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Technical Readiness and Safety Protocol Adherence of Aviation Students for Mro Employment

Frederick N. Ecija

National Aviation Academy of the Philippines

Abstract

This study examined the technical readiness and safety protocol adherence of aviation students for Maintenance, Repair, and Overhaul (MRO) employment. It assessed students' readiness in aircraft systems knowledge, troubleshooting skills, use of tools and equipment, maintenance documentation, and application of safety procedures. A quantitative descriptive study with demographic group comparisons was conducted among 100 Aircraft Maintenance Technology students at the University of Perpetual Help System of Laguna, comprising 60 second-year and 40 fourth-year students. Data were analyzed using frequency, percentage, mean, the Kruskal–Wallis H test, and the Mann–Whitney U test at a 0.05 significance level. The findings revealed high technical readiness across the assessed competencies, although troubleshooting skills received a comparatively lower rating. Safety protocol adherence was also high, with lock-out/tag-out procedures receiving the lowest rating among the safety indicators. No statistically significant differences in technical readiness were found according to age and sex. Across year levels, a significant difference was found only in maintenance documentation, with fourth-year students demonstrating higher readiness. Regarding training improvements, respondents prioritized increased hands-on maintenance training, stronger tool control and hazard identification, and improved industry alignment. The study recommends strengthening practical troubleshooting activities, progressive documentation training, specialized safety reinforcement, and industry collaboration to better prepare students for MRO employment.

Keywords: technical readiness, safety protocol adherence, aircraft maintenance students, MRO employment, maintenance documentation, aviation education

I. INTRODUCTION

Aviation maintenance is a safety-critical field in which technical competence, procedural accuracy, and consistent adherence to safety requirements are essential to maintaining aircraft airworthiness. Maintenance, Repair, and Overhaul (MRO) personnel perform tasks that require them to understand aircraft systems, identify and troubleshoot faults, use tools and equipment correctly, and document maintenance activities accurately. Deficiencies in these areas may compromise the quality and reliability of maintenance work. The Federal Aviation Administration (FAA, 2022), in its review of procedural noncompliance in aviation maintenance, explained that failure to follow established procedures remains a persistent safety concern influenced by individual, supervisory, environmental, and organizational factors. This demonstrates that safe maintenance performance cannot be ensured by technical knowledge

alone; it also requires consistent procedural compliance and a work environment that supports safe practices.

Technical readiness is therefore an important consideration in preparing Aircraft Maintenance Technology students for future employment. Students must develop competencies that enable them to apply theoretical knowledge to practical maintenance tasks. These competencies include aircraft systems knowledge, troubleshooting skills, the proper use of tools and equipment, compliance with maintenance documentation, and the application of safety procedures. The International Civil Aviation Organization (ICAO, 2021) provides guidance on competency-based training and assessment for aircraft maintenance personnel, emphasizing a structured approach to developing and assessing the competencies required for maintenance work. Such an approach is relevant to aviation education because it highlights the importance of assessing what learners can demonstrate in relation to the requirements of their intended professional roles.

Safety protocol adherence is equally important because maintenance activities involve potential hazards associated with tools, equipment, aircraft systems, hazardous materials, and work procedures. Atak and Kingma (2011), in their study of safety culture in an aircraft maintenance organization, examined how organizational processes and competing production and safety interests shaped maintenance practices. Their findings illustrate the importance of considering the wider context in which safety-related decisions and behaviors occur. Similarly, the FAA's human factors resources identify issues such as lack of knowledge, distraction, fatigue, communication difficulties, and lack of awareness as factors that can affect maintenance performance (FAA, n.d.). These sources reinforce the need for aviation maintenance education to develop both technical competence and safety-oriented behavior.

Training and assessment practices can help prepare students to meet these expectations. ICAO's Manual on Training of Aircraft Maintenance Personnel (Doc 10098) provides guidance for structuring competency-based training and assessment in ways that can be adapted to the context of aviation training organizations (ICAO, 2021). In educational settings, supervised practical activities, simulated maintenance scenarios, structured performance checklists, and systematic feedback can provide opportunities for students to demonstrate technical skills and follow safety procedures. Evaluating these competencies before students enter the workforce can help educators identify areas that need reinforcement and align training activities more closely with the demands of maintenance practice.

