

OCCUPATIONAL HEALTH AND SAFETY EDUCATION, SAFETY COMPLIANCE, AND ACCIDENT PREVENTION AMONG METALWORK TECHNOLOGY EDUCATION STUDENTS IN WELDING AND FABRICATION WORKSHOPS IN DELTA STATE

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Abstract

Welding and fabrication workshops, an aspect of Technical and Vocational Education and Training (TVET), expose students to occupational hazards that may affect safety concerns, skill acquisition, and learning outcomes. This study examined occupational health and safety (OHS) education, safety compliance, and accident prevention among Metalwork Technology Education students in Delta State, Nigeria. A convergent mixed-methods design was adopted involving 514 students from the University of Delta and Technical College, Agbor. 15 participants were purposively selected for semi-structured interviews until data saturation was achieved. Data collection was conducted using questionnaires, interviews, non-participant observation, and curriculum documents. Mean and standard deviation were used to analyse the quantitative data, whereas NVivo 10 and Braun and Clarke's six-step thematic analysis framework were used to analyse the qualitative data. Results revealed that Metalwork Technology Education students possessed moderate-to-high awareness of occupational health and safety practices with a grand mean of 3.58. Occupational health and safety education moderately influenced compliance with safety procedures and significantly contributed to accident prevention. However, issues like weak enforcement of safety regulations, inadequate personal protective equipment (PPE), and poor workshop infrastructure constrained effective safety implementation. The study recommends strengthened practical safety training, improved workshop facilities, and stricter institutional enforcement of occupational safety standards.

Keywords: occupational health and safety education, TVET, welding and fabrication workshops, safety compliance, accident prevention, metalwork technology education

Introduction

Technical and Vocational Education and Training (TVET) has become increasingly important to national development because of its role in preparing technically skilled manpower for industrial productivity, technological advancement, and sustainable economic growth. Across developed and developing countries, TVET programmes equip learners with practical competencies required in occupations such as welding and fabrication, automobile technology, electrical installation, and mechanical maintenance (Kingsley-Chibuikwe & Wordu, 2025; Thobela, 2025; Sibiya, 2025). In Nigeria, the increasing demand for technically competent graduates has intensified the need for practical-oriented education within universities, technical colleges, and vocational training centres. However, alongside the growing emphasis on practical skill acquisition, concerns regarding occupational health and safety (OHS) within technical workshops have also intensified.

Welding and fabrication workshops are among the most hazardous learning environments in technical education because students are regularly exposed to heat, sparks, toxic fumes, electrical equipment, excessive noise, and heavy machinery. These hazards expose learners to burns, cuts, respiratory complications, electrocution, eye injuries, musculoskeletal disorders, and fire outbreaks (Magoha et al., 2024). Studies conducted among welders in Ethiopia, Ghana, Uganda, Nepal, and South Africa reveal that inadequate safety awareness, poor use of personal protective equipment (PPE), and weak enforcement of safety procedures significantly contribute to occupational accidents and injuries in welding environments (Joshi et al., 2020; Candia, 2025; Mashimbyi et al., 2025). Although many of these studies focused on industrial and informal-sector welders, similar

concerns are increasingly evident within TVET institutions where students participate in workshop-based practical activities.

Occupational health and safety education refers to structured instructional processes designed to equip learners with the knowledge, attitudes, and competencies needed for identifying hazards, minimising risks, and maintaining safe working environments. Within TVET settings, OHS education includes instruction on machine handling, emergency response procedures, hazard identification, fire prevention, workshop conduct, and proper use of PPE (Adu Gyamfi et al., 2022). Effective safety education has been associated with improved compliance with safety standards, reduced unsafe behaviour, and increased awareness of occupational hazards among trainees and workers (Kabiesz et al., 2025; Kintu et al., 2015). Consequently, OHS education has become an essential component of quality technical education globally.

