regression model, approximately 61.9% of the variance in work readiness scores in the sample is associated with variance in industrial internship experience scores. The remaining 38.1% of the variance is not explained by the model. The remaining variance should not be directly attributed to any single factor, because this model did not test other variables. Factors such as motivation to enter the workforce, self-efficacy, digital literacy, communication skills, academic achievement, quality of supervision, and career support may be candidate variables for further research, but the contribution of each cannot be determined from the data of this study. R^2 also does not mean that 61.9% of work readiness is causally "caused" by industrial internship experience.

The linearity test showed a deviation from linearity value of 0.102, which is greater than 0.05, so no significant deviation from linearity was found based on this test. The Glejser test yielded $p = 0.865$, which is also greater than 0.05 and does not indicate significant heteroscedasticity. Both results support the use of simple linear regression on the research data.

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4. DISCUSSION

The main finding shows that industrial internship experience has a strong relationship with student work readiness in the context studied. Conceptually, this result is reasonable because industrial internships give students the opportunity to connect campus knowledge with professional tasks. In this process, students can practice following procedures, managing time, complying with instructions, communicating with colleagues, and understanding that the quality of work outcomes is not determined solely by theoretical knowledge. However, a strong relationship should not be read as evidence that all aspects of industrial internships contribute equally or that placement duration is an adequate indicator. This study did not separate the effects of supervision quality, type of tasks, intensity of engagement, or suitability of the internship site. Therefore, the safest interpretation is that students' assessments of their internship experience move in the same direction as their assessments of their work readiness.

This result is consistent with the study by Larosa et al. (2022), which reported a positive relationship between industrial internship experience and the work readiness of machining engineering students. The similar direction of the relationship reinforces the relevance of direct work experience as part of vocational learning, although coefficients across studies cannot be compared without assessing the equivalence of instruments, respondent characteristics, and sampling techniques. Supriyanto et al. (2022) also examined internship experience and work motivation in relation to the work readiness of automotive students. Their study positioned motivation as another relevant factor, serving as a reminder that industrial experience is not the only element in the transition to work. For Automotive Engineering Education students, motivation, professional identity as prospective educators or practitioners, and opportunities to observe modern automotive technology may shape the experience differently compared with secondary school students.

These results can also be situated within the work-integrated learning literature. Jackson (2015) showed that opportunities to develop skills in work placements depend on activity design and the support available. If students are merely placed in an industrial environment without meaningful tasks, guidance, or feedback, the experience may not produce optimal learning. Young et al. (2024) emphasized the need for a framework to evaluate work-integrated learning in a structured way. In the context of a study program, this means that administrators need to move beyond simply recording that students have completed their internships. Evaluation should examine competency attainment, task quality, supervisor involvement, connection with the curriculum, and student reflection. The correlational findings of this study can be a reason to pay attention to the quality of experience, but they are not direct evidence that any particular placement model is superior.

The work readiness literature emphasizes that readiness is a broader construct than the mastery of technical skills. Caballero et al. (2011) developed a work readiness measure to capture the dimensions graduates need when entering employment. Robles (2012) showed that communication, ethics, and interpersonal skills are among the attributes valued in the workplace. In automotive engineering education, these skills may be seen in the ability to explain symptoms of faults, document the diagnostic process, coordinate during repairs, maintain safety, and

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communicate with customers or the team. Nevertheless, the instrument in this study should not be assumed to be identical to the Caballero scale or Robles' soft skills measurement. These references are used to strengthen the conceptual framework, not as evidence that the constructs measured are operationally the same.

The demands of Industry 4.0 add a digital dimension to work readiness. Vehicle diagnostic technology, workshop management systems, electronic documentation, software, and data connectivity mean that automotive competencies are constantly changing. Naufalin et al. (2024) examined the relationship of internship programs and digital literacy with the work readiness of diploma students, while Kholifah et al. (2025) examined the digital employability skills of vocational graduates. Both underline that readiness to enter employment in a digital context needs to consider more than conventional technical experience. However, this study did not measure digital literacy separately. Therefore, it cannot be concluded that the correlation coefficient of 0.787 specifically reflects readiness for digital technology; the Industry 4.0 context is more appropriately used as a background that gives urgency to the research question.