Although aviation maintenance literature and regulatory guidance emphasize technical competence, human factors, procedural compliance, and competency-based training, these concerns do not automatically establish how prepared students in a particular educational institution are for MRO employment. Institutional assessment is necessary to determine whether students report comparable levels of readiness across different technical domains and whether particular competencies require greater instructional attention. An overall readiness rating alone may conceal important differences between students' knowledge of aircraft systems, troubleshooting abilities, maintenance documentation practices, and application of safety procedures.

A further concern is the need to examine technical readiness alongside safety protocol adherence. Students may report confidence in their technical knowledge while requiring additional practice in diagnosing faults or consistently applying specific safety procedures. Examining these dimensions separately can provide a more useful basis for identifying training priorities. Comparisons across age, sex, and year level may also help determine whether reported technical readiness differs among student

groups. However, such differences should be established empirically rather than assumed on the basis of demographic characteristics.

For the present study, the identified research need is therefore institution-specific: to assess the technical readiness and safety protocol adherence of Aircraft Maintenance Technology students and use the results to identify areas for training improvement. The study does not assume that no previous research has examined aviation maintenance students or that no assessment frameworks exist. Rather, it addresses the practical need for evidence about the competencies and safety practices of the students included in the study at the University of Perpetual Help System of Laguna. This evidence can support more focused decisions concerning practical instruction, competency assessment, and preparation for MRO employment.

In response to this need, the present study examined the technical readiness and safety protocol adherence of Aircraft Maintenance Technology students at the University of Perpetual Help System of Laguna in preparation for Maintenance, Repair, and Overhaul employment. Specifically, it described the respondents according to age, sex, and year level; assessed technical readiness in aircraft systems knowledge, troubleshooting skills, use of tools and equipment, compliance with maintenance documentation, and application of safety procedures; assessed safety protocol adherence; and tested differences in technical readiness according to age, sex, and year level. The study also identified priority areas for training improvement and used the findings as a basis for proposing a Competency Enhancement and Safety Reinforcement Program for Aviation Maintenance Training.

The study is intended to provide practical evidence that may assist aviation educators and training administrators in identifying areas of strength and competencies that require further development. By examining technical readiness and safety protocol adherence together, the findings can inform improvements in hands-on maintenance activities, troubleshooting exercises, documentation training, safety reinforcement, and performance-based assessment. The proposed program is intended to help align instructional practices with the technical and safety expectations associated with aviation maintenance work. Ultimately, the study seeks to contribute to the continuing improvement of aviation maintenance education and the preparation of students for the responsibilities they may encounter in MRO employment.

II. METHODOLOGY

This study employed a quantitative descriptive-comparative research design to assess the technical readiness and safety protocol adherence of Aircraft Maintenance Technology students at the University of Perpetual Help System of Laguna. The respondents comprised 100 students selected through purposive sampling. Data were collected using structured questionnaires covering the respondents' demographic profiles, technical readiness in aircraft systems knowledge, troubleshooting skills, use of tools and equipment, compliance with maintenance documentation, and application of safety procedures. A structured observation checklist was also used to assess safety protocol adherence during hands-on maintenance activities. The research instruments underwent content validation by individuals with relevant expertise in aviation maintenance and research.

The data were analyzed using frequency and percentage to summarize the respondents' demographic profiles and means and weighted means to describe their technical readiness and safety protocol adherence. The Kruskal–Wallis H test was used to examine differences in technical readiness across age groups, while the Mann–Whitney U test was used to examine differences according to sex and year

level. Statistical significance was evaluated at the 0.05 level. The findings were used to identify areas for improvement and develop a proposed Competency Enhancement and Safety Reinforcement Program for Aviation Maintenance Training.

Ethical considerations were observed throughout the research process. Formal permission to conduct the study was obtained from the university administration and participating organizations before data collection. Informed consent was secured from student respondents and safety officer evaluators. Participation was voluntary, and participants were informed of the purpose of the study. Confidentiality and privacy were maintained in the handling, analysis, and reporting of data. The collected information was used solely for research purposes, and the procedures were conducted with due consideration for the rights and welfare of all participants.

