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Methodological Needs of Electrical/Electronics Workshop Accident Prevention in Technical Colleges in South Western Part of Nigeria

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Abstract
The major purpose of the study was to determine methodological needs of electrical/electronics workshop accident prevention in technical colleges in south western part of Nigeria. Two research Questions were answered. The study adopted a descriptive survey design. The population for the study was sixty six (66) comprised of forty two (42) electrical /electronics teachers from technical colleges, Ogun state and twenty four (24) electrical/electronics teachers from technical colleges, Oyo state. No sampling was adopted because the population was of manageable Size. The internal consistency of the instrument was ascertained using Cronbach Alpha method and reliability coefficient obtained for the instrument was 0.99. Structured questionnaire containing 39 items was designed and used for data collection. Mean and standard deviation were used to analyze research questions. The findings of the study revealed that accidents in electrical/electronics workshops are caused by failure to de-energize or isolate the electrical energy source prior to maintenance activities; accidents in school workshops can result to reduction in students' enrolment. The findings of the study revealed that electrical/electronics workshop accidents can be prevented by covering all the potentially dangerous electric conductors with protective pane. It was recommended that workshop attendants or technologists should be recruited and updated always for proper monitoring of students' activities inside workshop.

INTRODUCTION

In Nigeria, Technical Colleges are training centres for producing the young manpower for a country's economic growth and development. Abdulrauf (2012) defined technical colleges as institutions where specific knowledge and practical skills required for specific trade, employment or professional craftsmen, technicians, or similar level in business and industry are imparted or taught. Technical colleges aim to provide functional vocational, technological and scientific skills, knowledge and attitudes which individuals need to gain entry to and progress in a selected occupation. United Nations Educational, scientific and Cultural Organization (UNESCO) and National Board for Technical Education, (NBTE), (2001) reported that the aim of technical colleges' curriculum is to give training and impart the necessary skills leading to the production of craftsmen, technicians and other personnel who will be enterprising and self-reliant. Technical colleges enroll students who must not be less than 14 years of age and should have successfully completed three years of junior secondary education or its equivalent (UNESCO & NBTE, 2001). The students are admitted and trained for different occupational areas. Technical college students are introduced to different subjects and courses including electrical/electronic trade. Federal Republic of Nigeria, FRN, on her National Policy on Education (2004), opined that the range of courses in the technical colleges shall be as wide as possible to include but not limited to: Mechanical Trade, Computer Craft Practice, Building Trades, Wood Trades, Hospitality, Textile Trades, Printing Trade, Beauty Culture Trade and Electrical Engineering Trades among others.

The electrical Engineering trades cover electricity/electronics subjects. Federal Republic of Nigeria, FRN, (2004) highlighted three subjects that are subsumed into electrical engineering trade: Electrical installation and maintenance work; Radio, television and electronics work; and Appliances repairs. Electricity, according to Grob cited in James (2009), is an invisible force that can produce heat, light and motion, and many other physical effects. Electricity implies a form of energy generated, transmitted, and converted into heat, light, motion, and other forms of energy through natural processes such as lightning, as well as by devices built by people such as generators and alternators. Anaemena (2000) asserted that electronics is a physical science that deals with the study of the properties and behavior of electrons under all conditions, especially with reference to technical and industrial application. Electronics, according to Amos & Amos (1999), is the study of the conduction of electricity in a vacuum, in gases and in semiconductors. The authors stated further that electronics is concerned with method of generating and controlling charge carriers such as electrons, holes and ions in, for example, electron of tubes and transistors and with applications for such devices. The relative difference between electricity and electronics is in the quantity and nature of electric current used in each field. In electricity, high alternating currents and voltages are involved whereas electronics functions with minute direct current and voltage. United Nations Educational, Social and Cultural Organization (UNESCO) and National Board for Technical Education (NBTE), (2001) stated that the curriculum of each programme including Electrical/Electronics is broadly divided into three components: General education which accounts for 30% of

the total hours required for the programme; Trade theory, trade practice and related studies which account for 65%; and Supervised Industrial Training/work experience which accounts for about 5% of the total hours required for the programme.

