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Assessment of Compliance with Industrial Safety Policies and Practices in Metal Workshops of Technical Colleges in Kebbi State, Nigeria

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Abstract

This study assessed the level of compliance with industrial safety policies and practices in metal workshops of Technical Colleges in Kebbi State, Nigeria. Industrial safety in educational workshops is critical to protecting students and staff from occupational hazards, especially in hands-on disciplines like metalwork technology. The study was guided by two objectives and two research questions. The study adopted a descriptive survey research design to collect and analyze data on safety practices, awareness levels, and adherence to institutional and national safety regulations. The population comprised 120 metalwork students from all four Technical Colleges in Kebbi State. Given the manageable size, the entire population was studied without sampling. A structured questionnaire was developed and validated to gather data on key safety dimensions, including personal protective equipment (PPE) usage, emergency preparedness, machine safety compliance, and student orientation on safety protocols. Descriptive statistics such as mean and standard deviation were used to analyze the data. The findings revealed that while students demonstrated moderate awareness of safety procedures, there were gaps in consistent compliance, particularly in areas of PPE use, signage availability, and emergency response training. Additionally, infrastructure limitations and weak enforcement mechanisms were identified as key constraints to effective policy implementation. The study concludes that although industrial safety policies exist, their practical enforcement within metal workshops remains suboptimal. It recommends regular safety audits, enforcement of workshop rules, capacity building for instructors, and improved funding for safety equipment and infrastructure to ensure a safer learning environment. These measures are essential for aligning technical training in Kebbi State with global occupational safety standards.

Keywords: Industrial Safety, Safety Compliance, Metal Workshops, Technical Colleges, Occupational Health and Safety, Technical Education, Personal Protective Equipment (PPE), Kebbi State, Nigeria

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1. Introduction

The importance of industrial safety in educational institutions, particularly in technical and vocational education settings, cannot be overstated. Metalwork workshops, as integral components of technical college training, expose students and instructors to a range of occupational hazards such as burns, lacerations, eye injuries, electric shock, and mechanical accidents. These risks are exacerbated when proper safety policies and practices are not adhered to. In this context, compliance with industrial safety policies becomes a critical factor in safeguarding the well-being of learners and fostering a culture of prevention, responsibility, and discipline in technical environments.

Globally, organizations such as the International Labour Organization (ILO) and the World Health Organization (WHO) have emphasized the enforcement of occupational health and safety (OHS) standards in both industrial and educational environments. Within Nigeria, national regulations such as the Factories Act (2004) and National Occupational Safety and Health Policy (2020) provide frameworks for workplace safety, including the expectations for training institutions. Despite the existence of these guidelines, implementation at the institutional level especially in public technical colleges is often inconsistent due to infrastructural limitations, inadequate training, poor supervision, and a lack of safety culture (Olabode & Adebayo, 2021).

Metal Workshop safety encompasses all aspects of maintaining a safe workplace, including workplace arrangement, environmental health risks and unsafe work practices conditions. Safety in the workshop, according to Vengidason et al, (2021) means having an environment free from injury and hazards. Proper processes and procedures, if applied by students and staff in the workshop will ensure safety. When educational institutions take measures to ensure a safe working environment for their students and staff, there is often increased morale and dedication to their workshop practice. Safe workplaces suffer fewer lost-times, accidents and worker ‘s compensation claims, thus increasing financial performance (Akhigbe et al, 2018). The management of health and safety in engineering workshops is about identifying the potential risks and adopting the right precautions taking account of time, money and resources.

The role of management in the Health and Safety issue is stressed by Adebayo & Emoh (2019) who emphasized that management should issue a written statement of safety policy, establish an organization and allocate responsibilities of workshop in health and safety matters, establish safety committee ensure first aid facilities exist, provide appropriate procedures and document to minimize accidents, consult with safety representative with a view to making and maintaining arrangement which promote and develop measure for safety and health of employees and checking the effectiveness of such measures.

