

## School Workshop Safety Practices and Students' Skill Acquisition in Electrical Installation Works in Technical Colleges in Akwa Ibom State

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### Abstract

The study was designed to determine the relationship between School Workshop Safety Practices and Students' Skill Acquisition in Electrical Installation Works in Technical Colleges in Akwa Ibom State. Two research questions and two hypotheses were formulated for the study. The population for the study was 45 which comprised 27 Electrical Installation teachers and 18 Workshop assistants in the six Technical Colleges in Akwa Ibom State. No sampling was taken as the whole population was used for the study. An instrument called School Workshop Safety Practices and Students' Skill Acquisition in Electrical Installation Works (SWSPSSAEIW) was used to collect data. The collected data were analysed using Pearson-Product-Moment-Correlation Coefficient (PPMC). The results from the study showed that adherence to electric shock preventive measures and regular safety audits relate positively to students' skill acquisition in Electrical Installation Works. It was recommended among others that Electrical Installation students should be properly taught on how to keep maintenance record of equipment in the workshop and teachers of electrical installation should ensure that electrical students are well groomed on how to carry out accident investigation procedures.

**Keywords:** Safety, School, Workshop, Electrical Installation, Teachers

### Introduction

A workshop is defined as a place where the learner may experiment, test, construct, dismantle, repair, design, create, imagine, and study (Okorie, 2001). Going by this definition, a workshop is an essential facility for the study and practice of Technical/Vocational Education. As a matter of facts, various types of workshops are in use, some of which are the single unit, General unit and Mobile shop.

Numerous activities taking place in the school workshop involve the use of tools, machines most of which can cause serious accidents if safety consciousness is not observed effectively. Kadiri (2006) cited in Muhammed (2010) defined safety as a condition of being protected against physical, social, occupational accidents, harm or any other events. According to the author, it is the responsibility of both staff and students to ensure safety of themselves and people around them. Mbaba (2000) opined that any Technical school that ignores safety practices or pays lip service to its implementation does so at its own risk because the losses it will encounter will be enormous.

Okorie (2001) observed skill acquisition as the bedrock of modern educational practices needed to fit individuals into the world of work, education for living (life skills) and self reliance. This implies that acquired skills enable individuals to develop their intellectual, physical, social, emotional and economic capacities. Skill acquisition is best defined from the point of view of the learner as the process of obtaining knowledge of technical and practical nature from an individual, group or institution that can impart such knowledge.

School workshop safety practices such as regular safety audits, adherence to electric shock preventive measures among others, if effectively implemented and enforced could enhance a meaningful students' skill acquisition in Electrical Installation Works in Technical Colleges in Akwa Ibom State. Electrical installation works in this context refer to all forms of fixing of electrical equipment, machines, cables, etc. these include Electrical domestic installation, Industrial installation, winding of electrical machines, repair of electrical machines and equipment, Battery maintenance, repairing and charging among others.

Basically, a number of researches have been carried out in an attempt to boost students performances in the shop, yet a lot of students are still lagging behind in the area of skill acquisition. Worried over this development, necessitated the study entitled "School Workshop Safety Practices and Students' Skill Acquisition in Electrical Installation Works in Technical Colleges in Akwa Ibom State".

### **Statement of the Problem**

Accidents and injuries are common in school workshops (Alake, 1992). Specially, in Electrical workshops of the Technical Colleges in Akwa Ibom State, a number of factors might be instrumental to the occurrence of accidents and injuries. Some of these factors are unsafe acts of people, contributing causes (acts that can lead to the cause of accident but cannot cause accident) and unsafe conditions (Muhammad, 2010).

In a nutshell, lip service is paid to school workshop safety practices by both Electrical teachers and students as regards enforcement and compliance. These developments have in no small measure militated against students' skill acquisition in Electrical Installation Works. Consequently, a greater percentage of school leavers who studied Electrical Installation in the Technical Colleges are unable to prove their mettle in numerous firms, industries and other establishments they find themselves.

