

WORKSHOP SAFETY PRACTICE SKILLS NEEDED BY ELECTRICAL AND ELECTRONIC STUDENTS OF TECHNICAL COLLEGE IN PLATEAU STATE

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ABSTRACT

This study examined the workshop safety practice skills needed by electrical and electronic students for effective functioning in Technical Collage workshop in Plateau State. The study adopted a survey research design. The population of the study comprised 70 electrical/ Electronic teachers and workshop attendants (50 teachers and 20 workshop attendants) in Technical Collage workshop in Plateau State. There was no sampling in selecting the schools as it is the only technical college in Plateau State. Government Science and Technical College, Bukuru was used in the study. However, a simple random technique was employed in selecting the respondents in the technical college within the study area. Three research questions were raised and three hypotheses postulated for the study. The instrument for data collection for the study was a 23-item structured questionnaire developed by the researcher. The instrument was validated by three experts from the Department of Science and Technology Education to ensure the relevance of the items to the aim of the study; and also to ensure the appropriateness of the items in terms of number. In determining the reliability index of the instrument, the instrument was administered to 20 teachers and 10 workshop attendants in Government Technical Colleges, Gumau and Gadau, Bauchi State. Shift half technique or Cronbach alpha method was used for obtaining the reliability of 0.89. The research questions were answered using mean and standard deviation while the hypotheses were tested using an independent sample t-test at a significance level of 0.05. The study found that safety practice skills such as avoidance of loose wire and cables and separation of higher power equipment and connections from lower power equipment are needed by students in the technical college. It was also revealed that tying long hear to the back of the head and wearing of PPE are safety practice skill needed by the students in clothing and personal equipment; and that familiarizing oneself with the exits in the workshop, ensuring provision of proper lightening and ventilation, keeping the floor off grease oil or any other liquid are the safety practice skills needed by students in workshop environment. The study recommended that all the safety practice skills being identified in the study should be integrated into the curriculum of electrical and electronic at technical college level.

INTRODUCTION

In the field of technology, emphasis is now placed on safety practice. Safety practice skill is an important component of electrical and electronic trade. Safety practice skill helps in reducing accidents among students and workers in the workplace when it is properly carried out; also helps the tools and machine in electrical and electronics workshop to be more effective and increase their lifespan (durable).

Safety is the freedom from dangers of both human and material resources. Okparaek (2004) viewed safety as the avoidance of accident which may lead to injury to persons, wastage of materials and damage of tools equipment or machines in the work site through adherences or compliance to precautionary measures. Oranu, Nkove and Ogwo (2002) further view safety as the ability to perform every simple task involved in a Job without causing damage to tools, equipment or materials used in performing the task. Safety practice is the repeated actions or exercise with appropriate precautionary measures or caution aimed at preventing accidents when performing an occupational task in work place.

Accident and damages of tools, equipment and machines cannot be prevented in any field through repeated observance of precautionary measures but only when skills are involved in such exercises. Skill, according to Osinem (2008) is a well-established habit of doing something and it involves the acquisition of performance capabilities. Okorie (2000) said that skill in a manual dexterity through preventive performance of an operation. Skill can be acquired through experience, practice or training.

Safety practices skills are needed by the students of electrical and electronics trade at technical college level. This is necessary for prevention from both minor and major accidents occurring in technical college workshops. Workshop is a room or building where things are made or repaired using machines and tools in technical colleges. Safety practice skills in this study might be seen as the ability, habit and skillful way of using electrical power, using personal protective equipment and working in the work environment consciously.

Electrical and Electronic as an area of specialization is one of the Vocational trades or courses offered in technical colleges in order to produce electrical and electronic craftsmen and technicians. According to college Board (2008), electrical and electronics students learn the basic skills required to operate, maintain, install and repair electrical and electronics equipment and appliances. Angemena (2000) stated that electronic and electrical students may study the properties and behaviors of electronics under all conditions especially with reference to technical and industrial applications. At technical colleges level, electrical and electronics students need to learn safety practice skills in order to be safety conscious in their workplace during and after graduation.

Technical college is a principal vocational institution in Nigeria that gives full vocational training at secondary school level to prepare students for entry into various occupations. It is that institution which provides students through training with the relevant and adequate knowledge, skills and attitude for employment under the guidance of a teacher in related occupation or program. Okorie (2001), viewed that technical college in Nigeria is established to prepare individuals to acquire practical skills and basic scientific knowledge. Electrical and electronic teacher at technical college level is regarded as a skilled person who imparts knowledge and useful skills to the students in classrooms and workshops. Electrical and electronic students need safety practice skills for using electrical power, clothing and personal equipment and workshop environment to avoid sustaining of injuries or casualties as the course is purely a practical field.

