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OCCUPATIONAL SAFETY PREPAREDNESS AND AWARENESS OF INDUSTRIAL ARTS STUDENTS IN BATANGAS TECHNICAL-VOCATIONAL SCHOOLS

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Abstract

Industrial Arts students in technical-vocational schools are exposed to workshop environments where occupational hazards and safety risks are common. Drawing from the researcher's experience as a TVL teacher, observations of varying student safety behaviors and workshop-related challenges highlighted the need to strengthen students' awareness and preparedness regarding occupational safety standards.

This study aimed to assess the level of awareness and preparedness of Industrial Arts students in Technical-Vocational schools in the Schools Division Office of Batangas Province regarding occupational safety standards. Specifically, it examined students' preparedness in terms of emergency response, use of safety equipment, and compliance with safety guidelines; awareness in hazard identification, risk assessment, and safety training and education; the relationship between awareness and preparedness; challenges encountered; and proposed enhancement activities.

A descriptive quantitative research design was employed among Grade 9 and 10 Industrial Arts students from selected technical-vocational schools in Batangas Province. Respondents were selected through stratified random sampling with proportionate allocation. Data were gathered using a validated researcher-made questionnaire and analyzed using frequency, percentage, weighted mean, ranking, and Pearson Product-Moment Correlation Coefficient.

Results revealed that students demonstrated a moderate level of preparedness in emergency response, use of safety equipment, and compliance with safety guidelines. Likewise, respondents exhibited a moderate level of awareness in hazard identification, risk assessment, and safety training and education. Findings further showed a significant positive relationship between awareness and preparedness ($p = .000$), indicating that increased awareness corresponded with improved preparedness. Students also encountered slight challenges associated with limited safety resources, inadequate signage, and workshop conditions.

The findings suggest that strengthening occupational safety awareness contributes to improved student preparedness. Enhancement activities focused on emergency simulation, safety equipment monitoring, hazard identification, risk analysis, and environmental audits are recommended to further enhance occupational safety competence and promote safer learning environments.

Keywords: *occupational safety standards, awareness, preparedness, Industrial Arts students, technical-vocational education*

INTRODUCTION

Safety serves as a fundamental component of effective education because it protects learners while promoting responsibility, discipline, and confidence. This becomes even more critical in Industrial Arts education, where students engage in practical activities involving tools, machines, and materials that expose them to various risks. Beyond developing technical competence, integrating safety into learning cultivates lifelong habits of precaution and responsibility that prepare learners for future workplaces and communities.

In the 21st century, occupational safety and health have become essential aspects of education and workforce development. The International Labour Organization (2023) emphasized that occupational safety is a fundamental human right linked to human dignity, productivity, and sustainable development. Likewise, the United Nations identifies safety as a key component of the Sustainable Development Goals, particularly Goal 3 on good health and well-being and Goal 4 on quality education, which advocate safe and inclusive learning environments. Similarly, UNESCO's Global Education 2030 Agenda highlights the importance of integrating safety culture, disaster preparedness, and risk management into educational systems. These initiatives recognize schools not only as centers of academic instruction but also as environments where safety awareness and preparedness are developed.

In the Philippines, learner safety is reinforced through national policies and educational frameworks. Occupational Safety and Health Standards Act of 2018 guarantees the right of workers and trainees to safe environments, while educational policies such as DepEd Order No. 37, s. 2015 on Disaster Risk Reduction and Management, DepEd Order No. 40, s. 2012 on Child Protection, and DepEd Order No. 21, s. 2021 through Brigada Eskwela collectively promote preparedness and school safety. These initiatives demonstrate the commitment of educational institutions to fostering a culture of safety, particularly in learning areas involving technical and manual skills.

Within the Technology and Livelihood Education curriculum, Industrial Arts combines theoretical instruction with practical applications in carpentry, welding, electrical installation, and metalwork. Due to the hands-on nature of these activities, students may encounter hazards such as burns, cuts, electrocution, and exposure to harmful substances. Consequently, developing occupational safety awareness and preparedness at the Junior High School level is essential in forming responsible and safety-conscious future workers.

Despite the presence of policies and school safety initiatives, studies continue to report gaps between policy and actual practice. Arriola and Domingo (2021) found that students' safety behavior is influenced by the availability of safety equipment and teacher supervision. Carreon (2022) further observed that inadequate safety materials and limited safety orientation contribute to weak compliance among students. Likewise, Lopez and Ferrer (2020) noted that unclear safety signage and insufficient workshop protocols increase the risk of accidents. These findings suggest that the implementation and internalization of safety practices remain inconsistent, particularly in resource-limited settings.

In Region IV-A CALABARZON and the Schools Division Office of Batangas Province, safety remains a priority through periodic inspections, safety audits, drills, and school preparedness initiatives. Among technical-vocational schools such as Bauan National and Vocational Integrated High School, Bauan Technical Integrated High School, and Malvar School of Arts and Trade, safety standards are integrated into Industrial Arts programs. However, differences in workshop conditions, equipment availability, and instructional practices may influence students' safety experiences and preparedness.

As a TVL teacher, the researcher observed varying student behaviors related to workshop safety. While some students demonstrate proper tool handling and responsible conduct, others exhibit complacency by neglecting protective equipment, mishandling tools, or overlooking safety reminders. Challenges such as equipment shortages, outdated safety signages, overcrowded workstations, and students' varying familiarity with workshop environments further emphasize the need for stronger safety education. These

observations, together with situations requiring immediate intervention to prevent potential accidents, raised concerns regarding students' hazard awareness and risk management skills.

According to Manalo (2022), students' preparedness for occupational hazards is influenced not only by instruction but also by the overall safety culture within schools. Safety practices that are consistently modeled and reinforced are more likely to become internalized behaviors rather than routine requirements. Guided by these perspectives and classroom experiences, the researcher recognized the need to examine students' occupational safety awareness and preparedness.

Hence, this study aimed to assess the occupational safety preparedness and awareness of Industrial Arts students in selected technical-vocational schools in Batangas Province. Specifically, it sought to determine students' levels of preparedness and awareness, examine the relationship between these variables, identify existing challenges, and propose enhancement activities. The findings of the study are expected to provide empirical evidence that may strengthen safety practices, improve workshop environments, and support the development of a stronger culture of safety among Industrial Arts learners.

Review of related literature

Occupational safety remains a fundamental component of technical and vocational education, particularly in Industrial Arts programs, where students are continuously exposed to tools, machines, and electrical equipment. Understanding safety awareness, preparedness, and the challenges in maintaining safe learning environments is essential not only for regulatory compliance but also for fostering responsible, competent, and skilled workers. Over the years, research has highlighted how educational institutions worldwide instill occupational safety among learners, emphasizing the interplay between training, institutional support, and individual readiness.

For instance, Taşkın (2025) investigated occupational health and safety awareness among vocational school students, highlighting a notable gap between theoretical knowledge and actual safety behavior. The study revealed that while most students could articulate basic safety rules, they often struggled to apply these principles in practical workshop settings due to insufficient hands-on training and weak supervision. This underscores that mere awareness, although necessary, is insufficient to ensure preparedness; effective safety outcomes require practical exposure reinforced by institutional support.

Similarly, Bérubé (2025) analyzed the impact of supervision and structured orientation programs on students' safety preparedness in technical institutions. The study found that schools implementing continuous safety monitoring, mentorship programs, and structured orientation sessions demonstrated higher compliance rates and fewer workshop accidents. These findings highlight the importance of cultivating an enabling learning environment where a safety culture is actively promoted and reinforced by educators and administrators.

Complementing these insights, Lawson, et al. (2019) examined safety preparedness at the school level and emphasized the critical role of leadership commitment and routine safety audits. The study demonstrated that visible management support, clear reporting mechanisms, and timely feedback fostered a safety-oriented culture, which significantly improved both student and teacher preparedness in workshop operations. This reinforces the notion that organizational backing is crucial for translating awareness into consistent safe practices.

Further, Randyputra et al. (2022) explored the correlation between occupational safety awareness and compliance among vocational students in Indonesia. Their results indicated a strong positive relationship, suggesting that consistent exposure to safety education and hands-on practice directly strengthens behavioral adherence to safety protocols. This study supports the perspective that awareness alone is insufficient; sustained behavioral compliance is essential for meaningful safety outcomes.

In line with these findings, Purba et al. (2024) demonstrated that regular emergency drills and instructor-led discussions substantially enhanced students' readiness to respond to accidents. Their research emphasized that repetitive experiential learning such as quarterly drills enables learners to retain safety

procedures more effectively and respond more rapidly during simulated emergencies. This highlights the critical role of practice in bridging the gap between knowledge and action.

Local studies further illuminate contextual challenges. For example, Cabutihan, Manaois, and Tomas (2024) investigated TLE learners and identified inadequate laboratory facilities, lack of safety gear, and limited consumables as major barriers to practicing safety standards. These constraints reveal that preparedness is often hindered by material resources and administrative support, demonstrating that institutional readiness is as important as individual awareness.

Moreover, the integration of technology into safety education has shown promising results. Vercelli et al. (2024) introduced virtual-reality-based safety simulations in technical education and observed a significant improvement in students' hazard recognition and appropriate response actions. Similarly, Zengin, et al. (2025) emphasized that simulation-based learning, combined with access to safety equipment, enhanced both confidence and competence among maritime students. These studies collectively underscore the value of immersive, active learning strategies over passive instruction in developing safety preparedness.