The rapid advancement of industrial technologies has further reinforced the need for stronger safety education in technical learning environments. Emerging technologies such as augmented reality, digital twins, artificial intelligence, and industrial metaverse systems are increasingly integrated into occupational safety education to simulate hazardous environments and improve learners' preparedness (Goppold et al., 2022). Similarly, virtual reality-based manufacturing education has demonstrated strong potential for improving learners' understanding of industrial hazards and safe operational procedures (Chen et al., 2026; Li et al., 2025). These developments suggest that modern safety education extends beyond traditional classroom instruction and requires interactive approaches capable of promoting safety culture and behavioural compliance.

Despite global advancements in occupational safety education, many African TVET institutions continue to face serious safety challenges. Studies in Ghana and Kenya revealed that although safety policies and regulations exist in technical institutions, implementation and compliance remain inconsistent because of inadequate supervision, limited resources, poor infrastructure, and insufficient safety training (Adu Gyamfi et al., 2023; Ochieng, 2024). Similarly, studies among informal welders in Tanzania and Uganda identified poor awareness of occupational hazards, inadequate PPE usage, and weak safety monitoring as major contributors to workplace injuries (Magoha et al., 2024; Candia, 2025). These findings indicate that occupational safety education remains insufficiently developed in many technical learning environments across sub-Saharan Africa.

In Nigeria, TVET continues to play a major role in youth empowerment, skills acquisition, and employment generation. Government and institutional initiatives increasingly promote vocational education as a strategy for addressing unemployment and improving economic productivity (Itodo et al., 2023). Nevertheless, many technical institutions still struggle with inadequate workshop facilities, obsolete equipment, overcrowded learning environments, and weak enforcement of safety regulations. In Delta State, infrastructural deficiencies and poor implementation of technical education policies have been identified as major barriers affecting the quality of TVET programmes (Golley & Ejairu, 2025; Onwenonye, 2023). These deficiencies often create unsafe workshop conditions where students are exposed to preventable occupational hazards during practical training.

Metalwork Technology Education students (MTESs) in welding and fabrication

workshops are particularly vulnerable because practical activities involve cutting, grinding, welding, heating, and fabrication processes. While technical competency development remains the major focus of workshop training, safety education and accident prevention often receive inadequate attention. Existing evidence suggests that students may possess basic awareness of workshop safety rules but still demonstrate inconsistent compliance because of inadequate supervision, peer influence, weak safety culture, and insufficient access to protective equipment (Tamba & Sumual, 2023; Ibrahim & Yunos, 2025). Furthermore, unsafe actions, unsafe workshop conditions, and inadequate safety knowledge significantly increase the likelihood of accidents among technical trainees (Ada et al., 2025).

Despite increasing concerns regarding workshop accidents, empirical evidence focusing specifically on MTESs in welding and fabrication workshops in Delta State remains limited. Most Nigerian studies concentrate on industrial workplaces, health facilities, or informal sectors, with limited attention given to institutional workshop safety within educational settings. Consequently, there is insufficient understanding of how occupational health and safety education influences students' safety awareness, compliance behaviour, accident prevention, and perception of workshop hazards in formal TVET environments.

This study is anchored on the Health Belief Model (HBM), which explains how individuals' perceptions of risk, susceptibility, and preventive benefits influence behavioural decisions. The theory suggests that learners are more likely to adopt protective behaviours when they perceive themselves as vulnerable to hazards and believe that preventive actions can reduce those risks. Within welding and fabrication workshops, the HBM provides a useful

framework for understanding how occupational health and safety education shapes students' awareness of hazards, attitudes toward safety procedures, and willingness to comply with preventive measures. By strengthening learners' understanding of workshop dangers and the benefits of safe practices, OHS education can improve safety consciousness and reduce accident risks among MTEs.