III. RESULTS AND DISCUSSION

Table 1. Demographic Profile of the Respondents

Profile	Frequency	Percentage
Age		
18–20	38	38.00%
21–23	49	49.00%
24–26	10	10.00%
27 and above	3	3.00%
Sex		
Male	83	83.00%
Female	17	17.00%
Year level		
Second Year	60	60.00%
Fourth Year	40	40.00%

Table 1 shows the demographic profile of the 100 Aircraft Maintenance Technology students in terms of age, sex, and year level. In terms of age, the largest group was aged 21–23 years, comprising 49 respondents (49%), followed by those aged 18–20 years, with 38 respondents (38%). Meanwhile, 10 respondents (10%) were aged 24–26 years, and 3 (3%) were aged 27 years and above.

Regarding sex, the majority of the respondents were male, accounting for 83 (83%), while 17 (17%) were female. In terms of year level, 60 respondents (60%) were second-year students, while 40 (40%) were fourth-year students. Overall, the profile indicates that the respondents were predominantly male, aged 21–23 years, and enrolled in the second year of the Aircraft Maintenance Technology program.

Table 2. LEVEL OF STUDENTS' TECHNICAL READINESS

Assessment indicator	Standard Mean	Verbal Interpretation
Aircraft Systems Knowledge	3.31	Very High
Troubleshooting Skills	3.08	High
Use of Tools and Equipment	3.53	Very High
Compliance with Maintenance Documentation	3.48	Very High
Application of Safety Procedures	3.59	Very High

Overall Mean	**3.40**	**Very High**

Table 2 presents the overall level of students' technical readiness across five competency areas relevant to aviation maintenance: aircraft systems knowledge, troubleshooting skills, use of tools and equipment, compliance with maintenance documentation, and application of safety procedures. The results yielded a grand mean of 3.40, verbally interpreted as Very High, indicating that the respondents generally reported a favorable level of readiness for aviation maintenance-related tasks.

Among the five indicators, application of safety procedures obtained the highest mean of 3.59, followed by use of tools and equipment (3.53). Both indicators were verbally interpreted as Very High. These findings suggest that students perceive themselves as well-prepared in applying safety practices and handling the tools and equipment necessary for maintenance activities. These competencies are particularly important in aviation maintenance, where improper tool use and failure to follow safety procedures can contribute to workplace injuries, maintenance errors, and risks to aircraft airworthiness. However, the high ratings should be interpreted as an indication of reported readiness rather than conclusive evidence of actual workplace competence. Practical demonstrations and direct observations would be needed to establish whether students consistently apply these competencies in authentic maintenance situations.

Similarly, compliance with maintenance documentation obtained a mean of 3.48, while aircraft systems knowledge received a mean of 3.31. Both were interpreted as Very High. These results indicate that students generally consider themselves prepared to understand aircraft systems and comply with maintenance documentation requirements. Knowledge of aircraft systems provides the foundation for understanding how aircraft components operate and interact, while accurate documentation supports the traceability of maintenance work, accountability, and compliance with prescribed procedures. The findings therefore highlight the importance of sustaining these competencies through classroom instruction, laboratory exercises, and guided maintenance activities.

In contrast, troubleshooting skills obtained the lowest mean of 3.08, interpreted as High. Although this result still reflects a favorable level of readiness, it identifies troubleshooting as a relative area for improvement. Unlike knowledge-based competencies, troubleshooting requires students to integrate theoretical knowledge with practical judgment, systematic fault identification, interpretation of technical information, and selection of appropriate corrective actions. The comparatively lower rating may indicate that students need more opportunities to apply what they have learned to realistic maintenance problems. Accordingly, aviation maintenance instruction could be strengthened through simulated fault-diagnosis activities, supervised laboratory exercises, case-based problem-solving, and practical assessments that require students to explain and demonstrate their diagnostic decisions.

These findings are consistent with Dela Peña et al. (2025), who examined competency gaps in aviation maintenance education in the Philippines. Their study highlighted the need to address deficiencies in advanced diagnostics and other technical competencies and reported the importance of industry-based on-the-job training in developing graduates' job readiness. This supports the implication that a strong foundation in aircraft systems and safety should be complemented by practical opportunities to diagnose faults and solve maintenance problems. In the context of the present study, the lower mean for troubleshooting skills suggests that more focused diagnostic training may help students develop the practical capabilities expected in Maintenance, Repair, and Overhaul (MRO) settings.