Social and organizational factors also influence compliance. Frejoles, Sildora Jr., and Saguban (2024) analyzed Filipino field workers and found that compliance depends not only on knowledge but also on peer norms, workload, and perceived organizational support. Although the study did not focus exclusively on students, its findings suggest that similar social and cultural dynamics may affect learners' safety behaviors in workshop environments.

In addition, reports from the Department of Education (DepEd, 2021) indicate that many public schools continue to face issues such as outdated safety equipment, lack of standardized and visible safety signage, and insufficient teacher training on occupational health and safety (OHS) procedures. These limitations weaken institutional preparedness and significantly reduce schools' capacity to respond effectively to emergencies, thereby compromising the safety of the learning environment.

Moreover, parallel concerns are evident in higher education institutions, where resource and organizational constraints affect the enforcement of safety policies. A study conducted at the University of the Philippines by Villanueva et al. (2023) found that limited funding, inadequate staffing, and the absence of dedicated safety units hinder the effective monitoring and implementation of occupational safety and health (OSH) programs. The study further revealed that budgetary limitations, lack of trained personnel, and weak inter-office coordination contribute to inconsistent policy enforcement and difficulty in sustaining safety initiatives over time.

Taken together, these findings indicate that safety challenges across basic and higher education are rooted in broader structural and capacity-related gaps. The persistence of resource limitations, inadequate expertise, and weak coordination reflects fragmented and inconsistent implementation of occupational safety and health (OSH) policies. These conditions highlight the need for standardized yet adaptable safety frameworks, supported by sustained capacity-building and resource allocation, to strengthen a culture of safety across educational institutions (Vallesteros, 2022).

Additionally, studies have examined the effectiveness of drills and orientation programs. UC Santa Cruz Environmental Health and Safety (2024) noted that frequent, realistic, and varied drills significantly improve procedural accuracy and readiness; however, overly repetitive drills may lead to complacency, emphasizing the need for adaptive and reflective training approaches. Viloria et al. (2021) also reported that while students in electrical installation programs were highly aware of safety rules, actual compliance was inconsistent due to poor laboratory maintenance and lack of supervision, demonstrating that awareness does not automatically translate into safe behavior.

Local studies in Batangas Province emphasize the importance of occupational safety and health (OSH) in technical and vocational education, particularly in strengthening students' preparedness and awareness. For instance, Santos (2022), in a study conducted at the University of Batangas, found that

safety training programs for Industrial Technology students significantly improved their hazard identification and risk assessment skills. The study highlighted that structured safety instruction equips learners with the competencies needed to apply safety protocols effectively in workshop environments.

Similarly, Reyes and Mendoza (2021) from the Lyceum of the Philippines University Batangas reported that students who participated in Basic Occupational Safety and Health (BOSH) training demonstrated higher levels of safety awareness and compliance with standard procedures. Their findings emphasized that formal safety education enhances not only knowledge acquisition but also the practical application of safety measures in technical tasks.

In another study, Garcia (2020) of the Batangas State University examined the integration of occupational safety concepts in engineering and industrial education. The results revealed that embedding safety topics such as machine operation, hazard control, and workplace inspection into the curriculum significantly improved students' preparedness and safety behavior. This supports the importance of curriculum-based approaches in developing safety-conscious learners.

Meanwhile, a study conducted by Dela Cruz (2020) from the University of the Philippines Los Baños found that exposure to OSH training is a strong predictor of hazard recognition and risk assessment competence. The study also identified that common workplace risks such as dust, noise, and improper equipment handling require consistent reinforcement through training and supervision.

Furthermore, Torres and Bautista (2021) from the Lyceum of the Philippines University Batangas Research Center reported that compliance with occupational safety standards is significantly associated with educational attainment and training exposure. Their findings suggest that individuals with higher levels of safety education demonstrate stronger adherence to safety protocols, reinforcing the role of continuous training in shaping safety behavior.

Theoretical perspectives further enriched this understanding. Ndem (2021), drawing on Protection Motivation Theory, provided valuable insights into how students develop confidence in handling emergencies. According to the study, students' readiness to respond effectively to hazards was influenced not only by their knowledge of safety protocols but also by their perception of personal efficacy, belief in their ability to act correctly in emergency situations.

Moreover, institutional readiness, such as the availability of equipment, structured procedures, and organized drills, significantly enhanced this confidence. Ndem's findings suggested that safety preparedness was not solely a matter of individual knowledge; rather, it emerged from the interplay between personal capabilities and the surrounding institutional support. This underscored the need for schools and technical institutions to create an environment where students feel both competent and supported, thereby promoting proactive and confident responses to potential hazards.

Similarly, Wijayanti (2020) approached safety awareness from a developmental and cyclical perspective. The study conceptualized awareness as a continuous process involving perception, reflection, and action, rather than a single learning event. Through repeated experiences, feedback, and reflective practice, learners gradually internalized safety principles, developed mindfulness regarding risks, and adopted preventive behaviors. This perspective emphasized that safety education should not be limited to one-off lectures or orientation sessions; instead, it should involve ongoing engagement, critical thinking, and opportunities for students to reflect on their experiences. By framing safety as a dynamic and iterative process, Wijayanti highlighted the importance of integrating both cognitive understanding and emotional preparedness in technical and vocational education.

Several studies reinforced the value of structured, practice-based safety education. Research by Yadav et al. (2020) reinforced the significance of formalized safety education. The study found that students who participated in structured safety orientations demonstrated higher procedural accuracy and superior hazard recognition compared to peers who received only ad hoc or informal training. These findings suggested that formalized programs, which combine instruction with clear guidelines and repeated practice,

enhanced learners' ability to apply safety principles consistently in practical contexts. In effect, structured training not only imparted knowledge but also fosters skill development and behavioral adherence to safety protocols.

Prajwal, Kundury, and Sujay (2020) further emphasized the importance of comprehensive coverage in safety training. Their study of healthcare trainees revealed that even learners with high overall awareness sometimes lacked preparedness for specific types of hazards due to uneven emphasis in training programs. This finding highlighted that awareness alone did not guarantee complete preparedness; rather, training must be holistic, addressing the full spectrum of risks learners may encounter.

Rodrigues et al. (2018) and Olajide and Oni (2018) extended these insights by demonstrating the effectiveness of interactive, hands-on safety training over traditional lecture-based methods. Their studies showed that students engaged in practice-oriented instruction exhibited greater long-term retention of safety procedures, improved hazard recognition, and faster response times during emergencies. Importantly, such interactive approaches also enhanced learners' perception of control over workplace hazards, linking knowledge, confidence, and action. These findings collectively underscore that awareness and preparedness are mutually reinforcing constructs: awareness informs behavior, while hands-on practice consolidates both knowledge and confidence in executing safe practices.

Finally, Gregorio (2016) highlighted persistent challenges in Philippine vocational schools, including inadequate safety equipment, insufficient teacher training, and inconsistent monitoring systems. These enduring issues underscore the ongoing need for context-sensitive, district-based safety standards that integrate both institutional support and learner-centered practices.

Statement of the problem

This study aimed to assess the level of preparedness and awareness of Industrial Arts students of Technical-Vocational schools in SDO Batangas Province regarding occupational safety standards. The findings served as the basis for proposing enhancement activities to strengthen safety preparedness in Industrial Arts education.

Specifically, it sought to answer the following questions:

1. To what extent of preparedness do Industrial Arts students practice occupational safety in terms of:
   1.1. emergency response;
   1.2. use of safety equipment; and
   1.3. compliance with safety guidelines?
2. What is the level of awareness of Industrial Arts students on occupational safety standards relative to:
   2.1. hazard identification;
   2.2. risk assessment; and
   2.3. safety training and education?
3. Is there significant relationship between the assessments on the extent of preparedness and on the level of awareness on occupational safety standards?
4. What challenges do Industrial Arts students experience in practicing occupational safety standards?
5. Based on the findings, what enhancement activities may be proposed?

METHODS

Research Design

This study employed a descriptive quantitative research design to determine the level of awareness and preparedness of Industrial Arts students regarding occupational safety protocols and procedures. This approach enabled the systematic collection and statistical analysis of numerical data to objectively assess students' knowledge, preparedness, and adherence to safety standards without manipulating variables.

Participants

The subjects of this study were Grade 9 and 10 Industrial Arts students enrolled in the Technology and Livelihood Education program in selected technical-vocational schools in the Division of Batangas Province for the Academic Year 2025–2026, specifically Bauan Technical Integrated High School, Bauan National and Vocational Integrated High School, and Malvar School of Arts and Trade, chosen due to their hands-on, skills-based training that requires strict adherence to occupational safety practices. A stratified random sampling technique with proportionate allocation was employed to ensure representative participation from each school based on population size, followed by random selection of respondents within each stratum to minimize bias and ensure equal opportunity for inclusion.

Instruments

The primary data-gathering instrument of this study was a validated researcher-made survey questionnaire designed to assess the preparedness, awareness, and challenges of Junior High School Industrial Arts students in the Division of Batangas Province regarding occupational safety standards. It consisted of three parts: students' preparedness in occupational safety practices (emergency response, use of safety equipment, and compliance with safety guidelines), their awareness of safety standards (hazard identification, risk assessment, and safety training and education), and the challenges encountered in practicing safety (such as limited resources, insufficient training, inadequate supervision, and institutional constraints).