Against this background, this study investigated occupational health and safety education, safety compliance, and accident prevention among MTEs in welding and fabrication workshops in Delta State. Specifically, the study addressed the following research questions:

1. What is the level of awareness of occupational health and safety education among MTEs in welding and fabrication workshops in Delta State?
2. To what extent does occupational health and safety education influence students' compliance with safety procedures in welding and fabrication workshops?
3. What is the relationship between occupational health and safety education and accident prevention among MTEs in Delta State?
4. What occupational hazards are commonly experienced by students in welding and fabrication workshops in Delta State?
5. What challenges affect the implementation of occupational health and safety practices in welding and fabrication workshops in Delta State?

By addressing these questions, this research contributes to a deeper understanding of occupational health and safety education within TVET environments, particularly in welding and fabrication workshops where learners face substantial occupational risks. The study also

provides empirical evidence that can guide policymakers, institutional administrators, instructors, and curriculum developers in strengthening safety education, improving workshop safety culture, and enhancing accident prevention strategies in technical education institutions in Delta State and beyond.

Empirical Review

Several empirical studies have examined occupational health and safety (OHS) awareness, compliance, hazard exposure, and accident prevention within welding environments, technical institutions, and vocational education settings. These studies provide useful insights into the relationship between safety education and workplace safety behaviour among technical learners and workers.

Adu Gyamfi et al. (2022) investigated workplace health and safety procedures and compliance in technical and vocational institution workshops in Ghana using a descriptive survey design. The study found that safety compliance among learners improved significantly when institutions implemented structured safety orientation programmes and instructor supervision. However, inadequate safety equipment and weak enforcement mechanisms reduced overall compliance. The study is relevant because it demonstrates the importance of institutional safety structures in TVET workshops. Nevertheless, the research focused primarily on general TVET workshops and did not specifically address welding and fabrication environments where hazards are more intense.

Similarly, Adu Gyamfi et al. (2023) examined occupational health and safety procedures and compliance in pre-tertiary TVET institutions in Ghana. The researchers reported that learners exposed to continuous safety education demonstrated higher adherence to workshop rules than learners who received occasional safety

instruction. Despite these findings, infrastructural deficiencies and insufficient PPE supply negatively affected safety implementation. The study contributes significantly to understanding safety compliance in educational workshops, although it relied mainly on quantitative approaches without a deeper qualitative exploration of learners' experiences.

Kintu et al. (2015) assessed occupational safety training and practices in vocational institutions and workplaces in Kampala, Uganda. Using survey methods, the study found that occupational safety training positively influenced safety awareness and safe behavioural practices among vocational trainees. Students who received regular safety orientation demonstrated lower involvement in unsafe workshop practices. However, the study emphasised that inconsistent monitoring by instructors contributed to continued exposure to hazards. Although the study established the effectiveness of safety education, it focused broadly on vocational institutions rather than welding-specific workshops.

Candia (2025) examined knowledge, attitudes, and practices relating to occupational safety and health among welders in Uganda. Findings indicated that although many welders possessed moderate knowledge of occupational hazards, consistent PPE utilisation remained low because of discomfort, inadequate access to equipment, and a weak safety culture. The study further reported that informal safety practices exposed welders to burns, eye injuries, and respiratory problems. While the study focused on industrial welders rather than students, its findings are important because welding workshops in technical institutions often mirror informal workplace conditions.

Magoha et al. (2024) investigated occupational safety and environmental health risks among informal welders in Tanzania. The

study identified major occupational hazards such as toxic fumes, electrical shocks, burns, excessive heat exposure, and poor ventilation. The researchers concluded that insufficient occupational safety education contributed significantly to unsafe workplace practices. The relevance of this study lies in its identification of environmental hazards commonly associated with welding activities. However, the study focused primarily on informal-sector welders and did not address educational workshop settings.

Mashimbyi et al. (2025) assessed occupational safety risks among informal welders in South Africa using a mixed-methods approach. The findings showed that inadequate training, limited PPE usage, and poor enforcement of safety regulations increased occupational accident risks. Participants also reported near-miss incidents linked to negligence and unsafe workshop behaviour. The study demonstrates how safety culture influences accident prevention. Nonetheless, the research concentrated on informal industrial environments rather than TVET institutions.