The trade practice and supervised industrial training/work experience in the curriculum require laboratory or workshop exercises and practices for the practical part of the training to be acquired by the students. Ezeji (2004) described laboratory as a unique learning situation in which the learners may experiment, test, construct, disassemble, repair, design, create, imagine, and study. Workshop, according to Okorie in Ofonmbuk and Ekereobong (2012), is defined as a place where the learners may experiment, test, construct, dismantle, repair, design, create, imagine, and study. Mammam (2008) submitted that electrical/electronics workshop is a place where electrical and electronics equipment and materials for practical lessons are kept and utilized for training in skill acquisition. The workshops and laboratories are essential and highly needed in technical colleges for imparting the practical skills needed by students to develop in their career choice, and also for teachers to improve on skills they have acquired. For practicals to be done properly in laboratory and workshop, training equipment; instrument; tools and consumables, as listed by United Nation Educational, Social and Cultural Organization (UNESCO) and National Board for Technical Education (NBTE), (2001) are needed to be at students and teachers disposal. Students interact with these instructional resources for proper habit formation under the guidance of teachers. Most of the equipment, tools, instruments and consumables are expensive, fragile, delicate, risky and dangerous. They require special skills, competencies, and care for handling them. During the course of interactions, mistakes which can be caused by ignorance, lack of knowledge and carelessness are made which may result to accidents.

Accidents are anxietic, sudden and unexpected event or situation without forewarning that can result into loss of materials, injury and death. Accident, according to Jorgensen in Tuuli (2010), is a result of a chain of events in which something has gone wrong, resulting in an undesired conclusion. Jorgensen in Tuuli defined electrical accidents as events resulting from either personnel action or equipment failure involving electrical installations that has the potential to result in an injury due to electrical flash and/or burn and Electric shock from a source greater than 50V. Accident in electrical/electronics workshops and laboratories can occur in a number of forms. The electrical/electronics workshop accidents can be electric shock, electrocution and other general workshop accidents. National Institute for Occupational Safety and Health, (2009) asserted that electric accidents can be fire outbreak, electric shock, explosions, and burns.

Accident in the school workshop has traumatic effect on students, teachers and material properties in the school system. Lar (2013) opined that consequence of accidents is related both to what is damaged and the magnitude of the damage. Accident maims, kills and causes loss of valuable resources in general workshops and in specific electrical/electronic laboratories and workshops. Effect may be death, injury or loss of valuable properties. Nichols (2005) reported that National Safety Council estimated that, more than 24,000 accidents were sustained by students in a year in United State of America. The author stated further that those Figures represent only accidents which were reported, and caused property damage or resulted in the loss of at least one half day of the school by the students. United States Department of Health and Human Service in Nichols (2005) also reported that the actual accident figures for students in vocational/technical institutions would be much greater in number nowadays if all accidents were reported. In Nigeria also, numbers of accident cases were reported. Olagbegi, Kwasi and Ugbi (2013) reported that in production department, University of Benin a technician was almost electrocuted to death. Also, Osang, Obi and Ewona (2013) reported that in 2008, a first year student in Cross River University of technology was rushed to hospital during practical experiment in chemistry laboratory due to chemicals which was wrongly mixed by self. Thus, the visible effect of an accident in the schools workshops and laboratories demand urgent and immediate actions ranging from the identification of the causes and prevention accidents in the school workshops.

Accidents are caused by number of factors. Washington State Department of Labor and Industries (2009) reported that from experience and analysis accidents are caused by occurrences. The department also reported that accidents are the logical outcome of hazards caused by things people do or fail to do. This shows that before accidents can occur, there should be initiating factors which Ward (2009) described in question form: what must be present to provide opportunity for an accident to occur? Ward stated that this necessary factor is hazard, something which in itself present no danger but when activated leads to damages or injuries. Hazard is an inherent property of a substance, agent, and source of energy or situation having the potential of causing undesirable consequences or effects (Work Cover Corporation, 2004). Occupational Safety and Health Organization, OSHA, (2003) stated that hazards exist in every workshop in many different forms: sharp edges, falling objects, flying sparks, chemicals, noise and myriad of other potentially dangerous situation. Hazards in electrical/electronics workshops include: Faulty equipment or machines, improper organization of the workshops and laboratories, unjust and unsafe abandonment of naked life wires or cables, working with life and high current without putting on necessary protective equipments, using defective tools or equipment, unjust placement of very hot soldering iron on object with low melting point and so on. United State Department of Labor (2002)