Procedure

The researcher secured approval from the Schools Division Superintendent of Batangas Province and coordinated with school principals before data collection. Informed consent from parents/guardians and assent from students were obtained, ensuring voluntary participation, confidentiality, and the right to withdraw at any time. The validated questionnaire was administered via Google Forms with assistance from TLE teachers, while printed copies were provided for students without internet access. All responses were collected, encoded, and verified for completeness, then consolidated into a secure database. Data were coded and prepared for analysis, with strict confidentiality maintained through password-protected files and secure storage of physical documents accessible only to the researcher.

Data Analysis

After data collection, the researcher tallied, tabulated, analyzed, and interpreted the responses using appropriate statistical tools. Frequency and percentage were used to describe the distribution and proportion of responses, while ranking identified the relative importance of indicators. The composite or weighted mean determined the overall levels of students' awareness and preparedness in occupational safety standards. Finally, the Pearson Product-Moment Correlation Coefficient (r) was used to test the significant relationship between students' awareness and preparedness regarding occupational safety.

RESULTS AND DISCUSSION

This section presents, analyzes, and interprets the data on Industrial Arts students' preparedness and awareness in Occupational Safety Standards, examines their relationship, and identifies challenges to inform enhancement activities for improving safety practices and learning outcomes.

1. Extent of Preparedness on Occupational Safety Standards

In this study, Occupational Safety Preparedness focuses on how Industrial Arts students demonstrate readiness in identifying hazards, responding to emergencies, using safety equipment, and following safety guidelines. Understanding and developing this preparedness is important because it protects students, reduces the risk of accidents, and fosters responsible safety practices for both school and future work environments.

1.1. *Emergency Response*

Emergency response refers to the knowledge and actions required to react quickly and effectively during accidents or hazardous situations in the workshop. For Industrial Arts students, this includes knowing how to respond to fires, electrical incidents, injuries, or other emergencies to minimize harm. Understanding emergency responses is essential to protect oneself and others and to ensure safety is maintained in critical situations.

Table 1 presents the extent of preparedness of Industrial Arts students on occupational safety standards in terms of emergency response.

Table 1. *Preparedness on Occupational Safety Standards in terms of Emergency Response*

During emergency response, I can / am / know…	Weighted Mean	Verbal Interpretation	Rank
quickly identify emergency exits and evacuation routes in the workshop or classroom.	3.44	Moderately Prepared	2.5
follow the correct procedures during fire, earthquake, or chemical spill emergencies.	3.46	Moderately Prepared	1
properly use first-aid supplies for minor injuries sustained in the workshop.	3.38	Moderately Prepared	8
remain calm and follow safety instructions during emergencies.	3.36	Moderately Prepared	10
recognize and respond appropriately to alarm signals or emergency sounds in the school.	3.43	Moderately Prepared	4
report accidents or injuries to the teacher following proper safety procedures.	3.39	Moderately Prepared	7
assist classmates who may panic or get injured during emergency situations.	3.37	Moderately Prepared	9
safely shut off electrical tools, machines, or equipment during emergencies.	3.42	Moderately Prepared	5.5
actively participate in school safety drills, simulations, and emergency exercises.	3.42	Moderately Prepared	5.5
confidently respond to emergency situations in the workshop, following established safety protocols.	3.44	Moderately Prepared	2.5
Composite Mean	**3.41**	**Moderately Prepared**	

As shown in the table, Industrial Arts students were moderately prepared in occupational safety standards in terms of emergency response, with a composite mean of 3.41. This indicates a functional but still developing level of preparedness, suggesting that while basic emergency competencies are present, full mastery and confidence in application have not yet been achieved.

The highest-rated indicator was the ability to follow correct procedures during fire, earthquake, or chemical spill emergencies (3.46). This suggests that students are most prepared in executing structured and standardized protocols. This result may be attributed to the regular conduct of safety orientations and drills, where step-by-step procedures are consistently reinforced, making them easier to recall during emergency situations. Supporting literature affirms that structured emergency instruction enhances procedural recall, particularly when reinforced through repeated practice (Ali & Kumar, 2023), highlighting the value of routine exposure to standardized safety procedures.

Closely rated indicators include identifying emergency exits and evacuation routes (3.44), recognizing alarm signals (3.43), and confidently responding to emergency situations (3.44). These results reflect adequate situational awareness and familiarity with safety environments. However, the slightly lower confidence in actual response compared to recognition suggests a gap between cognitive awareness and applied execution under pressure. Nguyen et al. (2021) emphasized that spatial familiarity with evacuation routes improves response efficiency in technical education settings, reinforcing the importance of environmental awareness in emergency preparedness.

At the mid-level, students showed moderate preparedness in safely shutting off electrical tools and machines (3.42) and participating in emergency drills (3.42). These findings indicate awareness of basic workshop safety practices, particularly in routine procedures that are regularly demonstrated in class. However, the moderate ratings suggest that execution may still depend on supervision and guided practice. Martin and Slade (2022) stressed that hands-on rehearsal and scenario-based training are essential in developing automatic response behaviors, especially in environments involving machinery and electrical hazards.

The lowest means were recorded in reporting accidents or injuries (3.39), using first aid supplies (3.38), assisting classmates during emergencies (3.37), and remaining calm while following instructions (3.36). These findings point to the weakest areas of preparedness, particularly in skills requiring immediate judgment, emotional regulation, and hands-on intervention. These competencies appear less developed because they are not routinely practiced and involve higher cognitive and emotional demands beyond procedural recall. Research shows that emotional regulation, peer assistance, and first aid competence are critical components of comprehensive emergency preparedness, as panic and uncertainty can significantly reduce response effectiveness (Rodriguez & Lee, 2022; Chen et al., 2021).

Overall, the findings reveal a consistent pattern: students demonstrate stronger preparedness in recognizing and following structured procedures but weaker performance in applied, interpersonal, and emotionally demanding aspects of emergency response. This suggests that current instruction is more effective in developing procedural knowledge than in building practical decision-making and crisis response skills. Therefore, strengthening Industrial Arts safety training through hands-on first aid activities, scenario-based simulations, peer-assisted drills, and stress-management strategies is essential to enhance overall emergency preparedness.

1.2. *Use of Safety Equipment*

The use of safety equipment involves knowing how to properly operate and maintain personal protective equipment (PPE) and other safety devices in the workshop. Competence in using safety equipment is crucial for preventing injuries and promoting a safe hands-on learning environment.

Table 2 presents the extent of preparedness of Industrial Arts students in occupational safety standards in terms of the use of safety equipment.

Table 2. *Preparedness on Occupational Safety Standards in terms of Use of Safety Equipment*

In using safety equipment, I / I can …	Weighted Mean	Verbal Interpretation	Rank
correctly wear and adjust personal protective equipment (PPE) such as gloves, goggles, and aprons.	3.44	Moderately Prepared	6
always check tools and machines before use to ensure they are safe and functional.	3.46	Moderately Prepared	5
properly use fire extinguishers and other emergency equipment when needed.	3.30	Moderately Prepared	10
store tools and equipment in their designated areas after use.	3.49	Moderately Prepared	1.5
differentiate between safety devices and regular tools in the workshop.	3.39	Moderately Prepared	8
ensure that safety guards or shields on equipment are in place before operating them.	3.32	Moderately Prepared	9
report any damaged or malfunctioning equipment to the teacher immediately.	3.40	Moderately Prepared	7
use proper lifting and carrying techniques when handling heavy or sharp objects.	3.48	Moderately Prepared	3
maintain my PPE regularly to ensure cleanliness and usability.	3.47	Moderately Prepared	4
use workshop tools and machines independently while observing safety procedures.	3.49	Moderately Prepared	1.5
Composite Mean	**3.42**	**Moderately Prepared**	

The results indicate a moderate level of preparedness, with a composite mean of 3.42, suggesting that students possess functional knowledge and basic skills in handling safety equipment but still lack consistency and confidence in more critical and applied safety behaviors. Overall, the pattern shows stronger performance in routine practices and weaker competence in judgment-based and emergency-related tasks.

The highest mean scores were observed in storing tools and equipment in designated areas after use (3.49) and using workshop tools and machines independently while observing safety procedures (3.49), followed closely by applying proper lifting and carrying techniques (3.48). These findings reflect stronger preparedness in routine, repetitive tasks that are consistently reinforced during workshop activities. Such practices are embedded in daily laboratory routines, where tool organization, machine use under supervision, and material handling are regularly demonstrated and corrected. This consistency in exposure likely explains the high ratings, as repeated practice strengthens both skill retention and safety awareness in technical education settings (Chen et al., 2021; Ali & Kumar, 2023). Thus, the results suggest that habitual, structured activities effectively develop foundational safety behaviors among students.

Moderate preparedness was noted in maintaining personal protective equipment (3.47), checking tools and machines before use (3.46), and correctly wearing PPE (3.44). These results indicate awareness of safety requirements but inconsistent application in practice. These tasks are often perceived as secondary steps in workshop routines, leading to occasional neglect or improper execution, especially under time constraints or familiarity with tasks. While students understand the importance of PPE and equipment checks, compliance tends to decrease when supervision is minimal or when no immediate consequence is observed. Martin and Slade (2022) emphasize that sustained supervision and repeated practice are essential in reinforcing proper PPE use and equipment inspection, which are critical in minimizing workshop-related risks. The moderate ratings therefore reflect a gap between knowledge and consistent behavioral application.