Joshi et al. (2020) examined occupational health problems and PPE utilisation among welders in Nepal. The researchers found that many welders experienced respiratory illnesses, skin irritation, eye injuries, and hearing problems because of prolonged exposure to welding fumes and excessive noise. PPE usage remained inconsistent due to discomfort and a lack of enforcement. The study highlights the long-term health implications of poor safety compliance in welding environments.

Tamba (2025) investigated students' interest in occupational health and safety subjects and their relationship with discipline in PPE utilisation during welding practices among vocational students in Indonesia. The study found a strong positive relationship between learners' interest in safety education and compliance with

PPE usage during practical sessions. Students who perceived safety education as relevant were more likely to adhere to workshop safety regulations. The study supports the argument that learners' attitudes toward safety education influence behavioural compliance.

Asyfiradayati (2026) investigated the relationship between knowledge, attitudes, and occupational safety practices among mechanical engineering students. The study found that students with higher safety knowledge demonstrated better compliance with workshop safety regulations and were less likely to engage in risky behaviour. The researcher concluded that occupational health and safety education plays a significant role in shaping positive safety attitudes among technical learners.

Ohanu et al. (2025) investigated the impact of safety management practices on technicians' safety behaviour. The researchers found that safety orientation mediated the relationship between institutional safety practices and workers' behavioural compliance. This implies that structured safety education strengthens safety consciousness and reduces risky workplace practices.

Collectively, these empirical studies demonstrate that occupational health and safety education significantly influences safety awareness, compliance behaviour, and accident prevention in technical and welding environments. Existing studies consistently identify inadequate PPE provision, poor infrastructure, weak supervision, and inconsistent safety enforcement as major barriers to effective occupational safety implementation. However, despite the growing body of literature on occupational safety, limited empirical attention has been given to MTEs in welding and fabrication workshops within Delta State, Nigeria. Furthermore, few studies have adopted convergent mixed-methods approaches

integrating interviews, observations, and curriculum analysis to comprehensively examine occupational health and safety education within TVET environments. This gap provides the justification for the present study.

Methodology

Research Design

This study adopted a convergent mixed-methods research design to obtain a comprehensive understanding of occupational health and safety education, safety compliance, and accident prevention among MTEs in welding and fabrication workshops in Delta State. The design enabled the simultaneous collection and analysis of quantitative and qualitative data, allowing statistical findings to be integrated with participants' lived experiences and observed workshop practices.

Area of the Study

The study was conducted in Agbor metropolis, Delta State, Nigeria, specifically at the University of Delta, Agbor (UNIDEL) and Technical College Agbor (TCA). These institutions were selected because both operate practical-oriented technical programmes involving welding and fabrication workshop activities.

Population, Sample, and Sampling Techniques

The study population comprised 514 TVET learners enrolled in welding and fabrication-related programmes, including 379 students from UNIDEL and 135 students from TCA. Census sampling was adopted for the quantitative strand because the population was manageable and accessible. Consequently, all 514 learners were targeted for questionnaire administration. However, only 498 questionnaires were correctly completed and returned, representing a 96.9% response rate. Sixteen copies were excluded

because of incomplete responses and inconsistent entries. For the qualitative strand, purposive sampling was used to select 15 participants, comprising 10 students from UNIDEL and 5 students from TCA. The sample size was considered adequate based on the principle of data saturation. During the twelfth interview, repetitive patterns relating to safety awareness, hazards, and compliance behaviour emerged, while three additional interviews confirmed thematic saturation. Participants were included if they were registered TVET learners, had participated in welding and fabrication practical activities for at least one semester, and voluntarily consented to participate. Students without workshop exposure or those absent during data collection were excluded.