submitted that most electrical accidents result from the following three factors: unsafe equipment or installation, unsafe environment and unsafe work practice. These with other actions may deteriorate the situation of electrical/electronics school workshops and laboratories which may latter lead to traumatic effects. It is therefore necessary to take appropriate measures for accident prevention in electrical/electronic workshops and laboratories.

Accident prevention strategy implies a process by which all necessary actions are taken to avoid accident from occurring in workshop. Heinrich in Brown (2000) defined Accident prevention as an integrated program, a series of coordinated activities, directed to the control of unsafe personal performance and unsafe mechanical conditions, and based on certain knowledge, attitudes, and abilities. Aggregate & Sand Producers Association of Southern Africa, ASPASA, (2011) opined that accident prevention requires the creation and maintenance of safe working environment, and the promotion of safe behavior. Accident prevention programme include safety, maintenance, training and monitoring measures to prevent accident from happening (Fahad, 2000). Occupational Injury Data from industry studies indicated that the injury rate is highest during the initial period of employment and decrease with experience (United State Consumers Product Safety Commission, 2006). The commission further submitted that similarly in a high school laboratory setting where students experience new activities, the likelihood of accidents, injuries and damage is high. Accident facts in Okon (2011) stated that there is wide scale of accidents that take place in technical colleges' laboratories due to carelessness or lack of safety practice skills by students. It is therefore necessary to give electrical/electronics students required skills and safety information on laboratory and workshop interactions or activities before they should be allowed to take part. This should be a major function of technical school teachers.

Teacher inculcates into students knowledge, skill and experience which can help the students function effectively in society. Teacher, according to Olusegun (2009), is someone who is engaged by an educational institution to instruct either in private or public. Teacher, according to Olusegun, is a person who has completed a minimum programme of professional teacher education and has met other requirements of teaching certification. Ogbaunya and Usoro (2009) explained that technical teachers are those who obtained technical training/theories and practice of education that are related to the advancement of knowledge, skills and attitude among youths, who will later use the knowledge and skills acquired to improve and solve environmental problems. Teachers are the embodiment of knowledge who guide the students and facilitate teaching and learning situation. Nichols in Nichols (2005) submitted that while the immediate job of preventing accidents in industry is usually the responsibility of the foreman or safety supervisor, in educational laboratory the job falls upon the teacher. Teachers as facilitators of workshop and laboratory activities are required to present the practical skills and knowledge to students with safety in mind. Teachers should plan and arrange the laboratory and workshop according to the standards and specifications and be able to provide students with information that can ensure precautionary actions anytime they are carrying out activities in the laboratory and workshop environment. These responsibilities require that teachers should be versed in accident prevention approaches and techniques. Nichols emphasized that in order for teachers to efficiently reduce accidents, they must have a complete understanding of the systematic approach to locating, evaluating and controlling factors which are primarily accountable for accidents and their subsequent effects. Linda, Clara and Todd (2007) also reported that if schools properly train staffs and through them students, and implement and adhere to appropriate laboratory safety protocols, the laboratory experience can be both safe and rewarding. Accident and hazards prevention and control should be the goal of every workshop and laboratory teacher especially in technical colleges with particular reference to electrical/electronics program. Nakepodia (2009) submitted that the duty imposed on a teacher through the school, is to take reasonable care to protect the children under their care and control from foreseeable risk or injury. This is because students are inexperienced in the use of tools, equipment, machines and consumable materials.