The lowest mean scores were recorded in reporting damaged or malfunctioning equipment (3.40), differentiating safety devices from regular tools (3.39), ensuring safety guards are in place (3.32), and properly using fire extinguishers or emergency equipment (3.30). These results indicate weaknesses in higher-order safety competencies that require judgment, responsibility, and emergency readiness. These tasks are less frequently practiced in actual workshop routines, which may explain the lower levels of preparedness. Reporting damaged equipment may be underperformed due to hesitation or uncertainty about responsibility, while distinguishing safety devices from regular tools requires conceptual clarity that may not be sufficiently emphasized in instruction. Similarly, ensuring safety guards are in place may be overlooked in favor of task efficiency, and limited hands-on exposure to fire extinguishers reduces students' confidence in emergency use. Prior research emphasizes that without scenario-based and simulation-driven training, learners are less likely to effectively apply safety protocols in real situations (Rodriguez & Lee, 2022; Nguyen et al., 2021). These findings highlight a critical gap in emergency and preventive safety competencies.

Overall, the results demonstrate a clear progression from strong performance in routine procedural tasks to weaker performance in judgment-based and emergency-oriented safety behaviors. While students show competence in habitual workshop practices, their preparedness declines when tasks require critical thinking, responsibility, or crisis response. This suggests that safety instruction in Industrial Arts is currently more effective in developing procedural compliance than in building situational judgment and emergency readiness. To address this gap, it is necessary to strengthen instructional strategies through simulation-based training, hands-on emergency equipment practice, structured hazard reporting exercises, and regular safety monitoring activities. Enhancing these components will help improve students' overall safety competence and foster a more proactive and safety-conscious workshop environment.

1.3. *Compliance with Safety Guidelines*

Compliance with safety guidelines refers to the consistent practice of following established rules, policies, and procedures designed to maintain a safe workshop environment. For students, this includes adhering to operational protocols, reporting unsafe conditions, and observing instructions from teachers and safety manuals. Compliance is important because it fosters a culture of safety, reduces risks, and reinforces responsible behavior in both learning and future workplace settings.

Table 3 presents the extent of preparedness of Industrial Arts students on occupational safety standards in terms of compliance with safety guidelines.

Table 3. *Preparedness on Occupational Safety Standards in terms of Compliance with Safety Guidelines*

Relative to compliance with safety guidelines, I /can/am..	**Weighted Mean**	**Verbal Interpretation**	**Rank**
quickly identify emergency exits and evacuation routes inside the workshop or classroom.	3.46	Moderately Prepared	2
know what to do during fire, earthquake, or chemical spill emergencies.	3.39	Moderately Prepared	7
properly use first-aid supplies in case of minor injuries.	3.39	Moderately Prepared	7
stay calm and follow safety instructions during emergencies.	3.49	Moderately Prepared	1
familiar with the alarm signals or emergency sounds used in our school.	3.37	Moderately Prepared	10
know the proper procedure for reporting accidents or injuries to my teacher.	3.44	Moderately Prepared	3
assist classmates who may panic or get injured during emergencies.	3.42	Moderately Prepared	4.5

know how to safely shut off electrical tools or equipment during emergencies.	3.38	Moderately Prepared	9
actively participate in school safety drills and simulations.	3.42	Moderately Prepared	4.5
confident that I can respond correctly to emergency situations in the workshop.	3.39	Moderately Prepared	7
Composite Mean	**3.41**	**Moderately Prepared**	

As shown in the table, Industrial Arts students were moderately prepared in occupational safety standards in terms of compliance with safety guidelines, as indicated by a composite mean of 3.41. This suggests that students generally understand safety rules and are able to follow them under structured conditions; however, consistent application, particularly in practical and emergency situations, remains developing. Overall, the results reflect a foundational level of compliance that requires further reinforcement through applied learning experiences.

The highest mean scores were observed in staying calm and following safety instructions during emergencies (3.49), identifying emergency exits and evacuation routes (3.46), and knowing proper procedures for reporting accidents or injuries (3.44). These findings indicate that students are strongest in procedural awareness and rule-based compliance. These competencies are largely reinforced through routine drills, posted safety signage, and formal orientation activities, which promote recognition and recall of standard procedures. Supporting literature emphasizes that familiarity with emergency protocols enhances compliance and reduces response errors in technical education environments (Nguyen et al., 2021; Ali & Kumar, 2023), suggesting that structured instruction effectively supports rule-based safety behavior.

Moderate preparedness was also evident in assisting classmates during emergencies (3.42), participating in drills and simulations (3.42), and knowing what to do during specific emergencies such as fire, earthquake, or chemical spill (3.39). These results indicate partial development of applied compliance skills that require coordination, judgment, and contextual decision-making. The moderate ratings suggest that while students are aware of expected actions, execution in peer-assisted and multi-scenario situations remains inconsistent. This aligns with findings that scenario-based and collaborative safety training improves decision-making and strengthens compliance behavior under pressure (Rodriguez & Lee, 2022).

The lowest mean scores were recorded in confidence in responding to emergencies (3.39), proper use of first aid supplies (3.39), safely shutting off electrical equipment (3.38), and familiarity with alarm signals (3.37). These results point to gaps in applied safety competence, particularly in tasks requiring hands-on skill, technical familiarity, and psychological readiness. These indicators are likely weak because such activities are rarely practiced in realistic settings, limiting both procedural fluency and confidence. Research confirms that effective compliance during emergencies requires not only knowledge but also repeated simulation, hands-on practice, and stress exposure to develop automatic and accurate responses (Chen et al., 2021; Martin & Slade, 2022).

Overall, the findings show a clear pattern: students demonstrate stronger compliance in rule recognition and routine safety behaviors, but weaker performance in applied, emergency-driven, and interactive safety tasks. This indicates that compliance is largely knowledge-based rather than action-based. Strengthening Industrial Arts safety education therefore requires greater emphasis on simulation-based training, hands-on emergency procedures, repeated drill variation, and peer-assisted response activities. These strategies would improve not only compliance accuracy but also confidence and responsiveness in real-life workshop emergencies.

2. Level of Awareness on Occupational Safety Standards

In Industrial Arts education, occupational safety awareness is crucial because students handle tools, machinery, and materials that pose physical, chemical, ergonomic, and environmental risks, making informed and responsible behavior essential. In this study, it focuses on students' awareness in hazard identification, risk assessment, and safety training and education, which helps determine their preparedness and areas for enhancement in workshop safety.

2.1. *Hazard Identification*

In Industrial Arts workshops, hazard identification involves being aware of physical, chemical, biological, ergonomic, and environmental risks associated with tools, equipment, materials, and practices. Understanding hazard identification is essential for preventing accidents and promoting a safe and productive learning environment.

Table 4 presents the level of awareness of Industrial Arts students on occupational safety standards in terms of hazard identification.

Table 4. *Awareness on Occupational Safety Standards in terms of Hazard Identification*

As an Industrial Arts student, I am aware of the hazards…	Weighted Mean	Verbal Interpretation	Rank
associated with tools and equipment used in the workshop.	3.36	Moderately Aware	1
related to electrical systems and wiring.	3.33	Moderately Aware	2.5
such as wet floors, cluttered workspaces, or obstructed pathways which are classified as physical hazards.	3.28	Moderately Aware	6
including solvents, paints, adhesives, and other chemical hazards and their potential effects.	3.21	Moderately Aware	9
such as molds, bacteria, or other contaminants in the workshop that are categorized as biological hazards.	3.13	Moderately Aware	10
including improper posture, repetitive movements, or unsafe lifting practices which are examples of ergonomic hazards.	3.31	Moderately Aware	4
such as poor ventilation, excessive noise, or inadequate lighting that are some of the common environmental hazards.	3.30	Moderately Aware	5
that may occur during routine workshop activities.	3.33	Moderately Aware	2.5
that may arise from classmates' unsafe behaviors or improper handling of equipment.	3.22	Moderately Aware	8
related to tools, materials, or equipment that are unfamiliar or newly introduced.	3.24	Moderately Aware	7
Composite Mean	**3.27**	**Moderately Aware**	

As reflected in the table, Industrial Arts students were moderately aware of occupational safety standards in terms of hazard identification, with a composite mean of 3.27. This indicates that students possess basic knowledge of workshop hazards; however, their awareness remains limited in scope and has not yet developed into a comprehensive understanding of both visible and latent risks. Overall, the results suggest a developing level of hazard perception that requires further strengthening through structured and varied exposure.

The highest mean scores were observed in awareness of hazards associated with tools and equipment used in the workshop (3.36), followed by hazards related to electrical systems and routine workshop activities (3.33). These findings indicate that students are most aware of hazards that are concrete, visible, and frequently encountered in daily hands-on activities. This pattern can be attributed to continuous exposure to machinery, tools, and electrical components during workshop sessions, where risks such as cuts, shocks, and mechanical injuries are regularly emphasized. Supporting literature affirms that repeated hands-on exposure enhances hazard recognition, particularly for tangible and immediate risks in technical

education settings (Chen et al., 2021; Martin & Slade, 2022). Thus, the higher ratings reflect effective experiential learning in developing awareness of acute physical hazards.

Moderate awareness was also observed in ergonomic hazards (3.31) and environmental hazards (3.30), such as improper posture, noise exposure, poor ventilation, and repetitive motion. These slightly lower scores suggest reduced sensitivity to risks that are gradual and less immediately observable. Unlike tool-related hazards, ergonomic and environmental risks often manifest over time, making them less likely to be recognized as urgent concerns. Students tend to prioritize immediate and visible dangers over long-term health effects, which reduces perceived importance and consistent precautionary behavior. Studies indicate that learners often underestimate cumulative hazards unless these are explicitly emphasized and reinforced in instruction (Ali & Kumar, 2023), highlighting the need for stronger integration of long-term safety awareness in technical education.