Data Collection

Data were collected using a structured questionnaire, semi-structured interviews, non-participant observation, and curriculum document analysis. The questionnaire contained demographic items and Likert-scale statements relating to occupational health and safety awareness, safety compliance, accident prevention, workshop hazards, and implementation challenges. A four-point Likert scale of Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1) was used. Mean scores were interpreted using the following decision rule: 3.50–4.00 = High; 2.50–3.49 = Moderate; 1.50–2.49 = Low; and 1.00–1.49 = Very Low. Semi-structured interviews were guided by eight open-ended questions aligned with the research questions. The interviews explored learners' experiences regarding safety education, workshop hazards, compliance behaviour, emergency preparedness, and institutional safety challenges. Non-participant observation enabled the researchers to assess workshop ventilation, PPE usage, machine

handling behaviour, emergency equipment availability, and instructor supervision without interfering with workshop activities. Curriculum document analysis examined workshop manuals, safety regulations, and course outlines to determine the extent of OHS integration within the curriculum.

Validity and Trustworthiness of the Study

The questionnaire and interview guide were validated by experts in Technical Education, Health Education, and Measurement and Evaluation to ensure clarity and alignment with the study objectives. Reliability testing using Cronbach's Alpha produced a coefficient of 0.78 for the entire instrument, indicating acceptable internal consistency. Trustworthiness of qualitative findings was ensured through credibility, dependability, transferability, and confirmability procedures. Member checking allowed selected participants to review interview summaries for accuracy, while peer debriefing was conducted with qualitative research experts who reviewed coding patterns and thematic interpretations. Triangulation involving interviews, observations, and curriculum documents further strengthened the credibility of findings.

Data Analysis

Quantitative data were analysed using mean and standard deviation. Qualitative data were analysed thematically using the NVivo software (Version 10). The analysis followed Braun and Clarke's (2006) six-step thematic framework involving familiarisation with the data, generation of initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the final report. Interview recordings were audio-recorded, transcribed verbatim, translated into English where necessary, and imported into NVivo 10 for

analysis. Coding followed an inductive approach because themes emerged directly from participants' responses rather than being predetermined. Open coding of significant statements led to the development of categories, subthemes, and broader themes. Participants were assigned identification codes such as UNIDEL-04 and TCA-02 to ensure confidentiality, while all identifiable information was removed from records and transcripts.

Ethical Considerations

Participants were informed about the purpose of the study, confidentiality procedures, voluntary participation, and their right to withdraw at any stage without penalty. Written informed consent was obtained before data collection. Confidentiality and anonymity were maintained throughout the study, and all questionnaire responses, transcripts, and audio recordings were securely stored and accessed only by the researchers.

Results

Participant Demographic Summary

Variable	Category	Frequency	Percentage
Institution	UNIDEL	367	73.7
	TCA	131	26.3
Gender	Male	381	76.5
	Female	117	23.5
Age	16–20 years	212	42.6
	21–25 years	231	46.4
	26 years and above	55	11.0
Level/Class	Beginner	201	40.4
	Intermediate	187	37.6
	Advanced	110	22.0

Quantitative Results

Research Question 1: What is the level of awareness of occupational health and safety education among MTESs in welding and fabrication workshops in Delta State?

Table 1: Level of Awareness of Occupational Health and Safety Education

Item	Mean	SD
I understand workshop safety rules	3.62	0.81
I am aware of PPE requirements in welding workshops	3.74	0.76
I can identify workshop hazards	3.55	0.88
I received safety orientation before practical sessions	3.60	0.83
I understand workshop safety rules	3.38	0.92
Grand Mean	3.58	0.84

The mean score reflects a moderate to high level of students' awareness about safety, where they have higher awareness in handling PPE compared to safety rules, and lower awareness in emergency procedures.

Research Question 2: To what extent does occupational health and safety education influence students' compliance with safety procedures in welding and fabrication workshops?

Table 2: Influence of OHS Education on Safety Compliance

Item	Mean	SD
I consistently use PPE during workshop activities	3.46	0.91
Safety education encourages compliance with rules	3.61	0.84
Instructor supervision improves safety compliance	3.68	0.80
Peer behaviour influences my compliance level	3.42	0.89
Safety rules are strictly followed in workshops	3.35	0.95
Grand Mean	3.50	0.88

The findings suggest that OHS education has a moderate effect on safety compliance, significantly influenced by instructor supervision and peer behaviours.