Technical colleges in Oyo and Ogun states, specifically, electrical/electronics departments are faced with the problem of low enrollment of the students. One of the problems militating against the school is frequent sustenance of injuries by students in the schools. This deserves adequate attentions which this study is aimed at. The researcher's preliminary discussions with some principals in technical colleges in the states showed that many students refuse to enroll in the colleges because of frequent cases of accidents experienced in the colleges. Even, students who are already in the colleges most times change to general grammar schools because of their fear of getting involved in workshop and laboratory accidents. This claim was also made by Okon (2011) that new students seem to be afraid of enrolling in technical colleges for fear that workshop practice is risky and hazardous. The urgent need to remove hazards and to prevent accidents in electrical/electronics workshops in technical colleges in Oyo and Ogun states has therefore become a great concern. It has also become an imperative to determine the causes and prevention of electrical/electronics workshops accidents in technical colleges in south western part of Nigeria.

Purpose of the Study

The major purpose of the study was to determine the methodological needs of electrical/electronics workshop accident prevention in technical colleges in south western part of nigeria. Specifically, the study sought to:
Ascertain the causes of accidents in electrical/electronics workshops in technical colleges in technical colleges in south western part of Nigeria.

Identify the strategies necessary for accident prevention in electrical/electronics workshops in technical colleges in south western part of Nigeria

METHODOLOGY

The study adopted descriptive survey research design. The study was conducted in Oyo and Ogun states, South West geographical zone of Nigeria. The population for the study was sixty six (66) technical college teachers comprised of forty two (42) electrical/electronics teachers in technical colleges in Ogun state and twenty four (24) electrical/electronics teachers in technical colleges in Oyo states. The entire population of 66 respondents was used for the study. Thus, no sample was used because the population for the study was of manageable size.

The instrument used for data collection from respondents was a structured questionnaire. The questionnaire contained one sixty eight (68) items which was used to obtain information from electrical/electronics teachers in technical colleges, in Oyo and Ogun states. The questionnaire was divided into six sections: A, B and C. Sections A was used to seek for electrical/electronics teachers' personal information. Sections A was used to seek for electrical/electronics teachers' personal information. Section B and C consisted of items relevant for answering the research questions posed for the study. Section B, C and D of the questionnaire was structured on four-point rating scale with value as 4, 3, 2, and 1 in descending order. The response options for section B and C of the questionnaire were: Strongly Agree (SA) _ 4, Agree (A) _ 3, Disagree (D) _ 2 and Strongly Disagree (SD) _1

The questionnaire was validated by three experts. Cronbach Alpha method was used to determine the internal consistency of the questionnaire items. Thus, a reliability coefficient of 0.98 was obtained which means that the instrument was reliable for the study.

Sixty six copies of questionnaire were administered to the respondents by the researcher with the help of two research assistants through personal contact in each technical college in Oyo and Ogun States.

The data collected for this study were analyzed using mean and standard deviation. The decision rule for section B and C of questionnaire were based on the mean cut off point of 2.50. Thus, for section B and C, any item with mean of 2.50 or above was considered agree; whereas any item with a mean below 2.50 was considered disagree.

RESULT

The presentation and analysis are done in tables and arranged according to the research questions posed for the study.

Research Question 1: *What are the causes of accidents in electrical/electronics workshops in technical colleges in Oyo and Ogun States?*

Table 2:
Mean ratings and standard deviation of Responses of Teachers on Causes of Accidents in Electrical/Electronics Workshops in Technical Colleges in Oyo and Ogun States.
N=39