The lowest mean scores were recorded in awareness of biological hazards (3.13), chemical hazards (3.21), and hazards arising from classmates' unsafe behaviors (3.22). These results indicate significant gaps in recognizing indirect, latent, and socially influenced risks. Biological hazards are rarely emphasized in workshop settings, leading to limited awareness of risks such as contamination from shared tools or materials. Chemical hazards are also underrecognized, particularly when warning signs are not visually obvious or when students do not engage with safety documentation such as labels or safety data sheets. Most notably, hazards arising from peers' unsafe behaviors reflect weak recognition of behavioral risk, where students may overlook unsafe actions due to familiarity, trust, or normalization within peer groups. Research highlights that non-visible hazards and peer-influenced risks are commonly under-identified among technical learners due to their indirect and non-immediate effects (Rodriguez & Lee, 2022), while peer dynamics significantly shape safety perception and vigilance levels (Nguyen et al., 2021).

Overall, the findings reveal a clear imbalance in hazard identification, where students demonstrate stronger awareness of visible, task-related hazards but weaker recognition of latent, environmental, chemical, biological, and behavioral risks. While the moderate overall level of awareness is a positive indication, it remains insufficient for comprehensive hazard anticipation and proactive safety behavior. These results imply the need to strengthen hazard education through explicit instruction on non-visible risks, hazard mapping activities, and scenario-based simulations that integrate both environmental and behavioral safety dimensions. Enhancing safety culture within workshops is also essential to promote shared responsibility and improve collective hazard awareness among students.

2.2. *Risk Assessment*

Risk assessment refers to evaluating the likelihood and potential consequences of identified hazards to determine their level of danger. For Industrial Arts students, this involves analyzing which workshop activities carry higher risks and prioritizing preventive measures to minimize injuries. Developing strong risk assessment skills ensures that students can make informed decisions and practice proactive safety measures during practical tasks.

Table 5 shows the level of awareness of Industrial Arts students on occupational safety standards in terms of risk assessment.

Table 5. *Awareness on Occupational Safety Standards in terms of Risk Assessment*

As an Industrial Arts student, I am aware on …	Weighted Mean	Verbal Interpretation	Rank

the potential severity of injuries or harm associated with workshop hazards.	3.36	Moderately Aware	4.5
how likely a hazard is to occur during workshop activities.	3.36	Moderately Aware	4.5
how to prioritize hazards based on their severity and likelihood.	3.28	Moderately Aware	10
the need to apply extra caution when handling high-risk tools or equipment.	3.33	Moderately Aware	7.5
identifying situations where multiple hazards may occur simultaneously.	3.30	Moderately Aware	9
recognizing which hazards require immediate attention to prevent accidents.	3.38	Moderately Aware	2.5
assessing the potential consequences of unsafe practices before starting a task.	3.35	Moderately Aware	6
determining which workshop activities carry higher risks for injury.	3.38	Moderately Aware	2.5
understanding the importance of evaluating hazards even during routine tasks.	3.45	Moderately Aware	1
using available information, such as warning labels or instructions, to anticipate potential risks.	3.33	Moderately Aware	7.5
Composite Mean	**3.35**	**Moderately Aware**	

As evidenced by the composite mean of 3.35, Industrial Arts students were moderately aware of occupational safety standards in terms of risk assessment. This indicates that students have a basic understanding of identifying and evaluating risks in workshop settings; however, their ability to systematically analyze, prioritize, and manage hazards remains at a developing level rather than a fully operational competency.

The highest mean score was observed in awareness of the importance of evaluating hazards even during routine tasks (3.45). This suggests that risk assessment is already understood as a continuous responsibility rather than being limited to high-risk activities.

Routine workshop tasks such as sawing, sanding, and assembling appear to have reinforced the idea that hazards can exist even in familiar activities. This reflects an internalized safety mindset shaped by repeated reminders and supervised practice. Literature supports this finding, emphasizing that integrating risk assessment into daily tasks strengthens preventive behavior and safety habits in technical education settings (Chen et al., 2021).

The next highest mean was recorded in recognizing which activities carry higher risks and identifying hazards that require immediate attention (3.38). This indicates that students are able to make basic distinctions between low-risk and high-risk activities. This awareness is likely influenced by teacher demonstrations and explicit labeling of hazardous tasks during workshop sessions. Ali and Kumar (2023) noted that the ability to distinguish high-risk tasks is essential in guiding safe decision-making and prioritizing preventive actions. However, the results also suggest that this understanding remains limited to obvious or explicitly emphasized hazards.

Moderate awareness was also observed in evaluating the severity and likelihood of hazards (3.36) and assessing potential consequences before starting a task (3.35). These findings suggest partial development of analytical risk assessment skills but limited consistency in applying structured evaluation. Rather than using systematic approaches, students appear to rely more on intuition when judging risk levels. Nguyen et al. (2021) emphasized that structured training and guided exercises are necessary to strengthen learners' ability to assess probability and impact more accurately. This indicates a need to further develop students' analytical decision-making in risk evaluation.

The lowest mean scores were obtained in prioritizing hazards based on severity and likelihood (3.28), identifying multiple simultaneous hazards (3.30), and applying caution when using warning labels or high-risk tools (ranging from 3.28 to 3.33). These results reveal the weakest aspect of risk assessment awareness, particularly in handling complex and layered safety situations. In actual workshop environments, multiple hazards often occur simultaneously, requiring prioritization and situational judgment—skills that appear underdeveloped among students. Similarly, exposure to warning labels without contextual application may lead to desensitization or limited understanding of their practical meaning. Rodriguez and Lee (2022) emphasized that advanced risk assessment skills, particularly hazard prioritization and multi-hazard recognition, are best developed through simulation-based and experiential learning approaches.

Overall, the findings show that students are stronger in recognizing the importance of risk assessment and identifying obvious high-risk activities, but weaker in applying systematic and analytical approaches to complex hazard situations. This suggests that their awareness is largely conceptual rather than procedural or analytical in nature. To address this gap, Industrial Arts instruction should incorporate structured risk assessment tools such as hazard ranking systems, scenario-based simulations, and guided case analyses of real workshop conditions. Strengthening these competencies will enhance students' ability to make informed safety decisions and improve overall occupational safety preparedness in technical-vocational settings.

2.3. *Safety Training and Education*

In Industrial Arts education, safety training and education includes awareness of school safety policies, participation in drills, proper handling of equipment, and adherence to safety procedures. Effective safety training fosters a culture of responsibility and preparedness, reducing the likelihood of accidents and reinforcing positive safety behavior.

Table 6 presents the level of awareness of Industrial Arts students on occupational safety standards in terms of safety training and education.

Table 6. *Awareness on Occupational Safety Standards in terms of Safety Training and Education*

As an Industrial Arts student, I am aware of the / that…	Weighted Mean	Verbal Interpretation	Rank
occupational safety rules and policies implemented in our school.	3.55	Highly Aware	1
I should have attended orientations or safety briefings before performing practical shop activities.	3.45	Moderately Aware	9.5
safety drills (e.g., fire or earthquake drills) are part of school preparedness programs.	3.51	Highly Aware	3
responsibility to follow workshop safety rules and report unsafe acts.	3.46	Moderately Aware	8
teachers must demonstrate safety procedures before starting practical lessons.	3.47	Moderately Aware	7
available safety manuals or posters are displayed in our Industrial Arts room.	3.49	Moderately Aware	5
continuous training and awareness programs improve accident prevention.	3.48	Moderately Aware	6
importance of developing a positive safety attitude during school activities.	3.53	Highly Aware	2
procedures for reporting injuries or unsafe conditions to proper authorities.	3.45	Moderately Aware	9.5

students must actively participate in maintaining safety culture in the school environment.	3.50	Moderately Aware	4
Composite Mean	**3.49**	**Moderately Aware**	

As reflected in the table, Industrial Arts students were moderately aware of occupational safety standards in terms of safety training and education, as indicated by a composite mean of 3.49. This suggests that students generally recognize the importance of structured safety programs; however, their active engagement and consistent application of safety knowledge in workshop settings remain at a developing level.

The highest mean scores were observed in awareness of occupational safety rules and policies implemented in the school (3.55), the importance of developing a positive safety attitude (3.53), and awareness that safety drills are part of school preparedness programs (3.51). These findings indicate strong familiarity with formal safety frameworks and institutional safety expectations. This awareness is reinforced through visible policy reminders such as posted rules, student handbooks, and regular teacher announcements. Students are consistently exposed to basic safety regulations (e.g., wearing protective gear, observing proper workshop behavior) and understand safety as a shared responsibility emphasized during orientations and drills. Supporting literature highlights that a strong safety culture grounded in clear policies and positive attitudes contributes to reduced risk behavior and improved compliance in technical and vocational settings (Ali & Kumar, 2023; Martin & Slade, 2022). Thus, the results suggest that foundational safety messaging has been effectively internalized.

Moderate awareness was also observed in active participation in maintaining safety culture, availability and use of safety manuals or posters, continuous training programs, and teacher demonstrations of safety procedures. These slightly lower ratings suggest that while safety structures are present and recognized, engagement beyond passive awareness remains limited. Active participation in safety culture requires initiative and responsibility, which many students may still be developing. Similarly, safety materials such as manuals and posters may become less impactful if not consistently reinforced through discussion and application. Teacher demonstrations, while useful, may lose effectiveness when repeatedly presented without variation or student interaction. Nguyen et al. (2021) emphasized that sustained exposure combined with participatory and interactive safety training enhances both retention and behavioral compliance, suggesting the need for more experiential approaches to reinforce safety learning.