According to Idowu & Iyabo, (2017), safety training spells out the rules and provides information on potential hazards and how to avoid them. It is part of a preventive program done through: induction course; transfer to new job or change in working

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methods; refresher course and training should be provided to deal with aspects of health and safety to employees. Afolabi et al, (2021) argues that lack of experience and poor training are the main cause of accidents at work. According to article 6(c) of the occupational safety and health act, it is the duty of the employer to ensure the health, safety and welfare at work of all persons in the workplace, this involves the provision of such information, instruction, training and supervision as is necessary to ensure that health and safety at work of every person employed (World Health Organization, 2007). Every employee should be made aware of any risks from new technologies imminent danger and ensuring that person employed participates in the application and review of health and safety measures management commitment gives a powerful message to the workforce by what they do for health and safety; they should personally get involved in health and safety inspections and audits, health and safety consultation meetings and also in the investigation of accidents, illhealth and accidents. (Ayeleso et al, 2024)

In Kebbi State, technical education has expanded to accommodate national goals for skills development and employability. However, preliminary observations and anecdotal reports from stakeholders in technical colleges suggest that safety practices in metalwork workshops are not uniformly enforced. Instances of improper use of personal protective equipment (PPE), absence of safety signage, lack of functional fire extinguishers, and limited first-aid training have been reported, raising serious concerns about institutional preparedness and student safety. These challenges are particularly worrying given the hands-on nature of metalwork instruction, which involves the use of dangerous equipment such as lathes, grinders, gas welders, and milling machines.
Furthermore, previous studies (e.g., Adeyemi & Ogunlana, 2020) have shown that students' awareness and compliance with safety regulations are directly influenced by the presence of clear policies, regular safety training, and proactive supervision. However, there remains a research gap in understanding how these factors interact specifically within the context of metalwork workshops in technical colleges in Northern Nigeria, particularly in Kebbi State. An empirical assessment is thus required to evaluate not only compliance levels but also the institutional factors that hinder or promote safety practices.

In view of the above, this study aims to investigate the level of compliance with industrial safety policies and actual safety practices among metalwork students in Technical Colleges across Kebbi State. The study also seeks to identify the challenges that impede effective implementation of these safety measures. By focusing on the lived experiences and practices of students in metal workshops, the research provides evidence that can inform safety policy reviews, infrastructure upgrades, and training interventions.

1.1 Objectives of the Study

Two key research objectives guided the study:

1. To determine the level of students' compliance with industrial safety policies and procedures in metal workshops of Technical Colleges in Kebbi State.
2. To identify the challenges affecting the effective implementation of safety practices in metalwork training environments.

1.2 Research Questions

To achieve these objectives, the study was guided by the following research questions:

1. What is the level of compliance with industrial safety policies and procedures among students in metal workshops of Technical Colleges in Kebbi State?
2. What challenges hinder the effective implementation of industrial safety practices in these workshops?

1.3 Significance of the study

The findings of this study have practical and theoretical implications for multiple stakeholders in technical and vocational education, particularly in relation to improving occupational safety standards in metalwork training environments. The study contributes to safety awareness, policy enhancement, and capacity building within the Nigerian technical education system and beyond.

Students are the primary beneficiaries of this study, as they are the most vulnerable to accidents and hazards in the workshop environment. By identifying the extent of compliance with safety policies and the challenges facing their implementation, this study sensitizes students to the importance of adhering to safety procedures.

For technical teachers and metalwork instructors, the study offers insights into their role as enforcers of safety protocols and role models for best practices. It reveals areas where supervision may be lacking and encourages reflection on teaching strategies that integrate safety education.

The results of the study are valuable to principals, vice-principals, and technical coordinators responsible for workshop facilities. Administrators will be better equipped to: Allocate resources effectively for safety-related infrastructure and materials. Conduct routine safety audits and compliance checks in line with national policy. Develop and implement institution-based safety policies, including training schedules, supervision frameworks, and emergency response plans.