S/N	Causes of an accidents	$\bar{X}$	S D	Decision
1	Equipment failure	2.09	0.72	Disagree
2	Defective tools and equipment	2.53	0.61	Agree
3	Poor housekeeping	2.88	0.97	Agree
4	Poor workshop ventilation	2.82	0.68	Agree
5	Floors and passageways of workshops not well cleaned	3.15	0.66	Agree
6	Lack of adequate safety equipment in the workshops	2.55	0.59	Agree
7	Lack of technological knowhow	2.53	0.56	Agree
8	Failure to report hazard	3.00	0.68	Agree
9	Failure to follow laid down procedures	3.08	0.73	Agree
10	Disregard to safety rules	2.68	0.93	Agree
11	Playing inside workshops	3.14	0.70	Agree
12	Failure to use personal protective devices	2.85	0.81	Agree
13	Lack of proper training and education on accident prevention and management	2.53	0.73	Agree
14	Lack of adequate supervision while students are using tools and machines inside workshops.	2.03	0.82	Disagree
15	Failure to de-energize or isolate the electrical energy source before beginning maintenance or repair activities.	3.03	0.82	Agree
16	Failure to verify that electrical energy source is de-energized before starting work	2.85	0.68	Agree
17	Failure to identify or label all hazardous energy sources	2.50	0.59	Agree
18	Carelessness of students in workshops	2.95	0.75	Agree
19	Improper use of tools and equipment in workshops	2.92	0.64	Agree
20	Improper or inadequate illumination in the workshop	3.14	0.63	Agree
21	Power tools not properly grounded and insulated	2.59	0.66	Agree
22	Students' lack of adequate knowledge of equipment before operating it	2.55	0.64	Agree
22	Placing working tools carelessly in the workshop	3.29	0.60	Agree
23	Poor and lack of regular maintenance of workshop tools and equipment	3.17	0.69	Agree
24	Failure to separate electric live part from working area	2.73	0.65	Agree
25	Overloading of circuit or over-fusing circuits by using wrong sizes or types of fuse	3.02	0.73	Agree
26	Too many cords per outlet	2.64	0.60	Agree
27	Use of frayed or damaged cords to carry current in the workshop	2.51	0.68	Agree
28	Wearing loose clothing inside workshops	2.58	0.66	Agree
29	Wearing of neckties, metallic wrist watch or hand chains and jewelries while working with electricity	3.03	0.74	Agree
30	Lack of proper attention by students while performing a task	3.12	0.73	Agree
31	Fatigue and tiredness	2.44	0.68	Disagree
32	Giving improper instructions to students	2.02	0.73	Disagree
33	Lack of adequate disciplinary behavior in the workshop	2.91	0.82	Agree
34	Failure to understand importance of accident prevention in school workshop	2.89	0.43	Agree
35	Working with high voltage without following necessary standards	3.23	0.67	Agree
36	Operating equipment or working with high voltage without taking necessary permission from appropriate authority in the workshop	3.17	0.69	Agree
37	Failure to lock out or tag out electrical/electronics energy source during electrical/electronics equipment maintenance activities.	3.08	0.75	Agree
38	Use of metal ladder while working on electrical installation	2.32	0.83	Disagree
	Overall	2.51	0.70	

Key: $\bar{X}$ = Mean, SD = Standard Deviation and S/N = Number of items

The data presented in Table 2 revealed that items 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30, 31, 32, 33, 34, 35,36, 37,38, 39, 40, 41, 42, 43, 44, 45, 46, 49, 50, 51, 52 and 53 had their mean values ranged between 2.50 and 3.23. This implied that those thirty five items are causes of accident in electrical/electronics workshops in technical colleges in Oyo and Ogun States. However, items 29, 47, 48 and 54 had their mean

values ranged between 2.02 and 2.44. This implies that those four items are not the causes of accidents in electrical/electronics workshops in technical colleges in Oyo and Ogun States. Furthermore, the standard deviation of all the items as well as the overall standard deviation ranged from 0.43-0.97 indicating that the responses of electrical/electronics teachers in the technical colleges in Oyo and Ogun states on causes of accident in electrical/electronics workshop were not far from one another.

Research Question 4: *What are the accident prevention strategies in electrical/electronics workshop in technical colleges in Oyo and Ogun States?*

The data for answering research question 4 were presented in Table 4 below.

Table 4:

Mean Ratings and standard deviation of Responses of Teachers on Accident Prevention Strategies in Electrical/Electronics Workshop in Technical Colleges in Oyo and Ogun States.