Research Question 3: What is the relationship between occupational health and safety education and accident prevention among MTEs in Delta State?

Table 3: Relationship between OHS Education and Accident Prevention

Item	Mean	SD
Safety education decreases the number of workshop accidents	3.72	0.78
I feel safer following safety training	3.66	0.81
Hazard awareness lowers risky behaviour	3.60	0.84
Accidents are less frequent due to safety training	3.44	0.90
Safety education improves caution during machines	3.70	0.79
Grand Mean	3.62	0.82

Results indicate that students believe OHS training is highly related to reducing accidents in the welding workshop.

Research Question 4: What occupational hazards are commonly experienced by students in welding and fabrication workshops in Delta State?

Table 4: Common Occupational Hazards Experienced

Hazard	Mean	SD
Burns due to welding sparks	3.69	0.82
Bright light exposure injury to the eyes	3.74	0.77
Cuts from sharp metals	3.58	0.86
Inhalation of welding fumes	3.66	0.83
Electric shock risks	3.52	0.89
Grand Mean	3.64	0.83

The results of the study showed that students are likely to be exposed to several work hazards, especially eye injuries and burns.

Research Question 5: What challenges affect the implementation of occupational health and safety practices in welding and fabrication workshops in Delta State?

Table 5: Challenges Affecting OHS Implementation

Challenge	Mean	SD
Inadequate access to PPE	3.71	0.80
Poor workshop infrastructure	3.67	0.83
Inadequate safety supervision	3.59	0.87
Peer influence on unsafe behaviour	3.54	0.88
Poor adherence to safety precautions	3.62	0.85
Grand Mean	3.63	0.85

The results show strong institutional and infrastructural constraints affecting safety compliance.

Qualitative Findings

The results of the interviews were broken down into the following main themes:

Theme 1: Safety Awareness is very fundamental but not extensive.

Pupils showed some knowledge of workshop safety procedures and not as much of emergency procedures and hazard management.

“At orientation and workshop sessions, we are always asked to wear protective goggles and gloves before welding or making any other type of work, but in practice, we are not given any details about the emergency measures to follow when using these goggles and gloves.” (Participant UNIDEL-05)

“Most of the safety information that I have learnt as a student has been at the first workshop orientation and from time to time reminders from the teachers, but I still do not know what to do when accidents occur suddenly and become serious.” (Participant TCA-03)

Theme 2: Instructor supervision is a key component of meeting safe behaviour standards.

Pupils reported that safety rules are strictly enforced during workshop activities, which encourages them to follow the rules.

“All students follow safety procedures, including wearing protective equipment and operating the machines safely, when the instructor or workshop teacher is in the class during welding practice.” (Participant UNIDEL-02)

“When it comes to safety, some students think they are alone and don't pay attention to safety rules, or use machines in an unsafe way, or think that safety is not very important.” (Participant TCA-01)

Theme 3: Poor PPE and infrastructure restrict compliance.

Poor workshop conditions and the lack of proper safety equipment were cited as significant issues in avoiding compliance with safety standards.

“At times, some students cannot participate in welding activities due to limited protective equipment in the workshop.” (Participant TCA-04)

“There are several issues in the workshop environment that make it less than safe, as many of the machines are old, poorly maintained, and in some cases pose unnecessary risk during fabrication exercises.” (Participant UNIDEL-07)

Theme 4: Occupational hazards occur often and regularly.

Burns, eye injury and fumes were reported as hazards affecting students during regular practice sessions of welding and fabrication.

“At the time of conducting the welding exercises, I had gotten a small burn on my hand as I was not completely protected then, so that was a realization to me of the dangers of the workshop environment.” (Participant UNIDEL-09)

“...Eye irritation and discomfort are very common after prolonged welding time as a result of exposure to intense light and sparks during welding fabrication activity.” (Participant TCA-02)

In sum, the results showed that occupational health and safety education is moderately developed in Delta State TVET workshops but limited due to infrastructural constraints, lack of consistent supervision, and inadequacy of safety education, especially on the availability of safety equipment and emergency preparedness.