Findings from other studies in Indonesia also show that the relationship between work experience and readiness may interact with personal factors. Ma'arif et al. (2025) examined field work practice together with self-efficacy and career guidance in a work readiness model, while Herawati and Turangan (2025) examined internship experience, self-efficacy, and soft skills in Generation Z. Rahmawati and Rosy (2025) tested the role of attitude as a mediator between internships, learning achievement, and work readiness. This evidence broadens the possible explanations for the relationship found in this study. Students who feel they have had a meaningful internship experience may also have higher self-confidence, more positive attitudes, or a clearer understanding of their careers. However, because these variables were not tested in this model, they should all be treated as hypotheses for future research, not as proven mechanisms.

From a human capital perspective, internship experience can be understood as an opportunity to build skills and knowledge relevant to work productivity. However, this perspective does not require every industrial experience to have equal value. Experiences involving authentic tasks, gradually increasing responsibility, supervision, and reflection have the potential to provide richer learning than passive observation. Helyer and Lee (2014) discussed the relationship between work experience and graduate employability, while Shoenfelt et al. (2013) positioned internships as a long-established mechanism for supporting employability. This literature provides a basis for viewing industrial internships as a bridge between education and employment, but the quality of the bridge depends on its design and implementation. Therefore, study programs should review not only whether students obtain an internship placement, but also what they actually do and learn.

International and regional studies on work-integrated learning also remind us that responsibility for learning is shared among higher education institutions, students, and host organizations. Higher education institutions set learning outcomes, prepare students, monitor placements, and assess reflections. Industrial organizations provide the work environment, access to relevant tasks, guidance, and feedback. Students play an active role by asking questions, complying with standards, recording their experiences, and connecting activities with prior knowledge. Chowdhury (2020) emphasized the importance of strong relationships between educational

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institutions and employers in work-integrated learning. If this coordination is weak, students may experience a mismatch between the competencies learned and the work assigned. Because this study measured experience only through questionnaires, the role of each party cannot be separated statistically; nevertheless, the programmatic implications remain relevant.

This study makes a contextual contribution to automotive engineering education. Students in engineering education study programs often occupy a position that bridges technical practice and learning. They need not only to master work procedures but also to understand how these competencies can be explained, modeled, and taught to learners. Industrial experience can provide authentic examples of work standards, quality control, maintenance, safety, documentation, and the use of technology. If these experiences are processed through reflection and discussion after the placement, students can develop the ability to translate professional practice into learning materials. However, this study did not measure pedagogical competence or teaching ability; therefore, this article does not claim that internship experience directly improves the quality of prospective teachers. That is a direction for further research that needs to be tested with its own indicators.

The first practical implication is to formulate explicit and observable industrial internship objectives. Objectives should link automotive field competencies with general work skills, such as following SOPs, recognizing safety risks, reading technical documentation, using tools correctly, conveying information accurately, and completing tasks in line with time and quality standards. Specific objectives make it easier for students, industry supervisors, and academic supervisors to assess progress. The second implication is to establish task agreements with industry partners before placement. Without such agreements, learning opportunities may depend heavily on the informal policies of the internship site. The third implication is to use activity logs or portfolios that contain not only a list of activities but also the problems encountered, decisions made, feedback received, and knowledge that needs to be deepened.

A further practical implication is to strengthen supervision and reflection. Industry supervisors can provide brief periodic feedback on work quality, discipline, communication, safety, and initiative. Academic supervisors can use these notes to help students identify the skills they have mastered and the aspects that still need development. Structured reflection also helps avoid the assumption that spending longer in industry always means being more ready for work. What matters more is the quality of engagement and learning from tasks. The literature on skill development in work placements shows that activity design and supervisor support are important components (Jackson, 2015; Young et al., 2024). Because this study did not compare supervision models, these recommendations should be understood as implications based on the literature and educational reasoning, not as interventions that have been proven effective through the data of this study.