The findings of this study provide evidence-based recommendations for the Ministry of Education, the National Board for Technical Education (NBTE), and curriculum developers. The study will: Inform policy formulation and curriculum revisions to integrate industrial safety as a core component of technical education. Guide the domestication and implementation of the National Occupational Safety and Health Policy (2020) in schools. Serve as a basis for designing teacher capacity development programmes and institutional monitoring mechanisms related to safety compliance.

2. Review of Related Literature

This section reviews existing literature related to industrial safety in technical education, with a focus on policy frameworks, compliance behaviors, safety practices in metalwork workshops, and challenges specific to Nigerian technical colleges. The review is structured under the following subheadings:

2.1 Overview of Technical and Vocational Education in Nigeria

Technical and Vocational Education and Training (TVET) in Nigeria is a critical sub-sector of the education system, aimed at equipping learners with practical skills, technical knowledge, and occupational competencies required for gainful employment and

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self-reliance. The National Policy on Education (FRN, 2014) recognizes TVET as a vehicle for technological development and industrialization, designed to prepare individuals for careers in manual, skilled, and semi-skilled trades such as metalwork, electrical installation, building, carpentry, and automotive technology.

Technical colleges serve as the foundation level institutions in Nigeria's TVET structure, positioned to produce craftsmen and women capable of entering skilled employment or progressing to higher technical training. These colleges are administered by both federal and state governments and operate under the regulatory frameworks of the National Board for Technical Education (NBTE) and the National Commission for Colleges of Education (NCCE). Students are trained in both general education and trade-specific courses over a period of three years, culminating in the award of the National Technical Certificate (NTC) or the Advanced National Technical Certificate (ANTC) (Yusuff & Soyemi, 2012).

The importance of metalwork technology within the TVET curriculum cannot be overstated. It provides learners with foundational skills in fabrication, machining, welding, casting, and mechanical assembly, which are vital for industrial development. Practical instruction in metalwork workshops is designed to simulate industrial processes, exposing students to tools, machines, and procedures common in real-world settings. However, the effective delivery of this component is heavily reliant on safe, functional workshop environments and instructors who uphold industrial standards in safety and practice (Olabode & Adebayo, 2021).

Despite its strategic role, TVET in Nigeria faces multiple systemic challenges. These include underfunding, obsolete equipment, shortage of qualified instructors, and poor alignment with labor market demands (Aina, 2013; Okoye & Okwelle, 2015). Of particular concern is the inadequate implementation of safety policies in workshops, which poses serious risks to students and undermines the quality of instruction. Research has shown that many technical colleges operate without clear safety guidelines, emergency protocols, or adequate personal protective equipment, thereby exposing students to unnecessary hazards (Shehu & Ibrahim, 2022).

Moreover, the growth of TVET institutions in Nigeria has not been matched by corresponding investments in safety infrastructure and policy enforcement. Instructors often rely on informal practices, and students receive limited exposure to structured safety training or drills. This situation calls for urgent reforms to integrate industrial safety education as a core part of the technical curriculum, particularly in high-risk areas like metalwork training.

2.2 Concept of Industrial Safety in Technical Education

Industrial safety refers to the set of policies, practices, and procedures established to prevent accidents, injuries, and health hazards in workplace environments. In technical education, especially in metalwork training, industrial safety encompasses the use of personal protective equipment (PPE), adherence to workshop rules, proper handling of machines and tools, emergency preparedness, and awareness of hazard symbols and signage (Olabode & Adebayo, 2021). The importance of industrial safety in schools lies not only in compliance with legal regulations but also in fostering a safety culture among students who will transition into high-risk industrial environments.

According to Adewuyi and Akinwale (2019), the safety consciousness of technical education students is directly linked to the kind of orientation and supervision they receive during practical sessions. Therefore, technical colleges have a responsibility to enforce safety measures as part of their instructional and administrative mandates.