Yakubu in Nwachukwu (2011) said that safety practice skill is not well acquired in technical colleges. It has been observed that some students in the laboratory often sustain injuries and damage some worthy tools and machines during practical activities. Nwachukwu (2011) said that injuries sustained by the students of electrical and electronic may sometimes be permanent. This may be as a result of deficiency in safety practice skills acquired by the students. It is also noticed that electrical and electronics in technical colleges often absent themselves from school during practical lessons. This, according to Yakubu (2004), was attributed to the accident that students experience in the workshop. Proper acquisition of safety practice skills by the students of electrical and electronics in technical colleges could reduce by eliminating accidents in the workshops if the appropriate workshop safety skills are instilled in the students. Therefore, it becomes imperative to identify safety practice skills needed by electrical and electronic students for effective operation in the workshops. This paper therefore, seeks to identify effective workshop safety practice skills needed by electrical and electronic students of technical colleges in Plateau State.

The study intended to achieve the following objectives:

1. To identify safety practice skills needed by electrical and electronic students in using electrical power and machines.
2. To identify safety practice skills regarded by electrical and electronics students in clothing and personal requirement.
3. To identify safety practice skills required by electrical and electronics students in workshop environment.

The study sought to provide answers to the following questions:

1. What are the safety practice skills needed by electrical and electronic students in using electrical power and machines?
2. What are the safety practice skills regarded by electrical and electronics students in clothing and personal requirement?
3. What are the safety practice skills required by electrical and electronics students in workshop environment?

The following null hypotheses were postulated and tested at alpha 0.05 level of significance:

Ho₁: There is no significant difference between the mean rating responses of the electrical and electronic teachers and workers on safety practice skills needed by electrical and electronic students in using electrical, power and machines.

Ho₂: There is no significant difference between the mean rating responses of the electrical and electronic teachers and workers on safety practice skill needed by electrical and electronic students in clothing and personal equipment.

Ho₃: There is no significant difference between the mean rating responses of the electrical and electronic teachers and workers on safety practice skills needed by electrical and electronic students in workshop environment of technical college in Plateau State.

METHOD

The research design used in the study was a descriptive survey research design. The reason for choosing the descriptive survey research design was that the design provides modality for gathering information from a sample size and generalizing the findings obtained to the entire population. The population of the study comprised 70 electrical/ Electronic teachers and workshop attendants in the field (50 teachers and 20 workshop attendants) in Technical Collage workshops in Plateau State. There was no sampling in selecting the schools as the only technical college in Plateau State, Government Technical College, Bukuru was used in the study. However, a simple random technique was employed in selecting the respondents in the technical college within the study area for the study.

The study sought to provide answers to three research questions and test three hypotheses. A 23-item questionnaire which was constructed by the researcher. The items were treated on a four-point Likert scale. The response options to the items under the research questions were: Strongly Needed (SN), Moderately Needed (MN), Slightly Needed (SN), and Not Needed (NN) with numerical values 4, 3, 2 and 1 respectively.

The instrument was validated by three experts from the Department of Science and Technology Education to ensure the relevance of the items to the aim of the study; and to ensure the appropriateness of the items in terms of number. In determining the reliability index of the instrument, the instrument was administered to 20 teachers and 10 workshop attendants in Government Technical Colleges, Gumau and Gadau, Bauchi State. Shift half technique or Cronbach alpha method was used for obtaining the reliability of 0.89.

The administration of the questionnaire to the respondents and the retrieval of the filled questionnaire lasted for one week. At the end of the exercise, a total of 90 valid copies of the questionnaire were realized for analysis, indicating 100% retrieval. The research questions were analyzed using descriptive statistics (mean and standard deviation) while the hypotheses postulated were tested using an independent sample t-test at 0.05 level of significance. To effect decision with respect to items under the research questions, a mean of means formula shown was used to obtain a value of mean of means. A criterion mean of 2.50 was used in making decisions on the item statements. Therefore, any item with a mean of mean value equal to or above 2.50 was considered "Needed" while a mean less than 2.50 was considered "Not Needed".

$$\text{Mean of Means } (\bar{X}_m) = \frac{(\bar{X}_1 \times N_1) + (\bar{X}_2 \times N_2)}{N_1 + N_2}$$

$\bar{X}_1$ = Mean Responses of Teachers

$\bar{X}_2$ = Mean Responses of Workshop Attendants

N_1 = Number of Teachers

N_2 = Number of Workshop Attendants

RESULTS

The following research questions were answered and the hypothesis tested.