This study also has implications for curriculum development. Study programs can map industrial internship experiences against graduate learning outcomes and prerequisite courses. Before departure, students can be prepared through reinforcement of occupational safety, professional communication, ethics, documentation, and the use of appropriate diagnostic tools. During the internship, tasks and achievements can be monitored with an agreed rubric. After the internship, students can present anonymized cases, explain their analytical process, and reflect on the

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connection between theory and experience. Such a model has the potential to transform industrial internships from an administrative activity into an integrated learning experience. However, curriculum implementation must consider partner capacity, student safety, the diversity of internship sites, and the availability of competent supervisors.

This study has several limitations. The data came from a single study program and a single cohort, so generalization to students in other programs should be made with caution. Measurement using self-report questionnaires is also potentially affected by perception bias and common-method variance. In addition, the correlational design does not determine causal direction; the relationship found may be related to other factors not analyzed in the model.

Another limitation relates to instrument documentation and analysis reporting. A strong article should report the operational definition of each variable, indicators, sample items, score ranges, reliability, methods for handling missing responses, and relevant respondent characteristics. Cronbach's alpha values for both variables should be reported based on valid output. Assumption tests should also be reported in full with the relevant statistics, not only significance values. In this study, the linearity and heteroscedasticity values can be reported according to the document, but the normality details are not sufficient to be presented precisely. With such transparency, readers can assess the reliability of the findings and other researchers can replicate the analysis. Strengthening the reporting does not change the substantive results, but it improves traceability and scientific quality.

Future research could expand the sample across study programs and institutions to determine whether the pattern of the relationship remains consistent in different contexts. A longitudinal design could measure readiness before and after industrial internships so that changes in scores can be observed, although such a design still requires attention to other factors that change during the study period. Mixed-methods studies could complement surveys with interviews of students, industry supervisors, and lecturers to understand which types of tasks are considered most valuable and what obstacles arise during placement. Research could also test multivariate models that include self-efficacy, work motivation, digital literacy, soft skills, academic achievement, supervision quality, and the suitability of the placement field. If mediation or moderation models are used, hypotheses and sample sizes should be determined before analysis, and results should not be concluded solely from statistical significance.

Overall, the results add contextual evidence that industrial internship experience and work readiness are interrelated among Automotive Engineering Education students. The strength of the results lies in the reported positive relationship, not in a cause-and-effect claim. These findings support attention to the design of industry-based learning experiences that are relevant, purposeful, supervised, and evaluated. Internship experience should be part of a learning ecosystem that connects the curriculum, the workplace, student reflection, and continuous competency development. At the same time, inconsistencies in the reported sample size must be resolved before the results are considered final. Rigor in reporting data and the limits of interpretation is as important as statistically significant values.

Recent research specifically addressing the work readiness of vocational students shows that internship experience should not be separated from other competencies. Gustiawan et al. (2025),

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in a study of business administration students, reported a strong correlation between internship programs and work readiness. Although the disciplinary context differs, these results indicate that experiences providing exposure to tasks, responsibilities, and organizational routines may be related to students' confidence in their ability to enter employment. This comparison must still be limited because administrative tasks are not the same as automotive work, which may involve safety risks, the use of equipment, diagnostic procedures, and technical standards. Therefore, the contribution of this study is to add evidence in the context of automotive engineering education, not to claim that results from all disciplines can be directly generalized.

Musa et al. (2025) examined the relationship of internships with employability, soft skills, and digital competence among graduates or students in Indonesia. This study is relevant because work readiness in a digital environment is not merely the skill of performing familiar work but also the readiness to learn new systems and work with digital information. In the automotive context, changes in diagnostic devices, vehicle electronic systems, service documentation, and alternative-energy vehicle technology make continuous learning increasingly important. However, the study discussed here did not measure digital competence separately, so it should not be interpreted as evidence that the industrial internships undertaken by respondents met the demands of the latest technology. Future research could add indicators of the types of technology used, the frequency of student involvement, the level of task independence, and the quality of feedback received.

