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SAFETY TECHNIQUES FOR MOTIVATING SKILL LEARNING IN ELECTRICAL AND ELECTRONICS WORKSHOPS AND LABORATORIES FOR COMPETENCY IN ELECTRICAL AND ELECTRONICS WORKS.

By

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Abstract

The study is designed to investigate the safety techniques needed to motivate skill learning in electrical and electronic workshops and laboratories for competency in electrical and electronic work. In doing this, three (3) research questions were generated; two (2) null hypotheses at 0.05 level of significance were also formulated to help guide the study. A 59 items questionnaire was used to collect data from the respondents consisting of 30 lecturers, 7 technicians and 160 students from electrical/electronic engineering departments in the two polytechnics in Niger State. No sampling was used since the population was not large enough for sampling. The result of responses from the respondents served as the data which was analyzed using frequency count, mean and analysis of variance (ANOVA) known as the f-test. The findings revealed that there is a need of safeguarding all hazardous equipment, organizing and directing learners work stations to avert any form of accident, keeping the shop clean, using colours for various demarcations and teaching safety whenever and wherever it is necessary, so that safety must be in the minds of learners. This will in turn motivate students to effectively learn the expected skill and attitude in the workshop.

Introduction

The general working definition of technical education means any programme designed to prepare the learner to enter an understanding of the laws of science and technology as applied to modern design and production. It stresses the engineering aspects of Technical education, such as electrical and electronics, mechanical and automobile trades. Indeed it involves understanding and practical application of the basic principles of mathematics and science (Pritchard 1986). Electrical and electronics engineering is a core course in the polytechnics which deals with the studies of the practical application of electricity in science and technology. It is one of largest branches of engineering and concerned with the development and design, application and manufacture of systems devices that use electrical power and machinery, electronic circuit, control systems, computer design, super conductor, solid state electronics, medical imaging system, robotics, lasers, radar, consumer electronics and fiber optics (Gupta, 2006). Nevertheless, despite its

diversity, electrical electronics engineering can be divided into four main branches; electrical power and machinery, electronics communication, control, and computer.

is controlled by means of electronic components which are concerned with the transmission, storage and processing of information whether it appears in electrical, optical or any other form. These components are available in electrical and electronics workshops. It is in this workshop and laboratory that the necessary practical skills are taught.

However, in a school environment, a workshop is a room or building containing tacks or machinery where

couple, repair, and design, create, imagine and study, (Adesina, 1990). For learners to develop effective skill, the arrangement and layout of the workshop demands usual foresight and planning due to the complexity of activities which will be carried out there. Skill is the learned capacity to carry out determined results often with the minimum outlay of time, energy, or both. According to Okobiah and Nwagu (1995), skill is the ability to perform expertly well arising from the repetitive process in which the skill holders engage in their jobs. This idea is in agreement with Okorie and Ezeji (1988) on the possession of a skill. They said

has become so natural through repetitive or practice that it has become automatic. Okobiah and Nwagu (1995), said that psychomotor skill is hierarchically classified into six levels as follow: reflex movement; basic fundamental movements; perceptual abilities; physical abilities; skilled movements and non-discursive communication. Technical skill is one of the skills necessary for an individual to succeed in job. The key to

of the workshop. The selection of equipment and location of area for electrical and electronics workshop

electric power outlets/supply, storage facilities and location, and arrangement of auxiliary rooms, (Adesina,1990).

It is however worthy of mentioning that in a workshop settings there are many potential hazards that can cause damage or injury. This can only be eliminated by good safety practice. Safety is the practical certainty that injury will not result from the use of substance or agents under specified condition or quality and manner of use. It is inevitable that electrical and electronics workshops which use supply of electricity at normal mains voltage and this obviously introduces an element of danger if safety precautions are not strictly observed. Accident can be prevented just as well as dangers can be averted (Geoff, Kellie, and Roy, 2004).

According to Conford (2005), whenever an accident occurs, it is an indication that somebody, somewhere has failed to do what should have been done. This could be due to negligence, ignorance or lack of knowledge. For effective learning to take place, these dangers need to be tackled seriously by ensuring various safety techniques are used so that learners will not be scared away from using the workshop thereby motivating them to learn the expected skill.

Motivation is a key factor to learning. Akinseinde (1998) sees motivation as the ability of the teacher to arouse the interest of the students in what is been taught. According to him, to achieve this, the teacher should present a condition that will direct a student's motivation towards learning the subject matter. A lesson can be well designed in every respect but the students have to be motivated to learn. He also pointed that it is the responsibility of the subject matter and make them develop positive attitudes towards the subject.