The results may also be understood in relation to Walter (2000), who discussed competency-based on-the-job training for aviation maintenance and inspection personnel. The study emphasized the value of structured, task-oriented training that identifies job requirements, sequences learning activities, and evaluates the development of competencies. This perspective supports the use of systematic practical instruction rather than relying solely on theoretical classroom learning. For the students in the present study, competency-based activities could be incorporated into troubleshooting, tool handling, and maintenance documentation exercises. Through repeated practice and feedback, students would have opportunities to demonstrate their skills and address performance gaps before entering actual maintenance workplaces.

Furthermore, Reynolds et al. (2010) examined human factors training in aviation maintenance and its relationship with maintenance-related incident rates. Their findings provide support for the importance of human factors training in reducing maintenance-related errors. This is relevant to the present study because application of safety procedures received the highest mean of 3.59. Although the result suggests a favorable level of readiness, safety competence must be continually reinforced through practical activities, procedural checks, hazard identification, and appropriate supervision. Particular attention should be given to ensuring that students understand and correctly apply procedures such as tool control, hazard recognition, and lockout/tagout where applicable to the maintenance task.

Taken together, the findings indicate that the respondents perceive themselves as having a strong foundation in the technical competencies required for aviation maintenance, particularly in safety procedures and the use of tools and equipment. Nevertheless, the grand mean of 3.40 should not be interpreted as proof that all students are fully competent or immediately ready to perform maintenance tasks independently. Instead, the results provide an indication of their overall reported readiness and identify specific areas that may benefit from further instructional support. The relatively lower mean for troubleshooting skills is especially important because effective fault diagnosis requires students to integrate technical knowledge, practical experience, and sound decision-making.

Therefore, aviation maintenance programs should sustain students' strengths while prioritizing the development of practical troubleshooting capabilities. Recommended approaches include expanding hands-on training, integrating realistic maintenance scenarios into laboratory instruction, providing progressive practice in maintenance documentation, and assessing students through competency-based performance tasks. Safety procedures should remain embedded across all learning activities rather than being treated as a separate instructional component. These measures may help bridge the gap between students' perceived readiness and the practical expectations of MRO employment.

Overall, the results suggest that students have a favorable foundation for further preparation in aviation maintenance, but continuous practical training and competency-based assessment remain necessary to strengthen their readiness for industry demands. Aligning technical instruction with authentic maintenance tasks and applicable safety requirements may better prepare students to perform their future responsibilities accurately, systematically, and safely.

Table 3. Observed Safety Protocol Adherence

Safety adherence indicator	Mean	Verbal interpretation
1. I consistently follow safety procedures during hands-on maintenance tasks.	3.56	Strongly Agree
2. I properly use personal protective	3.57	Strongly Agree

equipment during maintenance activities.		
3. I am aware of hazards present in aircraft maintenance environments.	3.58	Strongly Agree
4. I immediately report unsafe conditions or practices.	3.52	Strongly Agree
5. I strictly observe lock-out and tag-out procedures when required.	3.42	Strongly Agree
6. I maintain situational awareness while performing maintenance work.	3.54	Strongly Agree
7. I avoid shortcuts that may compromise maintenance safety.	3.53	Strongly Agree
8. I comply with safety instructions given by instructors and supervisors.	3.57	Strongly Agree
9. I follow safety protocols even during routine or repetitive tasks.	3.58	Strongly Agree
10. I am prepared to comply with strict safety standards in an MRO workplace.	3.57	Strongly Agree
Average weighted mean	**3.54**	**Strongly Agree**

Table 3 shows that respondents reported a high level of safety protocol adherence, with an average weighted mean of 3.54, verbally interpreted as Strongly Agree. The highest-rated indicators were awareness of hazards in aircraft maintenance environments and following safety protocols during routine or repetitive tasks, both with a mean of 3.58. These findings suggest that respondents recognize the importance of hazard awareness and consistent compliance with safety procedures. Similarly, Caputolan et al. (2026), in their study of aircraft maintenance graduates, found positive perceptions of safety practices promoted through personal protective equipment, standardized procedures, and instructor guidance.

The lowest-rated indicator was adherence to lock-out and tag-out procedures, with a mean of 3.42, although it remained within the Strongly Agree category. This suggests a relative area for improvement rather than evidence of outright noncompliance. Lee (2025), in a review of occupational safety culture in aviation maintenance, identified safety protocols, training and competence, communication, and documentation as important components of an effective safety culture. These findings support providing students with additional supervised practice in equipment isolation, hazard identification, and verification of safety procedures.