N=30

S/N	Accidents prevention strategies	$\bar{x}$	SD	Decision
39	De-energizing electric equipment before inspection, repair or maintenance	2.74	0.83	Agree
40	Keeping electric tools properly	2.73	0.76	Agree
41	Always use insulated tools and equipment while working with electricity	3.48	0.59	Agree
42	All potentially dangerous electric conductors should be covered with protective pane.	2.97	0.25	Agree
43	Labeling dangerous or damaged equipment with brief phrase, and use clear, permanent and legible markings	2.55	1.13	Agree
44	Exercising safety cautions when working near energized lines or cable.	2.56	0.81	Agree
45	Using appropriate protective equipment	2.52	0.73	Agree
46	Maintaining a safe distance from energized parts	3.15	0.68	Agree
47	Training and educating teachers on accident prevention and management	2.62	0.70	Agree
48	Control of workshop hazards	2.55	0.88	Agree
49	Proper identification of possible workshop hazards	2.17	0.81	Disagree
50	Correction of students unruly behaviour in workshops	2.91	0.84	Agree
51	Maintenance of workshop tools and equipment regularly	2.33	0.79	Disagree
52	Good housekeeping	2.97	0.74	Agree
53	Establishment of relevant safety rules and regulation in workshops	3.11	0.73	Agree
54	Keeping of gang ways clear to provide free access to every part of the laboratory.	2.92	0.69	Agree
55	Removal of all loose cable from the floor of the workshop	2.44	0.68	Disagree
56	Working in a very bright or well illuminated laboratory	2.55	0.73	Agree
57	Keeping laboratory/ workshop free from grease, oil and water	2.80	0.61	Agree
59	Remove rings, bracket and other loose clothe while working with electricity	3.17	0.78	Agree
59	Incorporating accident prevention and management into the technical college curriculum.	2.30	0.84	Disagree
60	Provision of modern and functional tools and equipment in school workshop	2.35	0.92	Disagree
61	Proper supervision and monitoring of students during workshop activities	2.62	0.89	Agree
62	Labeling all dangerous chemicals and faulty equipment	2.29	0.76	Disagree
63	Remove or guard dangerous machines, tools and chemicals From the reach of less experienced students	2.55	0.98	Agree
64	Hanging safety reminders at different strategic positions in the workshops.	3.02	0.79	Agree
65	Giving permission to students before interacting with any electrically operated equipments and dangerous chemicals	2.53	0.83	Agree
66	Always desist from working with high voltage except you are familiar with supportive standards.	2.70	0.53	Agree
67	Always ensure proper ventilation within the workshop.	2.61	0.76	Agree
68	Lock out or tag out electrical/electronics energy during electrical/electronics equipment maintenance activities.	2.64	0.83	Agree
	Overall	2.69	0.76	

Key: $\bar{X}$ = Mean, SD = Standard Deviation and S/N = Number of items

The data presented in Table 4 indicated that items 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 84, 86, 87, 88, 90, 91, 92, 95, 97, 98, 99, 100, 101, and 102 had their mean values ranged between 3.48-2.52. This implied that twenty four (24) strategies could be used to prevent accidents in electrical/electronics workshops in technical colleges in Oyo and Ogun States. However, items 83, 85, 89, 93, 94 and 96 had mean values ranged from 2.17-2.44. This indicated that the six items listed above could not be applied as strategies for preventing accidents in electrical/electronics workshops in technical colleges in Oyo and Ogun States. In addition, the standard deviation

of all the items as well as overall standard deviation ranged from 0.25 to 1.13. This indicated that all the respondents have similar opinions on strategies for preventing accidents in the workshops.

Discussion of findings

The findings of the study indicated thirty five causes of accidents in electrical/electronics workshop in technical colleges in Oyo and Ogun States. These causes of accidents according to the technical college teachers include: equipment failure; defective tools and equipment; poor housekeeping; poor ventilation; passage ways of workshops not well cleaned; lack of adequate safety equipment in the workshop; lack of technological knowhow; failure to report hazard; failure to follow laid down procedures; disregard to safety rules; playing inside workshop; failure to use personal protective devices; lack of proper training; failure to verify and de energized electrical source prior to maintenance activities; failure to label all hazardous energy source; carelessness of students in workshops; poor illumination; failure to ground or earth power tools; poor workshop maintenance; wearing of metallic jewelries; poor attention to task at hand; and failure to lock out or tag out electrical energy source prior to maintenance activities.