Research Question One:

What are the safety practice skills needed by electrical and electronic students in using electrical power and machines?

Data that were used to answer this research question are presented in Table 1.

Table 1: Mean and Standard Deviation of Respondents on the Safety Practice Skills Needed by Electrical and Electronic Students in Using Electrical Power and Machines

Item	Statement	$\bar{X}_1$	SD_1	$\bar{X}_2$	SD_2	$\bar{T}_m$	Remark
1	Avoid loose wire, cables and connections	3.16	0.77	3.05	1.00	3.13	N
2	Assume any exposed metal is live with electricity unless verified	3.38	0.64	3.25	0.85	3.34	N
3	Familiarized oneself with all ON/OFF buttons on equipment, circuit breakers and disconnect switches of a bench.	3.14	0.83	3.15	0.75	3.14	N
4	Use wires of suitable length for their appropriate applications	3.08	0.97	3.00	0.80	3.06	N
5	Separate higher power equipment and connections from lower power equipment.	3.32	0.74	3.00	0.92	3.23	N
6	Turn off all equipment before learning the w/shop once and experiment is concluded.	3.04	0.95	3.05	0.89	3.04	N
7	Do not allow a single user to perform an experiment alone when operating more than 50v C and three phase AC.	3.18	0.66	3.30	0.80	3.21	N

Source: Survey, 2020

Key: $\bar{T}_1$ = Mean Response of Teachers, SD_1 = Standard Deviation of Teachers, T_2 = Mean Response of Workshop Attendants, SD_2 = Standard Deviation of Workshop Attendants, T_m = Mean of Means

The data in Table 1 revealed that the teachers rated all the items within the range of 3.04 and 3.38 while the workshop attendants rated all the items within the range of 3.00 and 3.30. The values of mean of means of the items as rated by teachers and workshop attendants are within the range of 3.04 and 3.34. The table revealed that the entire items were rated above the mean criterion of 2.50 with respect to the safety practice skills needed by electrical and electronic students in using electrical power and machines in technical colleges. Therefore, the respondents agreed that the entire seven items are needed by electrical and electronic students in using electrical power and machines in technical college.

The table also reveals that the standard deviations of the items as rated by the teachers fall within the range of 0.64 and 0.97, indicating that there was a higher degree of unanimity of response among them. In the same vein, the standard deviations as rated by the workshop attendants fall within the range of 0.75 and 1.00 which also implies a higher degree of unanimity of response among them.

Research Question 2:

What are the safety practice skills needed by electrical and electronic students in clothing and personal equipment in teaching college in Plateau State?

Table 2: Mean and Standard Deviation of Respondents on the Safety Practice Skills Needed by Electrical and Electronic Students in Clothing and Personal Equipment

Item	Statement	$\bar{X}_1$	SD_1	$\bar{X}_2$	SD_2	$\bar{T}_m$	Remark
8	Remove jewellery, metal watches or other metallic accessories while performing any experiment	3.04	0.88	3.15	0.81	3.07	N
9	Do not wear loose apparel, short, or short skirts.	2.96	0.95	3.30	0.80	3.06	N
10	Do not wear hanging necklaces, glasses, tie and other accessories	3.10	0.74	3.15	0.93	3.11	N
11	Tie long hair to the back of the head.	3.16	0.93	3.15	0.88	3.16	N
12	Wear personal protective equipment (PPE) as required by local safety rules and regulation.	2.92	0.99	3.25	0.97	3.01	N
13	Wear safety goggles at all times during the experiment	3.18	0.85	3.10	0.72	3.16	N
14	Protect hands with gloves and wear safety shoes.	3.00	0.99	3.15	0.99	3.04	N
15	Use apron or overall while operating any power machine.	3.04	0.97	3.05	0.89	3.04	N
16	Remove coat and jacket, tie and roll up loose sleeves before operating power machine.	3.14	0.97	3.10	0.91	3.13	N
17	Wear approved ear protector when operating a power tool.	3.14	0.97	3.50	0.61	3.24	N

Source: Survey, 2020

The data in Table 2 revealed that the mean responses of teachers on the items fall within the range of 2.92 and 3.18 while the responses of the workshop attendants on the items are within the range of 3.05 and 3.50. All the values of mean of means of the items as rated by the respondents exceeded the mean criterion of 2.50 and it implies that the item statements are needed as the safety practice skills needed by electrical and electronic students in clothing and personal equipment in teaching college in Plateau State as indicated by the respondents.