Overall, the results suggest that respondents have a positive perception of their safety practices, but continued reinforcement is needed to support consistent application during practical maintenance activities. Plioutsias et al. (2020) further recommended stronger practical safety instruction and competency-based assessment to address gaps between safety knowledge and its application. Therefore, the proposed Competency Enhancement and Safety Reinforcement Program should prioritize hands-on safety exercises, instructor-supervised demonstrations, and performance-based assessment of lock-out and tag-out procedures. Since the indicators are phrased as self-reported statements, the findings should be described as self-reported safety protocol adherence unless the scores were obtained through direct observation.

Table 4. Differences in Technical Readiness by Age

Variables	Kruskal Wallis H-Tab	p-value	Decision H0	Conclusion
Knowledge of aircraft systems	.483	.839	Accept H0	Not Significant
Troubleshooting skills	4.853	.183	Accept H0	Not Significant
Use of tools and equipment	3.350	.341	Accept H0	Not Significant
Maintenance documentation	1.418	.701	Accept H0	Not Significant
Safety procedures	.938	.816	Accept H0	Not Significant
*Significant @.05				

Table 4 presents the differences in technical readiness across respondents' age groups using the Kruskal–Wallis H test. The results show no statistically significant differences in knowledge of aircraft systems (\(H=.483, p=.839\)), troubleshooting skills (\(H=4.853, p=.183\)), use of tools and equipment (\(H=3.350, p=.341\)), maintenance documentation (\(H=1.418, p=.701\)), and safety procedures (\(H=.938, p=.816\)). Since all p-values are greater than the .05 level of significance, the null hypothesis was not rejected for all five indicators. This suggests that the respondents' technical readiness did not significantly differ according to age. Thus, the findings suggest that age was not a significant factor in differentiating students' technical readiness within the sample. This result can be discussed alongside Kes et al. (2026), who emphasized competency-based training and assessment in aircraft maintenance education, particularly in evaluating technical and transferable competencies required in the aviation industry. Their study highlights the importance of assessing students based on demonstrated competencies rather than demographic characteristics alone.

Table 5. Differences in Technical Readiness by Sex

Variables	Mann-Whitney U-Test	p-value	Decision H0	Conclusion
Knowledge of aircraft systems	542.500	.132	Accept H0	Not Significant
Troubleshooting skills	602.500	.340	Accept H0	Not Significant
Use of tools and equipment	635.000	.506	Accept H0	Not Significant
Maintenance documentation	686.500	.859	Accept H0	Not Significant
Safety procedures	635.000	.500	Accept H0	Not Significant
*Significant @.05				

Table 5 presents the differences in technical readiness between male and female respondents using the Mann–Whitney U test. The results show no statistically significant differences in knowledge of aircraft systems (\(U=542.500, p=.132\)), troubleshooting skills (\(U=602.500, p=.340\)), use of tools and equipment (\(U=635.000, p=.506\)), maintenance documentation (\(U=686.500, p=.859\)), and safety procedures (\(U=635.000, p=.500\)). Since all p-values exceed the .05 level of significance, the null hypothesis was not rejected for all five indicators. This indicates that technical readiness did not significantly differ between male and female respondents in the study. Thus, the findings suggest that male and female students demonstrated comparable technical readiness across the assessed competencies. This highlights the importance of providing equitable access to technical instruction, hands-on activities, and competency-based assessments to ensure that all students are adequately prepared for employment in the aviation maintenance industry.

These findings may be considered in relation to Thulasy et al. (2022), who emphasized the importance of competency-based assessment in aircraft maintenance education, particularly in evaluating competencies relevant to industry safety and performance. Their study supports the value of assessing students through demonstrated knowledge and skills rather than relying solely on demographic characteristics.