The lowest mean scores, although still within the moderate range, were recorded in following safety rules and reporting unsafe acts (3.46), attending orientations or safety briefings (3.45), and knowing procedures for reporting injuries or unsafe conditions (3.45). These results indicate a gap between awareness of safety systems and active participation in enforcement and reporting mechanisms. Consistent rule compliance may be affected by perceived inconvenience or peer behavior, while reporting unsafe acts may be hindered by social hesitation or fear of conflict. Attendance in orientations and briefings is largely passive, and procedural knowledge on reporting incidents appears limited due to lack of actual practice and familiarity with institutional processes. Rodriguez and Lee (2022) emphasized that safety training becomes effective only when learners transition from awareness to active participation and accountability, underscoring the importance of experiential reinforcement in safety education.

Overall, the findings show that students are well informed about safety policies and value safety education, but their engagement in active safety practices and reporting systems remains moderate. This suggests that safety learning is still largely knowledge-based rather than action-oriented. To address this gap, Industrial Arts programs should strengthen participatory safety training through interactive orientations, scenario-based simulations, teacher- and student-led demonstrations, and peer accountability systems. Enhancing practical involvement in reporting procedures and safety enforcement will help translate awareness into consistent behavior, thereby fostering a more proactive and sustainable safety culture in workshop environments.

3. Relationship between the Assessments on the Extent of Preparedness and Level of Awareness on Occupational Safety Standards

This examines the relationship between students' level of awareness and their extent of preparedness in Occupational Safety Standards using the Pearson r-test to determine the strength and direction of their association.

Table 7 presents the relationship between students' level of awareness on occupational safety standards in terms of hazard identification and their extent of preparedness across three domains: emergency response, use of safety equipment, and compliance with safety guidelines.

Table 7. *Relationship between the Level of Awareness on Occupational Safety Standards in terms of Hazard Identification and on the Extent of Preparedness*

Variables	p-value	r-value	Decision	Interpretation
Emergency Response	.000	.701	Reject H_o	Significant
Use of Safety Equipment	.000	.767	Reject H_o	Significant
Compliance with Safety Guidelines	.000	.713	Reject H_o	Significant

Legend: significant at $p \leq .05$

The results reveal a consistent pattern of statistically significant relationships across all variables, as indicated by p-values of .000 and corresponding rejection of the null hypothesis. This means that hazard identification is meaningfully associated with all dimensions of occupational safety preparedness among Industrial Arts students.

In terms of emergency response, the relationship yielded a strong positive correlation ($r = .701$, $p = .000$), indicating that as students' awareness of hazards increases, their ability to respond appropriately during emergencies also improves. This suggests that recognizing potential hazards is a critical cognitive foundation for making quick and appropriate decisions during urgent situations. Students who are more aware of risks are more likely to anticipate possible emergency scenarios and respond with greater confidence and procedural accuracy. This finding highlights that hazard identification is not merely a theoretical skill but a practical determinant of emergency readiness in workshop environments.

For the use of safety equipment, the correlation is even stronger ($r = .767$, $p = .000$), indicating a high positive relationship. This implies that students who are more aware of hazards are significantly more likely to demonstrate better preparedness in properly using safety tools and equipment. Hazard awareness appears to directly influence how students handle protective devices, maintain equipment safety protocols, and apply preventive measures during workshop activities. This result suggests that understanding risks enhances not only caution but also correct operational behavior, particularly in environments where proper equipment use is essential to injury prevention.

Similarly, compliance with safety guidelines also shows a strong positive relationship with hazard identification ($r = .713$, $p = .000$). This indicates that students who have higher awareness of hazards are more likely to follow established safety rules and procedures. Hazard recognition strengthens their understanding of why safety protocols exist, making compliance more intentional rather than merely rule-based. This reinforces the idea that awareness fosters internalization of safety standards, which in turn promotes consistent adherence to safety guidelines in practical settings.

Overall, the findings of Table 8 demonstrate that hazard identification is a strong and significant predictor of students' occupational safety preparedness across all measured domains. The consistently high correlation values suggest that improving students' ability to recognize and understand hazards can substantially enhance their emergency response capability, proper use of safety equipment, and compliance with safety rules. This implies that hazard identification should not be treated as an isolated learning outcome but as a foundational competency that supports broader safety preparedness.

The results also highlight an important implication for Industrial Arts instruction: strengthening hazard identification through experiential learning, simulation activities, and real-world workshop scenarios may lead to improved overall safety behavior. By integrating hazard recognition more deeply into daily instruction, students are more likely to develop proactive safety habits, better decision-making skills, and stronger compliance with occupational safety standards, ultimately contributing to a safer and more responsive technical learning environment.

Table 8 presents the relationship between students' level of awareness on occupational safety standards in terms of risk assessment and their extent of preparedness in emergency response, use of safety equipment, and compliance with safety guidelines.

Table 8. *Relationship between the Level of Awareness on Occupational Safety Standards in terms of Risk Assessment and on the Extent of Preparedness*

Variables	p-value	r-value	Decision	Interpretation
Emergency Response	.000	.797	Reject H_o	Significant
Use of Safety Equipment	.000	.831	Reject H_o	Significant
Compliance with Safety Guidelines	.000	.801	Reject H_o	Significant

Legend: significant at $p \leq .05$

The results show that all relationships are statistically significant, as indicated by p-values of .000, leading to the rejection of the null hypothesis across all variables. This implies that risk assessment awareness is strongly associated with all dimensions of occupational safety preparedness among Industrial Arts students.

In terms of emergency response, the relationship yielded a strong positive correlation ($r = .797$, $p = .000$), indicating that higher levels of risk assessment awareness are closely linked with better preparedness in responding to emergencies. This suggests that students who are more capable of evaluating severity, likelihood, and potential consequences of hazards are also more likely to respond appropriately and efficiently during emergency situations. Risk assessment, therefore, functions as a cognitive framework that supports quick judgment and informed action when unexpected incidents occur in the workshop.

For the use of safety equipment, the strongest correlation was observed ($r = .831$, $p = .000$), indicating a very strong positive relationship. This suggests that students who are more skilled in assessing risks are significantly more prepared in properly selecting, using, and applying safety equipment. The ability to evaluate hazards appears to directly influence decisions on what protective measures are needed and when they should be used. This finding implies that risk assessment enhances not only awareness of danger but also the practical application of preventive safety measures, particularly in technical-vocational settings where equipment use is constant.

Similarly, compliance with safety guidelines also showed a very strong positive relationship with risk assessment awareness ($r = .801$, $p = .000$). This indicates that students who are more proficient in evaluating risks are more likely to consistently follow safety rules and procedures. This relationship suggests that compliance is not merely driven by rule memorization but is strengthened by an understanding of potential consequences, allowing students to internalize safety regulations as necessary protective actions rather than external requirements.

Overall, Table 9 demonstrates that risk assessment awareness is a highly influential factor in students' occupational safety preparedness. The consistently strong correlation coefficients across all domains suggest that the ability to analyze hazards, evaluate their severity and likelihood, and anticipate consequences plays a central role in shaping safe behavior in workshop environments. Compared to other safety dimensions, risk assessment shows the strongest relationships with preparedness indicators,

highlighting its critical role as an advanced cognitive skill in occupational safety education.

These findings imply that strengthening risk assessment instruction may yield substantial improvements in overall safety preparedness. Integrating structured risk analysis tools, scenario-based problem solving, and real-life workshop simulations can enhance students' ability to make informed safety decisions. Ultimately, developing strong risk assessment skills supports more effective emergency response, proper use of safety equipment, and consistent compliance with safety guidelines, thereby promoting a higher level of safety competence in Industrial Arts education.

Table 9 presents the relationship between students' level of awareness on occupational safety standards in terms of safety training and education and their extent of preparedness in emergency response, use of safety equipment, and compliance with safety guidelines.

Table 9. *Relationship between the Level of Awareness on Occupational Safety Standards in terms of Safety Training and Education and on the Extent of Preparedness*

Variables	p-value	r-value	Decision	Interpretation
Emergency Response	.000	.818	Reject H_o	Significant
Use of Safety Equipment	.000	.831	Reject H_o	Significant
Compliance with Safety Guidelines	.000	.796	Reject H_o	Significant

Legend: significant at $p \leq .05$

The results show that all relationships are statistically significant, as indicated by p-values of .000, leading to the rejection of the null hypothesis across all variables. This indicates that safety training and education is strongly associated with all dimensions of occupational safety preparedness among Industrial Arts students.

In terms of emergency response, a strong positive correlation was observed ($r = .818$, $p = .000$), indicating that higher awareness of safety training and education is closely linked with better preparedness in responding to emergency situations. This suggests that structured safety instruction, drills, and orientation activities play a crucial role in developing students' ability to respond appropriately under pressure. When students are consistently exposed to safety training, they are more likely to internalize correct procedures and apply them effectively during emergency situations.

For the use of safety equipment, the relationship also yielded a strong positive correlation ($r = .831$, $p = .000$), which represents the highest value among the three domains. This indicates that safety training and education has a very strong influence on students' preparedness in properly using safety tools and equipment. This suggests that instructional demonstrations, guided practice, and repeated exposure to proper equipment handling significantly enhance students' competence and confidence in applying safety measures during workshop activities.