Discussion

The findings of this study reveal that MTESs in welding and fabrication workshops in Delta State possess a moderate to high level of occupational health and safety awareness. This aligns with Kintu et al. (2015), who found that structured safety training improves awareness among vocational learners. However, the limited understanding of emergency procedures indicates a critical gap in experiential safety learning, consistent with Adu Gyamfi et al. (2023), who reported that TVET safety training often emphasises theory over practice.

The study further established that occupational health and safety education moderately influences compliance with safety procedures. Instructor supervision emerged as a strong determinant of compliance, reinforcing Ohanu et al. (2025), who argued that safety orientation and institutional enforcement significantly shape safety behaviour. However, peer influence and inadequate PPE reduce compliance consistency, confirming Ada et al. (2025), who noted that unsafe actions and

conditions significantly contribute to workplace accidents.

The strong relationship between OHS education and accident prevention supports global findings by Jayadi et al. (2026), which demonstrated that safety education significantly reduces occupational risks. In welding environments, hazard exposure remains high, as also reported by Magoha et al. (2024) and Joshi et al. (2020), particularly in relation to burns, fumes, and eye injuries.

Qualitative findings enrich these results by revealing the lived experiences of students, especially regarding inadequate PPE and infrastructural limitations. This supports Mashimbyi et al. (2025), who emphasised that poor resources significantly undermine safety compliance in welding environments. The consistency between quantitative and qualitative results strengthens the credibility of the study through triangulation.

Overall, the findings highlight a persistent gap between safety knowledge and safety practice. Although students are aware of basic

safety requirements, actual compliance is constrained by institutional, environmental, and behavioural factors. This reflects the Health Belief Model, where perceived barriers weaken the translation of safety awareness into action.

Conclusion

This study concludes that occupational health and safety (OHS) education plays a significant but only moderately effective role in shaping safety awareness, compliance behaviour, and accident prevention among MTESs in welding and fabrication workshops in Delta State. Although students demonstrate a generally moderate-to-high level of awareness of workshop hazards and safety procedures, their practical compliance is inconsistent and largely dependent on instructor supervision, peer influence, and availability of safety equipment. The study further confirms that accidents and near-miss incidents remain common in welding environments due to gaps in emergency preparedness, inadequate PPE supply, and weak enforcement of safety rules. The integration of quantitative and qualitative evidence reveals a persistent disconnect between safety knowledge and actual practice. Therefore, strengthening experiential safety training, improving workshop infrastructure, and institutionalising consistent safety enforcement are essential for building a sustainable safety culture. Overall, OHS education remains a critical but under-optimised tool for reducing occupational risks in TVET welding workshops in Delta State.

Recommendations

1. TVET institutions should move beyond theoretical safety teaching by introducing compulsory hands-on emergency drills, hazard simulation exercises, and live safety demonstrations in welding workshops.

2. Government and institutional authorities should ensure a consistent supply of certified personal protective equipment (PPE) and modernise workshop facilities to meet international safety standards.
3. Clear and enforceable safety policies should be implemented in all technical workshops, including penalties for non-compliance and incentives for safe behaviour.
4. Workshop instructors should receive periodic training on modern occupational safety practices to enhance their ability to supervise and enforce safety compliance effectively.
5. Integration of Safety Assessment into Curriculum: Safety compliance should be formally assessed as part of students' practical grading to reinforce its importance.
6. Institutions should conduct periodic safety audits to identify risks and ensure adherence to occupational safety standards.

Limitations of the Study

1. The study was limited to two institutions in Delta State, which may affect generalisation.
2. Self-reported questionnaire data may introduce response bias.
3. Some students may have exaggerated compliance behaviour due to awareness of being studied.
4. Time constraints limited prolonged observational engagement in workshops.

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