2.3 Industrial Safety Policy Frameworks in Nigeria

Several national policies and laws provide a regulatory framework for safety practices in Nigerian educational institutions. The Factories Act (2004) sets the legal foundation for workplace safety and mandates institutions to provide a safe working environment for all users of industrial facilities, including students. Additionally, the National Occupational Safety and Health Policy (2020) outlines Nigeria's commitment to integrating occupational safety into all levels of education and training. These documents are further supported by guidelines from the National Board for Technical Education (NBTE), which requires that technical colleges incorporate safety instruction and demonstration as part of their workshop practice curriculum.

Despite the existence of these policies, studies (Ezenwafor & Okonkwo, 2020) have shown that compliance at the institutional level remains uneven. Many technical colleges, particularly in Northern Nigeria, lack the financial, material, and human resources to fully implement these safety standards.

2.4 Safety Practices in Metalwork Workshops

Metalwork workshops are particularly hazardous due to the nature of operations carried out. Activities such as welding, grinding, cutting, drilling, and casting expose students to injuries, fire risks, and respiratory hazards. According to Arinze and Sani (2020), the use of defective machines, absence of safety guards, improper wiring, and poor ventilation are common problems in many technical school workshops.

Research by Yusuf and Abubakar (2018) revealed that in several Nigerian technical colleges, workshop safety is often taught theoretically but poorly implemented during practical sessions. Students either lack access to basic PPE (e.g., gloves, goggles, boots) or are not monitored consistently during machine use. Moreover, safety signage, fire extinguishers, and first aid boxes are either missing or non-functional in many cases.

2.5 Factors Influencing Compliance with Safety Policies

1. Several factors influence the degree to which students and instructors comply with safety policies in technical colleges:
2. Knowledge and Awareness: Students with higher exposure to safety training are more likely to comply (Akinlabi & Ogunyemi, 2019).
3. Supervision and Enforcement: Inconsistent monitoring and lack of consequences for safety violations reduce compliance.
4. Availability of Equipment: Even when policies exist, compliance is hindered by the unavailability of PPE and faulty workshop infrastructure.

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5. Attitudes and Habits: A negative attitude toward safety rules, often due to peer influence or poor safety culture, can lead to negligence and risky behavior.

3. Methodology

The study employed a descriptive survey research design, which is appropriate for assessing the views, practices, and behaviors of a defined population without manipulating variables. The design enabled the researcher to obtain empirical data on the extent of compliance with industrial safety policies and the practical application of safety measures in metal workshops across technical colleges in Kebbi State. The descriptive nature of the study made it possible to capture the real-time safety experiences of students and identify institutional factors influencing compliance. The target population of the study consisted of all 120 final-year metalwork students from the four recognized technical colleges offering metalwork education in Kebbi State. These institutions include: Federal Science and Technical College, Zuru, Government Science and Technical College, Zuru, Government Science and Technical College, Saminaka, Government Science and Technical College, Bunza. No sampling technique was employed, as the population size was small and manageable. Thus, the entire population was studied using the census method to ensure full coverage and increased reliability of results. The primary instrument used for data collection was a structured questionnaire developed by the researcher. The questionnaire consisted of two main sections. The draft questionnaire was subjected to face and content validation by three experts: One specialist in Technical and Vocational Education (TVE). One expert in Educational Measurement and Evaluation. One industrial safety consultant. The validators reviewed the instrument for clarity, relevance, and alignment with the study objectives. Their feedback informed necessary adjustments to ensure construct validity. A pilot study was conducted using 15 metalwork students from a nearby technical college in Niger State not included in the main study. The internal consistency of the instrument was determined using the Cronbach's Alpha method, yielding a reliability coefficient of 0.87, indicating high reliability and suitability for data collection. With appropriate permissions from school authorities, the researcher administered the questionnaires in person to all final-year metalwork students in their respective institutions. Respondents were briefed on the purpose of the study and assured of confidentiality and anonymity. A total of 120 copies of the questionnaire were distributed and all were returned, representing a 100% response rate. Data collected were coded and analyzed using descriptive statistics, specifically: Mean ($\bar{X}$) to determine the central tendency of responses. Standard Deviation (SD) to assess the level of variability in students' perceptions and practices. A criterion means of 3.00 was adopted as the decision benchmark: $\bar{X} \geq 3.00$: Indicates high compliance or agreement with safety practices. $\bar{X} < 3.00$: Indicates low compliance or poor safety practice. The analysis was performed using the Statistical Package for Social Sciences (SPSS) version 25.