From the researcher's point of view, if these ills militating against students' skill acquisition in Electrical installation works are not stamped out or drastically reduced, it will be very difficult for Electrical installation students to acquire useful skills.

### **Purpose of the Study**

The purpose of the study was to determine the relationship between School Workshop Safety Practices and Students' Skill Acquisition in Electrical Installation Works in Technical Colleges in Akwa Ibom State. Specifically, the study sought to determine the relationship between:

1. regular safety audits and Students' Skill acquisition in Electrical Installation Works; and
2. adherence to electric shock preventive measures and Students' Skill acquisition in Electrical Installation Works.

### **Regular Safety Audits and Students' Skill Acquisition in Electrical Installation Works.**

Safety audit as a safety practice is a systematic approach to evaluate potential hazards and to recommend suggestions for improvement. It is an important tool for identifying deterioration of standards, areas of risks or vulnerability, hazards and potential accidents in an Office, Facility or Plant for determining necessary action to minimize hazards and for ensuring that the whole safety effort is effective and meaningful. This practice, if embraced in electrical shop would in no small measure bring about a remarkable students' skills acquisition.

According to Brayant (1992) cited in Yakubu (2004), audit safety system is a management tool which is used in positive terms to evaluate "the 'state of act' of the safety programme". Brayant emphasized that it is a most useful system required when performance is known to be low and efforts are required to stimulate additional ones. The audit system involves the use of supervisory methods, which identify hazards situations or circumstances such as physical items like faulty tools, equipment or machines and non-physical items working methods, lack of discipline, lack of training, failure to follow procedures or use of incorrect equipment to mention a few. Actually, the management method of measuring safety activity through reporting, recording and investigating equally identify hazardous situation. The records of safety performances are subjected to analysis. This performance trend in the organization is used to find remedy for the present and make forecast or projection to the future safety conditions. Basically, the approach is very relevant and could be useful to training and practice during operation in the laboratory.

However, Alan (1998), viewed safety audit as an inventory or checklist of the features in the shop which one feels affects his or her safety. These features include the electrical accessories, tools, equipment, etc. Safety audit allows action to be taken to correct these features. Whether there is sufficient lighting, whether one would be heard if one called for help, whether there are people who can help, or improvements you would like to see to enhance safety are questions whose answers help determine the appropriate action to take. Alan further added that the goal of a safety audit include:

- Identification of potentially hazardous electrical situations and provision of corrective actions for these situations;
- Determination of electrical system and electrical safety compliance with National Electrical code;
- Review and provision of corrective actions for electrical safety work processes;
- Identification of potential cost savings and efficiencies through modifications of electrical system. Generally, safety audit is to identify and, if possible, to improve an environment (shop) to make it safer and less threatening for its users. The result will be reduced opportunities for anti-social behaviour in the shop. Of course, a safety audit is a simple but powerful tool. Its strength lies in each person's direct experience, as with expert on his or her own neighbourhood.

John and Randolph (1986), opined that safety audits are designed to inspire users of the laboratories or workshops to get involved, and to challenge them to work for change in parts of their neighbourhood where they feel unsafe or uncomfortable. According to the authors, safety audit areas include:-

- Electrical safety audit,
- Fire safety audits,
- Occupational Health Hazards and First aid,
- House keeping,

- Documentation on company policies on safety,
- Documentation on preventive maintenance and practices and
- Employees Awareness on safety, Drills and Training levels.

This implies that safety audit is a necessity as far as school shop is concerned if students must acquire useful skills in electrical installation works.

## 2.6 Adherence to Electric Shock Preventive measures and Students' Skill Acquisition in Electrical Installation Works.

Students' skill acquisition in Electrical shop could be enhanced if the students and teachers are adequately protected from Electric Shock. The Institute of Electrical Engineers (1999), viewed electrical shock as the effect of passing electric current through the Body. The minimum current a human can feel is thought to be about 1 milliampere (mA). The extent of the injury will depend upon the quantity or amount of current which flows through the body, the path or course of the current through the body, the duration or length of time the victim is in contact with the circuit, the kind of electrical energy, and the physical condition of the victim.