Similarly, compliance with safety guidelines showed a strong positive correlation ($r = .796$, $p = .000$), indicating that students with higher awareness of safety training and education are more likely to consistently follow established safety rules and procedures. This suggests that structured safety education not only provides knowledge of rules but also reinforces their importance, leading to better adherence in actual workshop practice. Compliance appears to be strengthened when students understand the rationale behind safety protocols, as emphasized during training sessions and orientations.

Overall, Table 9 demonstrates that safety training and education is a key determinant of students' occupational safety preparedness. The consistently strong correlation values across all domains indicate that formal instruction, drills, and safety-related learning experiences significantly contribute to improving emergency response, proper use of safety equipment, and compliance with safety guidelines. This highlights the essential role of structured safety education in translating awareness into actual safety behavior.

These findings imply that strengthening safety training programs through regular drills, interactive demonstrations, and sustained reinforcement strategies can further enhance students' preparedness. By ensuring that safety education is continuous, practical, and experience-based, Industrial Arts programs can effectively develop students' competence, confidence, and consistency in applying occupational safety standards in real workshop environments.

4. Challenges Experienced in Practicing Occupational Safety Standards

This presents and discusses the challenges experienced by Industrial Arts students in practicing occupational safety standards, highlighting the factors that hinder consistent adherence to safety protocols and affect overall preparedness in the workshop.

Table 10 presents the challenges experienced by Industrial Arts students in practicing occupational safety standards.

Table 10. *Challenges Experienced in Practicing Occupational Safety Standards*

Challenges	Weighted Mean	Verbal Interpretation	Rank
Lack of complete personal protective equipment (PPE) such as gloves, goggles, or aprons limits my ability to work safely.	1.99	Slightly Experienced	7
Some tools, machines, or equipment are defective or outdated, increasing the risk of accidents.	1.98	Slightly Experienced	8
The workshop is often overcrowded, making it difficult to maintain safe distances.	2.03	Slightly Experienced	5
Poor lighting, ventilation, or workspace arrangement affects my ability to perform tasks safely.	2.07	Slightly Experienced	3
Limited availability of first-aid kits, fire extinguishers, or clear reporting systems makes emergency response difficult.	2.14	Slightly Experienced	1
I find it hard to consistently follow safety rules due to time pressure, heavy workloads, or distractions from classmates.	2.03	Slightly Experienced	5
Safety reminders, posters, or warning signs are unclear, insufficient, or not visible.	2.11	Slightly Experienced	2
Teachers or supervisors are not always present to monitor safety compliance or conduct regular training.	1.96	Slightly Experienced	10
Discomfort, fatigue, or poor ergonomics in the workshop affects safe practice.	2.03	Slightly Experienced	5
Limited school resources or budget hinder the maintenance of a safe and hazard-free learning environment.	1.97	Slightly Experienced	9
Composite Mean	**2.03**	**Slightly Experienced**	

As reflected in the table, the respondents experienced slight challenges in practicing occupational safety standards, as indicated by weighted means ranging from 1.96 to 2.14 and a composite mean of 2.03. This suggests that, overall, safety implementation in workshop settings is generally manageable, but still affected by subtle yet meaningful barriers that influence consistency in practice. Complementing these findings, interview responses similarly pointed to occasional limitations in resources and environmental conditions, but these were not described as frequent or severe concerns, reinforcing the quantitative result of only minor

challenges. Overall, the data suggest that challenges exist, but they are not dominant factors in students' day-to-day safety experiences.

The most notable challenge was the limited availability of first-aid kits, fire extinguishers, or clear reporting systems (2.14). This indicates a perceived gap in emergency preparedness infrastructure, which can affect timely response during accidents. In the interviews, students also mentioned that emergency tools are "sometimes present but not always visible or quickly accessible," which aligns with the survey finding of only slight but notable concern. From a systems perspective, even minimal gaps in emergency readiness can weaken confidence in responding to incidents. Supporting literature emphasizes that accessible emergency equipment and clear reporting mechanisms are essential in ensuring rapid response and strengthening institutional safety responsiveness (Nguyen et al., 2021; Rodriguez & Lee, 2022).

Slight challenges were also observed in unclear or insufficient safety reminders, posters, or warning signs (2.11) and poor lighting, ventilation, or workspace arrangement (2.07). These environmental conditions, while not severe, may subtly affect hazard recognition and task performance. Interview responses further revealed that some students "notice posters but do not always read them regularly," suggesting that safety reminders are present but not consistently reinforced or engaged with. Similarly, concerns about ventilation and lighting were described as occasional rather than persistent, particularly during longer workshop activities. Research in technical-vocational education highlights that clear visual cues and well-designed workspaces improve attention, reduce errors, and strengthen safety compliance (Chen et al., 2021; Martin & Slade, 2022), underscoring the importance of maintaining conducive learning environments.

Moderate concerns were also identified in time pressure, workload demands, and peer distractions (2.03), fatigue and poor ergonomics (2.03), and overcrowded workshops (2.03). These situational factors suggest that contextual pressures can occasionally interfere with safe practice. In interviews, students noted that "group work and machine use sometimes become crowded" and that they may feel "rushed during activities," which supports the quantitative results. These conditions may reduce attentiveness and increase the likelihood of minor safety lapses. Literature affirms that cognitive load, fatigue, and environmental stressors can negatively influence safety compliance and decision-making in hands-on learning environments (Ali & Kumar, 2023; Chen et al., 2021).

The lowest mean scores were observed in lack of complete personal protective equipment (1.99), defective or outdated tools and machines (1.98), limited school resources or budget for safety maintenance (1.97), and inconsistent teacher supervision or monitoring (1.96). Although these were the least experienced challenges, they remain important from a safety systems perspective. Interview responses generally indicated that students "usually have PPE and teachers are present most of the time," which aligns with the low ratings and suggests that institutional support is largely adequate. However, occasional concerns about equipment condition and supervision were still mentioned, highlighting areas for continuous improvement. Studies emphasize that even when student awareness is sufficient, institutional resources, supervision, and equipment quality remain critical in sustaining effective safety systems (Rodriguez & Lee, 2022; Ali & Kumar, 2023).

Overall, the findings reveal that challenges in occupational safety practices are generally minor and situational, with environmental and resource-related issues slightly more evident than behavioral or supervisory factors. The interview data complement this by showing that students experience these challenges intermittently rather than consistently, reinforcing the interpretation of a generally supportive but improvable safety environment. This alignment between quantitative and qualitative findings strengthens the conclusion that safety systems are functional but not yet fully optimized.

Addressing these minor but meaningful gaps requires sustained attention to both physical infrastructure and safety reinforcement strategies. Improving emergency equipment visibility, enhancing environmental conditions, strengthening engagement with safety reminders, and maintaining consistent supervision will

further reinforce safe practices. Ultimately, integrating these improvements will help ensure that existing safety awareness and preparedness are consistently translated into reliable, proactive safety behavior in Industrial Arts workshop settings.

5. Proposed Enhancement Activities

The findings revealed that students are moderately aware and moderately prepared, with a strong positive relationship between awareness and preparedness. This means that strengthening applied, experiential, and scenario-based safety education will likely elevate students to a higher level of preparedness. Although challenges were only slightly experienced, proactive intervention is necessary to prevent future safety risks and to institutionalize a strong safety culture in the Industrial Arts workshop.

1. "Code Red, Stay Ahead" – *Emergency Simulation Drills*



This activity addresses the identified gap in students' emergency preparedness within the Industrial Arts workshop, particularly their low competence in reporting accidents or injuries, assisting peers during emergencies, properly utilizing first-aid supplies, and maintaining composure under pressure. It also highlights a weak familiarity with structured emergency reporting systems and coordinated response procedures, which may compromise safety during real-life incidents.

To address this, the "Code Red, Stay Ahead" activity is implemented as a series of unannounced, scenario-based emergency drills conducted within the workshop environment. During these drills, students are assigned rotating roles such as First-Aider, Reporter, Evacuation Guide, and Calm Monitor to simulate real-world emergency response systems. Each simulation requires students to apply appropriate safety protocols while responding to unexpected scenarios such as injuries, accidents, or emergency alerts, followed by a structured debriefing session that allows reflection on performance, decision-making, and areas for improvement.

The implementation of this activity is scheduled on a monthly basis, with a total of four drills conducted per semester. Each drill lasts approximately 15 to 20 minutes for simulation followed by a 10-minute guided debriefing facilitated by the teacher. A comprehensive orientation session is conducted at the beginning of the semester to ensure that students understand emergency roles, procedures, and expectations. The materials and resources required include first-aid kits and basic medical supplies, simulated injury materials or mannequins (or volunteer student actors), accident reporting forms, an alarm system such as a whistle or bell for drill initiation, a stopwatch or timer for monitoring response time, and laminated role cards outlining assigned responsibilities.

The primary implementers include the Industrial Arts teacher as the lead facilitator, the school nurse or first-aid trainer for technical guidance, the DRRM coordinator for protocol supervision, and all students as active participants. Funding requirements are sourced primarily from the school's Maintenance and Other Operating Expenses (MOOE), with optional support from student organization funds for minor supplies or enhancement materials.

2. "Tool or Threat?" – ***Safety Equipment Identification & Maintenance Logs***



This activity addresses students' difficulty in identifying unsafe tools and equipment, reporting defective or malfunctioning items, and ensuring proper use of safety devices such as machine guards and fire extinguishers. It also responds to gaps in students' awareness of preventive maintenance practices and systematic reporting of workshop hazards.