Table 6. Differences in Technical Readiness by Year Level

Variables	Mann-Whitney U-Test	p-value	Decision H0	Conclusion
Knowledge of aircraft systems	1128.000	.610	Accept H0	Not Significant
Troubleshooting skills	1196.000	.977	Accept H0	Not Significant
Use of tools and equipment	1041.500	.251	Accept H0	Not Significant
Maintenance documentation	897.000	.029	Reject H0	Significant
Safety procedures	958.000	.076	Accept H0	Not Significant
*Significant @.05				

Table 6 presents the differences in technical readiness across respondents' year levels using the Mann–Whitney U test. The results show no statistically significant differences in knowledge of aircraft systems (\(U=1128.000, p=.610\)), troubleshooting skills (\(U=1196.000, p=.977\)), use of tools and equipment (\(U=1041.500, p=.251\)), and safety procedures (\(U=958.000, p=.076\)). Since all p-values exceed the .05 level of significance, the null hypothesis was not rejected for these four indicators. However, maintenance documentation showed a statistically significant difference (\(U=897.000, p=.029\)); thus, the null hypothesis was rejected for this indicator. These findings suggest that technical readiness generally did not significantly differ by year level, except in maintenance documentation.

Thus, the findings suggest that students' year levels may be associated with differences in their readiness to perform maintenance documentation tasks. This highlights the importance of providing sufficient learning activities and practical exercises to strengthen students' documentation competencies throughout the aircraft maintenance technology program.

Table 7. Preferred Training Improvements

Recommendation or suggestion	Frequency	Rank
1. Observed safety behavior may show weaknesses in current assessment methods.	47	8th
2. Safety competencies may require stronger integration across courses.	51	7th
3. Documentation practices may need greater instructional focus.	54	6th
4. Curricula should adopt performance-based technical assessments.	56	4th
5. Curriculum revision should be guided by observed performance gaps.	56	4th
6. Hands-on maintenance training should be increased.	87	1st
7. Tool control and hazard identification may require reinforcement.	70	2nd
8. Industry alignment may need strengthening through structured involvement.	67	3rd

Table 7 presents the respondents' preferred training improvements for enhancing technical readiness and safety in aircraft maintenance. Increasing hands-on maintenance training ranked first, with a frequency

of 87, followed by reinforcing tool control and hazard identification (70), and strengthening industry alignment through structured involvement (67). Performance-based technical assessments and curriculum revision guided by observed performance gaps both ranked fourth, with a frequency of 56. Meanwhile, greater instructional focus on documentation practices ranked sixth (54), stronger integration of safety competencies across courses ranked seventh (51), and improvements in the assessment of observed safety behavior ranked eighth (47).

Thus, the findings suggest that respondents place the greatest emphasis on practical training, hazard identification, and stronger industry collaboration. These priorities indicate the perceived need to provide more opportunities for students to apply technical knowledge in realistic maintenance settings while reinforcing safe work practices. The results may guide the institution in reviewing its curriculum, expanding hands-on learning activities, strengthening industry partnerships, and aligning assessments with the competencies required for maintenance, repair, and overhaul (MRO) employment.

IV. CONCLUSIONS

The study concludes that the 100 Aircraft Maintenance Technology students demonstrated high technical readiness in aircraft systems knowledge, use of tools and equipment, maintenance documentation, and application of safety procedures. However, troubleshooting skills received a comparatively lower rating, while lock-out/tag-out procedures obtained the lowest rating among the safety indicators. The results revealed no statistically significant differences in technical readiness according to age and sex. Similarly, no significant differences were found across year levels in most competencies, except maintenance documentation, where fourth-year students demonstrated higher readiness than second-year students.

The findings imply that aviation maintenance education should continuously strengthen students' practical competencies and safety practices to prepare them for Maintenance, Repair, and Overhaul (MRO) employment. The comparatively lower ratings in troubleshooting and lock-out/tag-out procedures indicate the need for more focused practical exercises and safety reinforcement. Furthermore, the significant difference in maintenance documentation by year level highlights the importance of progressive documentation training throughout the curriculum. The respondents' preference for increased hands-on maintenance training, stronger tool control and hazard identification, and greater industry involvement also emphasizes the value of authentic, workplace-oriented learning experiences.

Based on these findings, the institution is recommended to expand hands-on maintenance activities, conduct troubleshooting workshops and simulated fault-diagnosis exercises, reinforce lock-out/tag-out and hazard-identification procedures, and integrate progressive documentation exercises across year levels. Performance-based assessments should be used to evaluate students' actual technical skills and adherence to safety protocols. The institution should also strengthen partnerships with MRO organizations to provide industry immersion, internships, and workplace-aligned training. Finally, the proposed Competency Enhancement and Safety Reinforcement Program should be implemented and evaluated to determine its effectiveness in improving students' technical readiness and safety protocol adherence.

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