The picture of work readiness also needs to be situated within changing employer expectations. Studies on vocational soft skills emphasize that communication, teamwork, time management, professional attitude, and problem-solving are elements that complement technical skills (Abdullah-Al-Mamun, 2012; Widodo et al., 2025). In automotive activities, these skills may emerge when students receive work instructions, explain the status of a job, record the components inspected, coordinate work with other technicians, and follow safety procedures. Thus, a valuable internship experience cannot be judged merely by the amount of work performed. The experience needs to give students the opportunity to understand the reasons behind procedures, evaluate work results, and receive corrections. This approach is consistent with the view that work readiness is multidimensional, even though these dimensions were not analyzed separately in this research model.

Several Indonesian studies show that internship experience is related to work readiness through different pathways. Wijaya et al. (2025) examined internship experience and work interest as predictors of the work readiness of vocational students. Ma'arif et al. (2025) considered self-efficacy and career guidance alongside internship experience. Rahmawati and Rosy (2025) tested attitude as a mediating variable, while Kamal et al. (2025) examined soft skills, learning facilities, and learning motivation. This body of studies suggests that work readiness is formed within an ecosystem, not from a single experience. The high correlation value in this study does not negate the role of these factors. On the contrary, it provides a reason to design further research that tests broader models and theoretically specifies confounders, mediators, or moderators before data collection.

Herawati and Turangan (2025) highlighted internship experience, self-efficacy, and soft skills in the work readiness of Generation Z. Self-efficacy can influence how a person chooses tasks,

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persists when facing difficulties, and assesses their own abilities. Students who feel more capable may be more active in requesting challenging tasks, thereby gaining broader experience while also rating their work readiness higher. This possibility indicates that the relationship between internship experience and work readiness may be complex. Because the data in this study were collected through a correlational survey and did not track the temporal order of changes in the variables, the direction of the relationship cannot be determined. Longitudinal studies or pre–post measurements could help examine whether experience precedes changes in readiness, while interviews could explain which types of experience students consider most valuable.

Systematic reviews of internship experience and vocational readiness also warn of heterogeneity in program designs and outcome definitions. Sartika et al. (2024) mapped research on the impact of internship experience on the employability of vocational students, while Megasari et al. (2025) examined the links between internship experience, soft skills, and self-efficacy. Because these studies used different populations, indicators, and methods, their synthesis should not be treated as a single uniform effect size. The lesson for the study program context is the importance of clearly defining internship experience: whether the focus is on placement length, field alignment, type of tasks, active participation, supervisor support, or students' assessment of the overall experience. Precise operational definitions make research results easier to compare and use in program improvement.

This study also has significance for the governance of university–industry partnerships. Effective partnerships require communication before, during, and after placement. Before the internship, the study program and partners need to agree on objectives, permitted tasks, safety standards, supervision procedures, and ways of assessing achievement. During the internship, monitoring needs to ensure that students are not merely performing repetitive tasks without understanding the competencies being developed. After the internship, a joint evaluation can identify mismatches between the curriculum and field needs. Safrani et al. (2026) discussed vocational education partnerships in the context of Industry 4.0 workforce readiness; this study reinforces the relevance of institutional cooperation as a broader context for student experience. However, the present study did not evaluate partnership quality directly, so these recommendations need to be tested in a separate program evaluation.

The literature used in this article situates work readiness and employability within the context of changing workforce needs. The selection of references focused on publications relevant to work readiness, soft skills, industrial internships, and work-integrated learning.

5. CONCLUSION AND SUGGESTIONS

This study found a strong positive relationship between industrial internship experience and the work readiness of students in the Automotive Engineering Education Study Program at Universitas Negeri Malang. The analysis output reported a Pearson correlation of $r = 0.787$ with $p < 0.001$. Simple linear regression reported a slope coefficient of 0.988, $t = 9.282$, $F = 86.152$, and $R^2 = 0.619$. These results indicate that industrial internship experience scores are associated with variation in work readiness scores in the analyzed model. Practically, the findings support

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strengthening industrial internships as planned learning experiences that are relevant to competencies, accompanied by supervisors, and followed by reflection. However, the correlational design does not prove causality, and the study did not test other variables that may also be related to work readiness.

Future research could involve a broader sample from several study programs and institutions, use longitudinal or mixed-methods designs, and measure self-efficacy, work motivation, digital literacy, communication skills, and supervision quality. Such approaches could broaden understanding of the conditions under which work experience supports students' readiness to enter the professional world.

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