This finding is in line with Olagbegi, Kwasi and Ugbi (2013) who found that low health and safety practice in the workshop is related to: inadequate of fire extinguisher in the laboratory; poor ventilation including hot shop and machine shop, faulty and old door locks, especially in the thermo fluid laboratory; little or no use of personal protective equipment, no working fire alarm, uncovered electrical panels and fuse boxes. Uncovered trenches within the workshops and floor spaces are not fully clear of debris, tables, stools and chairs. These findings also agree with that of Atsumbe, Ohize, Abutu and Amine (2013). They discovered that defective conditions of equipment; lack of signals and barricades; improper use of mechanical aid; power tools not properly grounded and insulated; floors, aisles and inside passageway not kept clean; protective clothing such as gloves and protective shoes amongst others not used; incompetent personnel operating industrial equipment; poor handling of industrial equipment; poor constructed laboratory and workshop buildings; negligence to safety rules while working in industries; poor illumination in the factories, and poor safety awareness, education and safety training are the potential sources of industrial accidents in workshops/laboratories of manufacturing industries. Thus, the findings of author cited above authenticated the discoveries of this study

The findings showed twenty four strategies for accident prevention in electrical/electronics workshops in technical colleges in Oyo and Ogun states, Nigeria. They include: de-energizing electric equipment prior to maintenance work; keeping electric tools properly; always use insulated tools and equipment; covered all potentially dangerous electric conductors with protective pane; label dangerous or damaged equipment with brief phrase and use clean, permanent and legible markings; exercise safety cautions when working near energized lines or cables; use appropriate protective equipment; maintain a safe distance from energized parts; train and educate teachers on accident prevention and management; correct students' unruly behavior in workshops; good housekeeping; keep gang ways clear to provide free access to every part of the laboratory; working in a very bright laboratory; keep laboratory free from grease, oil and water; remove metallic rings and jewelry before working with electricity; proper supervision and monitoring of students during workshops activities; remove or guard dangerous machines, tools and chemicals from the reach of less experienced students; hanging safety reminder at different strategic positions in the workshops; ensure proper ventilation and lock out or tag out electrical/electronic energy source during electrical/electronics maintenance activities.

The result is in consonance with the opinion of Nichols (2005) that the prescriptions for litigation immunity in schools include: be present in the classroom at all times when a class is in session; maintain a neat, orderly and safe classroom environment, instigate a comprehensive and continuing safety program; correct all known hazards and defective conditions; review safety policies and procedures on a regular schedule; provide a good personal example, particularly when demonstrating power equipment; equip and maintain all machines with guards; insist that guards be in position and used whenever a machine is in operation; be particularly alert and in a close proximity to power machines when students use them; require 100% eye and face protection of all students and classroom visitors; establish safety zones around all power equipment; use visual safety aids as an integral part of classroom instruction; don't assume that students will perform in a safe manner without adequate supervision and predetermine a plan of action in the event of an emergency. Osangi, Obi and Ewona (2013) discovery was in consonance with the present finding that to avoid or minimize accidents in the laboratory or workshop, these workshop safety and precision need to be observed: read carefully and understand all the rules before using the workshop; do not run in the workshop; wear strong shoes plus thick soles; get first aid immediately for any injury; be sure you have sufficient light to see clearly; don't wear ring, watches, bracelets or other jewelry that could get caught in moving machinery; keep the floor free of oil, grease or any other liquid and always clear up the workshop among others. The findings of authors cited above authenticated the discoveries of this study

Conclusion

The accidents are mostly caused by poor housekeeping and Failure to de-energize or isolate the electrical energy source prior to maintenance activities among others. However, the accidents can be prevented by labeling all dangerous chemicals and faulty equipment and keeping laboratory/workshop free from grease, oil and water.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. Format for recording accident in school workshop should be established by school administration and management.
2. The teachers should be encouraged to update their knowledge and skills on accident prevention and management.
3. Supervision and monitoring activities should be regularly conducted and carried out in all technical colleges workshop.
4. Safety equipment such as fire extinguishers and first aid box should be provided adequately in the workshops.

Workshop attendants or technologists should be recruited in each workshop to ensure proper monitoring of students activities inside workshop. This would ultimately assist in accident prevention

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