The table also reveals that the standard deviations of the items as rated by the teachers fall within the range of 0.74 and 0.99, indicating that there was a higher degree of unanimity of response among them. In the same vein, the standard deviations as rated by the workshop attendants fall within the range of 0.72 and 0.99 which also implies a higher degree of unanimity of response among them.

Research Question 3:

What are the safety practice skills needed by electrical and electronic students in workshop environment of technical colleges in Plateau State?

Table 3: Mean and Standard Deviation of Respondents on the Safety Practice Skills Needed by Electrical and Electronic Students in Workshop Environment of Technical College

Item	Statement	$\bar{X}_1$	SD_1	$\bar{X}_2$	SD_2	$\bar{T}_m$	Remark
18	Familiarize oneself with the exits in the workshop.	3.06	0.96	2.90	1.12	3.01	N
19	Proper lightening and ventilation should be provided	3.14	1.03	3.30	1.03	3.19	N
20	Keep the floor off grease oil or any other liquid.	3.30	0.86	3.15	0.88	3.26	N
21	Walk carefully in the workshop.	2.94	1.02	3.05	0.95	2.97	N
22	Keep gang ways clear and provide free access to every part of the laboratory.	3.16	0.82	3.05	1.15	3.13	N
23	Remove all loose cable from the floor of the workshop	3.00	0.90	3.30	0.81	3.09	N

Source: Survey, 2020

The data in Table 2 revealed that the mean responses of teachers on the items fall within the range of 2.94 and 3.30 while the responses of the workshop attendants on the items are within the range of 2.90 and 3.30. All the values of mean of means of the items as rated by the respondents exceeded the mean criterion of 2.50 and it implies that the item statements are needed as the safety practice skills needed by electrical and electronic students in workshop environment of technical college in Plateau State as shown be the responses of the respondents.

The table also reveals that the standard deviations of the items as rated by the teachers fall within the range of 0.82 and 1.03, indicating that there was a higher degree of unanimity of response among them. In the same vein, the standard deviations as rated by the workshop attendants fall within the range of 0.81 and 1.15 which also implies a higher degree of unanimity of response among them.

Testing of Hypotheses

Ho₁: There is no significant difference between the mean rating responses of the electrical and electronic teachers and workers on safety practice skills needed by electrical and electronic students in using electrical, power and machines.

Table 4: t-test of Difference between the Mean Responses of Teachers and Workshop Attendants on Safety Practice Skills Needed by Electrical and Electronic Students in Using Electrical, Power and Machines

Respondent	N	Mean	Mean Dif.	Stand. Dev.	t-value	p-value	Decision
Teacher	50	3.19		0.803			
			0.017		0.875	0.382	Accept
W. Attendant	20	3.11		0.849			

As presented in Table 4, the grand means of teachers and workshop attendants stood at 3.19 and 3.11 with a mean difference 0.017. Also, the standard deviations of the teachers and workshop attendants stood at 0.803 and 0.849 respectively. The table also revealed that the t_{value} stands 0.875 with a p-value 0.382. The p-value is greater than the alpha value of 0.05 level of significance i.e., $p > 0.05$; therefore, it implies that the responses of the respondents do not differ significantly. Thus, the null hypothesis which states that there is no significant difference between the mean rating responses of the electrical and electronic teachers and workers on safety practice skills needed by electrical and electronic students in using electrical, power and machines is retained.

Ho₂: There is no significant difference between the mean rating responses of the electrical and electronic teachers and workers on safety practice skill needed by electrical and electronic students in clothing and personal equipment.