The "Tool or Threat?" activity establishes a daily safety inspection routine wherein students assess tools and equipment before each workshop session. They classify items as safe, defective, or unsafe based on inspection criteria and record their findings in a maintenance logbook or digital tracking sheet. Additionally, selected students serve as rotating "Shop Safety Officers" responsible for monitoring compliance, tagging unsafe equipment using red warning labels, and coordinating with custodial personnel regarding repair or replacement needs.

This activity is implemented daily, requiring approximately five minutes before each class session for inspection, while a more detailed review of maintenance logs is conducted every Friday for about ten minutes. A one-hour orientation is conducted at the beginning of the semester to establish procedures and expectations for tool inspection and reporting. The materials needed include printed inspection checklists, maintenance logbooks or digital recording sheets, red "Do Not Use" tags for defective equipment, fire extinguisher inspection checklists, and tool identification cards to support visual learning.

The Industrial Arts teacher supervises the activity, while student safety officers manage rotating responsibilities and the property custodian assists in addressing equipment concerns. Funding support is drawn from the school's MOOE, with possible supplementary assistance from barangay or LGU safety programs when available.

3. "Beyond the Obvious" – ***Hazard Scavenger Hunt***



This activity responds to students' low awareness of biological, chemical, and behavioral hazards, as well as their limited ability to recognize unsafe peer practices and insufficient exposure to visible safety reminders such as warning signs and hazard indicators within the workshop environment.

The "Beyond the Obvious" activity is designed as a structured hazard scavenger hunt where students actively explore the workshop to identify, document, and analyze different types of hazards. Students classify hazards according to type, report unsafe behaviors, and justify their observations using structured reporting tools. Following the activity, a gallery walk is conducted where groups present their findings, engage in peer validation, and participate in guided discussion facilitated by the teacher.

This activity is conducted once per semester, typically during the midterm period, with a total duration of two hours consisting of a 30-minute briefing, 60-minute scavenger hunt, and 30-minute gallery walk and reflection session. Materials required include printed scavenger hunt checklists, mobile phones or tablets for documentation, "Unsafe Act" reporting slips, a projector for presentations, and whiteboards or flip charts for synthesis of findings.

The Industrial Arts teacher facilitates the activity, with students working in small groups and senior students optionally serving as peer evaluators to enhance collaboration and accountability. Funding is supported through PTA contributions, student organization funds, and the use of ICT resources already available in the school, minimizing additional costs.

4. "The Layered Risk" – ***Multiple Hazard Simulation Table***

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This activity addresses students' difficulty in prioritizing hazards based on severity and likelihood, identifying multiple simultaneous hazards within a single scenario, and applying appropriate safety responses under time pressure. It also highlights challenges in decision-making when exposed to distracting and high-pressure workshop conditions.

The "Layered Risk" activity engages students in analyzing complex, multi-hazard scenarios using a structured risk matrix. Students are required to identify all existing hazards, prioritize them based on severity and likelihood, and justify their decisions using safety reasoning principles. The activity also includes a timed "Stop Work Challenge," which simulates real-life decision-making situations where students must determine whether to continue or halt operations based on risk assessment.

The activity is implemented during the mid-semester period and is divided into two one-hour sessions. The first session focuses on orientation and practice in using the risk matrix, while the second session involves a competitive simulation exercise. Materials required include laminated multi-hazard scenario cards, a large risk matrix board for visual analysis, a stopwatch or timer for time-bound decision-making, a whiteboard for scoring and feedback, and simple rewards such as certificates or safety-related incentives.

The Industrial Arts teacher facilitates the sessions, with students participating individually or in pairs, and an optional industry safety officer may be invited to serve as evaluator or resource person. Funding is sourced from the school's research or extension fund, LGU educational support programs, and the school MOOE for printing and reproduction of materials.

5. "Fix the Shop" – ***Student-Led Environmental Audit & Advocacy***



This activity addresses multiple environmental and safety deficiencies within the workshop, including inadequate safety infrastructure such as first-aid kits, fire extinguishers, and signage, as well as poor environmental conditions such as insufficient lighting, ventilation, and inefficient workspace layout. It also responds to students' low initiative in reporting unsafe conditions and participating in environmental improvement efforts.

Students are organized into committees focusing on First-Aid Systems, Safety Signage, Ergonomics and Layout, and Peer Safety Monitoring. Each group conducts a comprehensive safety audit, develops improvement proposals, and implements feasible solutions such as signage creation, workspace organization, and first-aid kit restocking.

The implementation spans an entire semester, beginning with Weeks 1 to 3 for safety auditing and data collection, Weeks 4 to 6 for proposal development and cost estimation, Week 7 for formal presentation to school administrators, and Weeks 8 to 15 for implementation of approved interventions. Required materials include mobile phones or cameras for documentation, measuring tools such as tape measures, audit templates and checklists, signage materials including cardboard, markers, and laminating sheets, and basic safety supplies for immediate improvements.

The Industrial Arts teacher serves as adviser, while students take active leadership roles in committees. Key stakeholders include the school principal or academic head for approval, property custodians and maintenance staff for implementation support, and the PTA president for community engagement. Funding is sourced from PTA fundraising activities, student organization contributions, the school MOOE, and possible support from the LGU or the Schools Division Office (SDO) Batangas Province

Matrix for Enhancement Activities

Key Result Areas	Objectives	Proposed Activities	Success Indicators
A. Extent of Preparedness			
1. Emergency Response	To enhance students' ability to respond effectively during workshop emergencies such as accidents, injuries, and evacuation situations	**"Code Red, Stay Ahead" – Emergency Simulation Drills**: Monthly unannounced scenario-based drills with assigned roles (First-Aider, Reporter, Evacuation Guide, Calm Monitor) followed by structured debriefing	Improved response time, correct execution of emergency roles, increased confidence in handling emergencies, and improved debriefing performance
2. Use of Safety Equipment	To strengthen students' proper use, handling, and maintenance of safety tools and equipment in workshop activities	**"Tool or Threat?" – Safety Equipment Identification & Maintenance Logs**: Daily tool inspection, classification (safe/defective/unsafe), maintenance recording, and rotation of student Safety Officers	Accurate inspection logs, reduced use of defective tools, increased compliance in PPE use, and improved reporting of faulty equipment
3. Compliance with Safety Guidelines	To improve students' consistent adherence to safety rules, procedures, and reporting protocols	Integration of safety rule reinforcement through role-based monitoring, drill participation, and structured reporting practice embedded in workshop routines	Increased rule compliance, improved reporting of unsafe conditions, and consistent participation in safety procedures
B. Level of Awareness			
1. Hazard Identification	To enhance students' ability to recognize visible and hidden workshop hazards including biological, chemical, environmental, and behavioral risks	**"Beyond the Obvious" – Hazard Scavenger Hunt**: Structured hazard identification activity with documentation, classification, and group reporting	Increased number of correctly identified hazards, improved hazard classification accuracy, and active participation in discussions
2. Risk Assessment	To develop students' ability to evaluate severity, likelihood, and prioritize hazards in workshop situations	**"The Layered Risk" – Multiple Hazard Simulation Table**: Risk matrix-based scenario analysis with timed decision-making and hazard prioritization tasks	Improved use of risk matrix, correct hazard prioritization, and better decision-making under simulated pressure
3. Safety Training and Education	To strengthen students' understanding and engagement in safety programs, drills, and safety culture practices	Reinforcement of safety orientations, teacher-led demonstrations, and student participation in structured safety discussions and drills	Increased engagement in safety activities, improved recall of safety procedures, and active participation in training sessions
C. Challenges			
1. Resource and Equipment Limitations	To address gaps in safety resources such as PPE, first-aid kits, signage, and functional equipment	**"Fix the Shop" – Student-Led Environmental Audit & Advocacy**: Workshop inspection, identification of safety gaps, and proposal of improvements for approval and implementation	Improved availability of safety resources, updated signage, and reduced reports of missing or defective equipment
2. Environmental and Workspace Conditions	To improve lighting, ventilation, and overall workshop layout for safer learning conditions	Integration of student audit findings into workspace improvement plans and coordination with school maintenance units	Improved workshop conditions, better ventilation/lighting feedback, and reduced environmental safety concerns
3. Behavioral and Supervisory Factors	To strengthen safety discipline, reporting behavior, and consistent supervision in workshop activities	Peer monitoring system, structured reporting mechanisms, and reinforcement of safety responsibility through assigned roles	Increased reporting of unsafe acts, improved compliance behavior, and stronger peer accountability system

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CONCLUSION

Based on the findings, the following conclusions were drawn:

1. Assessment showed that Industrial Arts students are moderately prepared in emergency response, safety equipment use, and compliance with safety guidelines.
2. Similarly, the assessment revealed that the students demonstrate moderate awareness.
3. There is a significant and strong positive relationship between the assessment on the students' awareness and on their preparedness on occupational safety standards.
4. Students experience slight challenges in practicing safety standards, mainly due to limited resources, inadequate signage, environmental constraints, and situational pressures.
5. The proposed enhancement activities are emergency simulation drills, tool inspection logs, hazard scavenger hunt, multi-hazard risk simulation, and student-led environmental audit.

In view of the foregoing conclusions, the researchers presented the following recommendations:

1. The proposed enhancement activities may be presented to the appropriate school authorities for review, evaluation, and approval to ensure their relevance and alignment with institutional safety objectives.
2. The enhancement activities may be utilized by concerned TLE teachers to strengthen students' occupational safety awareness, preparedness, and practices through structured implementation in workshop-based instruction.
3. Future researchers may conduct parallel or similar studies to validate and further expand the proposed interventions across Technical-Vocational contexts and explore innovative approaches to improving occupational safety education.

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