4. Results and Discussion

This section presents the analyzed data using descriptive statistics (mean and standard deviation) in response to the two research objectives. The results are organized in tabular form, followed by interpretive discussion under each objective.

Research Objective 1:

To determine the level of students' compliance with industrial safety policies and procedures in metal workshops of Technical Colleges in Kebbi State.

Table 1: Mean Ratings of Students' Compliance with Industrial Safety Policies (N = 120)

S/N	Safety Practice Statement	$\bar{X}$	SD	Decision
1	I always wear personal protective equipment (PPE) during metalwork practicals.	3.82	0.91	High
2	I follow safety signs and warnings displayed in the workshop.	3.65	1.03	High
3	I switch off machines before leaving my workstation.	3.72	0.88	High
4	I know how to respond in case of a fire outbreak or emergency.	3.45	1.12	High
5	I attend regular safety briefings or orientation sessions.	2.78	1.25	Low
6	I report safety hazards or faulty equipment to instructors.	3.21	1.01	High
7	I clean and organize my workspace after practical sessions.	3.68	0.95	High
8	I avoid operating machines without proper guidance or training.	3.91	0.82	High
9	I handle tools and equipment according to the safety rules taught.	3.76	0.89	High
10	I participate in workshop safety drills or simulations.	2.63	1.34	Low
	Grand Mean	**3.46**		**High**

Source: Field work 2025

Decision Rule: Mean ≥ 3.00 = High Compliance; Mean < 3.00 = Low Compliance

Discussion of Findings (Objective 1)

The results in Table 1 reveal an overall **high level of compliance** among students with a grand mean of **3.46**. Students reported consistent use of PPE ($\bar{X}$ = 3.82), adherence to safety signage ($\bar{X}$ = 3.65), and machine shut-down procedures ($\bar{X}$ = 3.72), indicating that safety habits are reasonably well embedded in daily workshop practice.

However, two critical areas scored **below the benchmark of 3.00**: participation in safety briefings ($\bar{X}$ = 2.78) and involvement in emergency drills ($\bar{X}$ = 2.63). These results suggest a gap in institutionalized safety education and practical training for emergency scenarios. Although students know how to use tools safely and avoid machine misuse, the **absence of structured orientation and safety drills** could hinder preparedness for real-life emergencies.

These findings align with the work of Shehu and Ibrahim (2022), who observed that Nigerian technical students often rely more on

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informal peer learning and instructor guidance rather than formalized safety training. Hence, while compliance exists, it appears to be driven more by common sense and supervision than by structured institutional programs.

Research Objective 2:

To identify the challenges affecting the effective implementation of safety practices in metalwork training environments.