Table 5: t-test of Difference between the Mean Responses of Teachers and Workshop Attendants on Safety Practice Skills Needed by Electrical and Electronic Students in in Clothing and Personal Equipment

Respondent	N	Mean	Mean Dif.	Stand. Dev.	t-value	p-value	Decision
Teacher	50	3.07	0.115	0.921	1.475	0.141	Accept
W. Attendant	20	3.18		0.835			

Table 5 revealed that the grand means of teachers and workshop attendants stood at 3.07 and 3.18 with a mean difference 0.115. Also, the standard deviations of the teachers and workshop attendants stood at 0.921 and 0.835 respectively. The table also revealed that the t_{value} stands 1.475 with a p-value 0.141. The p-value is greater than the alpha value of 0.05 level of significance i.e., $p > 0.05$; and this signifies that the responses of the respondents do not differ significantly. Thus, the null hypothesis which states that there is no significant difference between the mean rating responses of the electrical and electronic teachers and workers on safety practice skills needed by electrical and electronic students in clothing and personal equipment is accepted.

Ho₃: There is no significant difference between the mean rating responses of the electrical and electronic teachers and workers on safety practice skills needed by electrical and electronic students in workshop environment of technical colleges in Plateau State.

Table 6: t-test of Difference between the Mean Responses of Teachers and Workshop Attendants on Safety Practice Skills Needed by Electrical and Electronic Students in Workshop Environment of Technical College

Respondent	N	Mean	Mean Dif.	Stand. Dev.	t-value	p-value	Decision
Teacher	50	3.10	0.025	0.934	0.244	0.807	Accept
W. Attendant	20	3.13		0.984			

As presented in Table 6, the grand means of teachers and workshop attendants stood at 3.10 and 3.13 with a mean difference 0.025. Also, the standard deviations of the teachers and workshop attendants stood at 0.934 and 0.984 respectively. The table also revealed that the t_{value} stands 0.244 with a p-value 0.807. The p-value is greater than the alpha value of 0.05 level of significance i.e., $p > 0.05$; therefore, it implies that the responses of the respondents do not differ significantly. Thus, the null hypothesis which states that there is no significant difference between the mean rating responses of the electrical and electronic teachers and workers on safety practice skills needed by electrical and electronic students in workshop environment of technical college in Plateau State stands accepted.

DISCUSSION

Finding based on research question one as presented in Tables 1 showed that all the safety practice skills items are needed by electrical and electronic students of technical college and the hypothesis postulated showed no significant difference between the mean rating responses of the electrical and electronic teachers and workers on safety practice skills needed by electrical and electronic students in using electrical, power and machines. The study found that safety practice skills such as avoidance of loose wire and cables and separation of higher power equipment and connections from lower power equipment are needed by electrical and electronic students of

technical college. This finding is in line with the opinion of Oranu, Nwoke and Agwo (2002) that the users of electrical power and machines should always avoid loose wires, cables and connections. The result also in agreement with the opinion of Bakare in Nwachukwu (2011) that operators should always separate higher power equipment and connections from lower power equipment in the workshop and make sure that they turn off all equipment before leaving the workshop once an experiment is conducted.

Finding based on research question two also revealed that the entire 10 safety practice skills in Table 2 are essentials for electrical/electronic students as there was no significant difference between the mean rating responses of the electrical and electronic teachers and workers with respect to the safety practice skills presented in the table. It was revealed that tying long hair to the back of the head and wearing of PPE and safety goggles are necessary at all times during the practical. This is Bakere (2006) that workers should always wear safety goggles at all times during the experiment and make sure they remove jewellery, metal watches and other metallic accessories while performing any experiment.

Also, findings based on research question three revealed that safety practice skills needed by electrical and electronic students in workshop environment in technical college include familiarizing oneself with the exits in the workshop, ensuring provision of proper lightening and ventilation, keeping the floor off grease oil or any other liquid, and walking carefully in the workshop. It was also found that there is no significant difference between the mean rating responses of the electrical and electronic teachers and workers on safety practice skills needed by electrical and electronic students in workshop environment of technical college in Plateau State. These findings are in agreement with the opinion of John (2004) that workers should work carefully in the workshop, proper lightening and ventilation should be provided, keep the floor off grease, oil or any other liquid and remove all the loose cable from the floor of the workshop.

CONCLUSION

Safety practice skills are essentials to all students of electrical and electronic and electrical and electronics in technical colleges as they provide security from accident and severe injuries. Based on the results of the study, all the safety practice skills are needed by electrical and electronic students in using electrical power and machine, clothing and personal requirement and workshop environment.

RECOMMENDATIONS

The study recommends the following:

1. Teachers and workshop attendants should ensure that electrical and electronic students are fully kitted with the required PPE before engaging in workshop activities.
2. All the identified safety practice skills in the study should be integrated into the curriculum of electrical and electronic in technical colleges for proper acquisition by the students.

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