According to the Institute of Electrical Engineers (IEE), some of the effects of electric shock are:-

**Psychological:** The perception of electric shock can vary, depending on the voltage, duration, current, path taken, frequency, and other factors. Current entering the hand has a threshold of perception of about 5 to 100mA for direct current (DC) and about 1 to 10mA for alternating current (AC) at a frequency of 60 hertz(Hz). Shock perception declines with increasing frequency, ultimately disappearing at frequencies above 15-20KHz.

**Burns:** Heating due to resistance can cause extensive and deep burns. Voltage level of 500 to 1,000 volts tend to cause internal burns due to the large energy (which is proportional to the duration multiplied by the square of the voltage) available from the source. Damage due to current is through tissue heating. In some cases, 16 volts might be fatal to a human being when the electricity passes through organs such as the heart.

**Ventricular Fibrillation:** A low-voltage (110 to 220v) alternating current of 50 or 60Hz through the chest for a fraction of a second may induce ventricular fibrillation, when the current is as low as 60mA. With direct current, 300 to 500mA is required. If the current has a direct pathway to the heart, a much lower current of less than 1mA, (AC or DC) can cause fibrillation. Fibrillation are usually lethal because all the heart muscle cells move independently. Above 200mA, muscle contractions are so strong that the heart muscles cannot move at all.

**Neurological effects:** The current may interfere with control of the nervous system, especially over the heart and lungs. Repeated or severed electric shock that does not lead to death has been shown to cause neuropathy. When the current path is through the head, it appears that, with sufficient current, loss of consciousness almost always occurs swiftly.

According to National Safety Council (1992), electrical shock could be caused by unsafe work practices, defective equipment and lack of knowledge of the dangers of electricity.

**Defective equipment:** The types of equipment involved in electrical accident range from motor-driven equipment, control devices, portable electric tools, switches, panel, cutouts, conductors, plugs, and fuses to electric extension cords. A variety of equipment conditions involving various types of equipment creates many electrical hazards. Some of the common defects of tools and equipment are listed as follows:-

- Improperly grounded equipment (ground wires missing, broken, or improperly connected).

- Open conduits, switch boxes, damaged or worn connections, and exposed live wires.
- Improperly connected power tools and defective insulation in portable tools.
- Defective switches, receptacles, extension cords, and camp sockets.
- Insulation which is defective, inadequate, worn, frayed, wet, oily or deteriorated, creating short circuit possibilities and energizing equipment frames.

**Unsafe Practices:** Unsafe practices and work procedures result in electric shock and fires. Some of the common unsafe acts committed in shops are:-

- Using ungrounded equipment and portable tools or removing ground connections.
- Overloading of circuits or overfusing circuits by the use of wrong size or type of fuse.
- Failure to use suitable protective equipment, gloves, rubber mats, etc for electrical installation and repair.
- Use of metal ladders while working on electrical equipment.
- Installation of electrical facilities which do not meet the National Electrical Code.
- Work practices which damage motors, insulation wires, or electrical accessories.
- Using defective tools or equipment in need of repair.
- Unsafe cleaning of electrical panels switch boxes, motors, and other electrical equipment with water or dangerous solvents.
- Failure to de-energize circuit before working on equipment.

**Lack of Knowledge:** It might be said "that 'ignorance' is no excuse for causing electrical accidents". Unfortunately a number of electrical accidents do happen because "the individuals 'just didn't know any better' as a matter of fact". Too many people lack an understanding of electricity, a situation which can be remedied through adequate supervision and sound educational programme.