Table 2: Mean Ratings of Challenges to Safety Policy Implementation (N = 120)

S/N	Identified Challenge	$\bar{X}$	SD	Decision
1	Inadequate supply of personal protective equipment (PPE)	3.89	1.07	Major
2	Lack of fire extinguishers, signage, and first aid kits	3.76	1.10	Major
3	Poor workshop ventilation and lighting	3.58	0.97	Major
4	Overcrowded workshop spaces during practical sessions	3.61	1.12	Major
5	Inconsistent monitoring and enforcement of safety policies by instructors	3.47	1.15	Major
6	Students' carelessness and nonchalant attitudes toward safety	3.25	1.06	Major
7	Absence of regular training or safety briefings for students	3.81	1.09	Major
	Grand Mean	**3.62**		**Major**

Source: Field work 2025

Decision Rule: Mean ≥ 3.00 = Major Challenge; Mean < 3.00 = Minor Challenge

Discussion of Findings (Objective 2)

All listed items in Table 2 scored above the benchmark of 3.00, indicating that students perceive **multiple institutional and behavioral factors** as significant barriers to effective safety implementation. Chief among these were inadequate supply of PPE ($\bar{X}$ = 3.89), absence of critical safety infrastructure such as fire extinguishers and first aid kits ($\bar{X}$ = 3.76), and lack of routine safety briefings ($\bar{X}$ = 3.81).

These findings mirror those of Ezenwafor and Okonkwo (2020), who concluded that many Nigerian technical schools have outdated or non-functional safety systems and insufficient funding to support routine hazard prevention. Students also pointed to **overcrowded workshops ($\bar{X}$ = 3.61) and poor instructor supervision ($\bar{X}$ = 3.47)** as contributing factors to unsafe practices. The moderate rating on **student carelessness ($\bar{X}$ = 3.25)** implies that while institutional constraints dominate, some behavioral issues also require targeted intervention.

This suggests that improving safety in technical college workshops will require both structural investments (equipment, signage, ventilation) and attitudinal reorientation through continuous safety education and enforcement.

5. Conclusion

This study assessed the level of compliance with industrial safety policies and the practical implementation of safety measures in metal workshops across four Technical Colleges in Kebbi State, Nigeria. The findings revealed that while students generally exhibit a moderate-to-high level of safety compliance particularly in areas such as PPE use, machine shutdown procedures, and proper tool handling there are significant gaps in institutional support and training structures.

Specifically, students reported low participation in safety briefings and emergency drills, indicating a lack of formalized safety education beyond day-to-day supervision. Furthermore, major challenges such as inadequate PPE supply, absence of first aid kits and fire extinguishers, overcrowded workshops, and inconsistent policy enforcement were identified. These issues compromise the overall effectiveness of safety policy implementation in metalwork training environments and place students at risk of accidents and injuries.

The study thus concludes that while safety awareness exists among students, systemic deficiencies in infrastructure, training, and supervision hinder full compliance. Bridging this gap requires deliberate efforts from school authorities, policymakers, and curriculum developers to institutionalize safety culture in technical education.

6 Recommendations

In light of the findings, the following recommendations are made:

1. Technical colleges should be equipped with functional safety infrastructure, including PPE, fire extinguishers, first aid kits, safety signage, and emergency exit plans.
2. A standard checklist should be developed and used for weekly safety audits by school administrators or workshop supervisors.
3. Mandatory safety orientation programs should be conducted at the beginning of every term for both students and workshop staff.
4. Where workshop spaces are overcrowded, split sessions or batch-based practicals should be introduced to reduce student-to-equipment ratios.
5. Governments and stakeholders should allocate special funds for procurement of modern tools and safety devices that reflect current industry standards.
6. The National Board for Technical Education (NBTE) and NCCE should revise the metalwork curriculum to include a dedicated unit on industrial safety policies and practices.
7. Safety topics should be practically assessed through observations, role plays, or case-based evaluation to ensure that students internalize safety knowledge.
8. Kebbi State Ministry of Education should establish a Safety Compliance Monitoring Unit to oversee enforcement in all technical colleges.

7 Suggestions for Further Research

Future studies should:

1. Explore instructors' perspectives on safety policy implementation to identify gaps in teacher training and responsibility.

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2. Conduct longitudinal studies to examine changes in compliance levels over time and in response to interventions.
3. Extend the study to private and urban-based technical institutions to allow for comparative analysis across different operational contexts.

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