Kneeland, Timothy and Warren (2008), in relation to prevention of an electric shock recommended that people should avoid working on exposed live conductors as much as possible. In the school shop, a positive programme of action which encompasses education and training of the students must be embraced. These authors added that students should be taught the basic concepts necessary for an adequate understanding of electrical energy. Safety practices should be taught to the students, making certain that the reasons for following definite procedures are known to them. Teachers on the other hand, should analyse the shop environment and list all possible sources of electrical hazards. Each item on the list should be discussed with students, and the safe practices which attend each hazard should be taught to all concerned. When students fully understand the causes and results of electrical accidents, they should be encouraged to assist the instructor in identifying present hazards and potentially dangerous situations.

Generally, for a meaningful students' skills acquisition in Electrical Installation works in the school shop, adequate programme for the prevention of electric shock must rest upon:

- correct installation of equipment;
- intelligent selection and purchase of equipment;
- periodic inspection of equipment;
- regular maintenance; and
- education of students for the safe use of electrical energy.

## Methodology

The survey design was adopted for this study. The target population for the study was 45 Electrical Installation teachers and Workshop assistants. This population was made up of 27 Electrical installation teachers and 18 workshop assistants obtained from the six government owned

Technical Colleges in Akwa Ibom State. There was no sampling since all the respondents involved in the study were used. A 30 item structured questionnaire entitled "school Workshop Safety Practices And Students' Skill Acquisition in Electrical Installation Works" (SWSPSSAEIW) was used for the study. The questionnaire was made up of three sections A, B and C. Section A solicited information on personal data of the respondents, Section B was divided into two parts which solicited information on Regular safety audits and adherence to electric shock preventive measures. Section C elicited information on skill acquisition in Electrical Installation works. Responses were measured on a 4-point rating scale. The instrument was subjected to face validation by three experts from the department of Vocational Education, University of Uyo, Uyo. The data generated in the study were analysed using the Mean statistic while the Pearson's Product Moment Correlation (PPMC) was used to test the hypothesis at .05 level of significance.

## Result

The summary of the Mean statistic and PPMC are presented on Table 1, 2, 3, and 4.

### Research Question 1

What is the relationship between regular safety audits and students' skill acquisition in Electrical installation work in Technical Colleges in Akwa Ibom State?

**Table 1:** r-value showing the relationship between regular safety audits and students' skill acquisition in electrical installation works.

Variables	N	Sum of scores	Mean scores	Computed r-value
Regular safety audits	45	1736	38.578	0.580
Students' skill acquisition	45	3601	80.022	

Table 1 shows that the Mean score for regular safety audits is 38.578 while the Mean score for students' skill acquisition is 80.022 and the computed r-value is 0.580. This result implies that there exist a positive relationship between regular safety audits and students' skill acquisition in Electrical installation works.

### Research Question 2

What is the relationship between adherence to electric shock preventive measures and students' skill acquisition in Electrical Installation works in Technical Colleges in Akwa Ibom State?

**Table 2:** r-value showing the relationship between adherence to electric shock preventive measures and students' skill acquisition in electrical installation works.

Variables	N	Sum of scores	Mean scores	Computed r-value
Adherence to electric shock preventive measures	45	1914	44.533	0.7360
Students' skill acquisition	45	3601	80.022	

Table 2 indicates that the Mean score for adherence to electric shock preventive measures is 44.533; the mean score for students' skill acquisition is 80.022 and the computed r-value is 0.733. The implication of this result is that the respondents have agreed that there exist a significant relationship between adherence to electric shock preventive measures and students' skill acquisition in Electrical Installation Works.

HO<sub>1</sub>: There is a no Significant relationship between regular safety audits and students' skill acquisition in electrical installation works in Technical Colleges in Akwa Ibom State.

**Table 3:** Pearson Product Moment Correlation analysis between regular safety audits and students' skill acquisition in electrical installation works.

N= 45

Variables	$\sum X$ $\sum Y$	$\sum X^2$ $\sum Y^2$	$\sum xy$	Cal. r-value	Crit. r-value	decision
Regular safety audit (x)	1736	68248	139846	0.5799	0.276	*
Students' skill acquisition (y)	3601	290163				

\* Significant at .05 level of significance.

Table 3 shows that the calculated r-value of 0.5799 is greater than the critical r-value of 0.276 at .05 level of significance with 43 degree of freedom. Hence, the null hypothesis is rejected. This shows that there is a significance relationship between regular safety audits and students' skill acquisition in Electrical installation works in Technical Colleges in Akwa Ibom State.

HO<sub>2</sub>: There is no significant relationship between adherence to elective shock preventive measures and students' skill acquisition in Electrical installation works in technical Colleges in Akwa Ibom State.

**Table 4:** Pearson Product Moment Correlation analysis between adherence to electric shock preventive measures and students' skill acquisition in electrical installation works.

N= 45

Variables	$\sum X$ $\sum Y$	$\sum X^2$ $\sum Y^2$	$\sum xy$	Cal. r-value	Crit. r-value	decision
Adherence to electric shock preventive measures (X)	1914	82060	15400	0.7333	0.276	*
Students' skill acquisition (y)	3601	290163				

\* Significant at .05 level of significance.

Table 4 shows a calculated r-value of 0.7333 which is greater than the critical r-value of 0.276 at .05 level of significance with 43 degree of freedom. Therefore, the null hypothesis is rejected. This implies that there exist a significant relationship between adherence to electric shock preventive measures and students' skill acquisition in Electrical Installation works in Technical Colleges in Akwa Ibom State.

## Discussion

On research question 1, the result of data analysis shows that regular safety audits positively relates to students' skill acquisition in electrical installation works. The findings from table 3 show that there is a significant relationship between regular safety audits and students' skill acquisition in electrical installation works. These findings are consistent with the opinion of Brayant (1992) cited in Yakubu (2004) which opines that audit safety system is a management tool which is used in positive terms to evaluate the state of act of safety programme. In Brayant opinion, safety audit involves the use of supervisory methods which identify hazards situations or circumstances such as physical item like faulty tools and equipment among others. This implies that safety audit is a necessity as far as school shop is concerned if students must acquire useful skill in electrical installation works. The study of Alan (1998) viewed safety audit as an inventory or checklist of the features include the electrical accessories, tools, equipment, etc. According to the researcher, safety audit allows action to be taken to correct these features.

Data in table 2 indicate that adherence to electric shock preventive measures and students' skill acquisition in electrical installation works relates to each other.

In table 4, result shows that there is a significant relationship between adherence to electric shock preventive measures and students' skill acquisition in electrical installation works. The findings of the study are in line with the views of Kneeland, Timothy and Warren (2008) who in relation to prevention of an electric shock recommended that people should avoid working on exposed live conductors as much as possible. In the authors opinions, students should be taught the basic concepts necessary for an adequate understanding of electrical energy. This implies that when students fully understand the causes and result of electrical accidents in the shop, they will be free to practice and acquire useful skills in electrical installation works.

## Conclusion

Based on the findings of the study, the following conclusions are made:-

1. Regular safety audits and students skill acquisition in electrical installation works relates to each other.
2. A greater percentage of the electrical students do not have adequate knowledge of accident investigation procedure.
3. There is a positive relationship between adherence to electric shock preventive measures and students' skill acquisition in electrical installation works.
4. A greater number of electrical students not been taught how to keep maintenance record of equipment and machines.

## Recommendations

On the basis of the above findings, it is pertinent to proffer the following recommendations:-

1. Teachers of electrical installation should ensure that electrical students are well groomed with regard to accident investigation procedures.
2. Electrical students should be properly taught on how to keep maintenance record of equipment in the shop.



3. The state government should make provisions for periodic following-up studies of former graduates of Technical Colleges in the state to collect information for curriculum development.

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