If the course learnt is meaningful to the students they become motivated and enthusiastic because they now know the reason for learning. Motivation is also a force that determines how much effort an individual puts

once their attention has been captured. Once the student wants to learn, the battle is half won. He also said that external impose motives such as threats of punishment or promises of rewards, always result in a shallower degree of learning than motives that are self imposed. Motivation in education can have several effects on how students learn and how they behave towards subject matter. It can:

1. Direct behavior toward a particular goals
2. Lead to increase effort and energy.
3. Increase initiation of, and persistence in, activities.
4. Enhance cognitive processing
5. Determine what consequences are reinforcing
6. Lead to improved performance.

Statement of the Problem

Mass outcry against the sorrowful working conditions of workers and students in factories and workshop gradually began to gather momentum. This has limited the rate at which student learn skills in the workshop. The effects of accident ranging from disabilities to health fatalities and even loss of human lives, has been scaring away students from participation in electrical and electronics workshop. Geoff, Kellie, and Roy, (2004) also said that the economy is further retrogressed by the payment of huge medical bill incurred from the treatment of these victims; replacement of damaged equipment, compensation claims etc. these huge amounts of money would have been more beneficial had they been invested in promoting, ensuring and

the safety technique needed to motivate skill learning in electrical and electronic workshop/laboratory in polytechnics in Niger State.

Purpose of the Study

The main purpose of this study is to investigate on the safety technique needed to motivate skill learning in electrical and electronics workshops in polytechnics in Niger state.

Specifically the study tends to determine.

1. The level of adequacy of safety facilities in electrical and electronics workshop/laboratory
2. The safety techniques needed to motivate skill learning in electrical and electronics workshop/ laboratory.
3. The roles of lecturers/technicians in motivating skill learning.

Research Questions

The following research questions were formulated to guide the study.

1. What is the level of adequacy of safety facilities in electrical and electronics workshop/laboratory?
2. What are the safety techniques needed to motivate skill learning in electrical and electronics workshop/laboratory?
3. What are roles of lecturers/technicians in motivating skill learning?

Hypotheses

The null hypotheses were tested at 0.05 level of significance.

HO_1: There is no significant difference between the mean responses of electrical and electronic lecturers, technicians and students on the level of adequacy of safety facilities in electrical and electronics workshop/laboratory.

HO_2: There is no significant difference between the mean responses of lecturers, technicians and student on the safety techniques needed to motivate skill learning in electrical and electronic workshop/ laboratory.

Research Design

The research design that was used in carrying out this study is the descriptive survey method, where questionnaire was used to determine opinions of respondent on the issue under investigation. This study covered the two Polytechnics in Niger State, that is the Federal Polytechnic Bida and Niger State Polytechnic Zungeru The target population for this study comprises 30 lecturers, 7 technicians, and 160 ND2 students of the department of electrical and electronics engineering in the two polytechnic in Niger State. In view of the small size of the population of the lecturers, technicians, and the ND2 students, the researchers decided to use the whole population from the two polytechnics in Niger state. Hence a total of 197 (comprising of 30 lecturers, 7 technicians and 160 ND2 students) of electrical and electronics engineering department in the two polytechnics were used.

The data for this research study was analyzed using measures of central tendencies that are the mean, standard deviation while inferential analysis of variance (ANOVA) known as the f-test was used to test the null hypotheses at a 0.05 level of significance.

To determine the acceptance level mean 2.50 was used as deciding point between adequate and inadequate, agreed and disagreed. Inferential analysis of variance techniques (ANOVA) known as the F-ratio or statistic was used to test the hypothesis at 0.05 level of significant to compare the mean response of the three groups. An inferential F- critical value of 3.07 was selected based on the 2df for numerator and 197

is not rejected but if F- calculated is greater than F-critical, the null hypothesis is rejected.

Research Question 1

What is the Level of Adequacy of Safety Facilities in Electrical and Electronic Workshops/laboratory?

Table 1: Mean responses of lecturers, technicians and students on the level of adequacy of safety facilities in electrical and electronics workshop/laboratory.

$N_1 = 30 \; N_2 = 7 \; N_3 = 160$

S/NO	ITEMS	$\overline{X}_1$	$\overline{X}_2$	$\overline{X}_3$	$\overline{X}_{av}$	REMARK
1.	Protective nose mask	3.27	2.00	2.11	2.46	Inadequate
2.	Ear muffles	2.24	2.21	2.26	2.23	Inadequate
3.	Non conductive hand gloves	2.83	3.85	3.40	3.36	Adequate
4.	Overall	2.83	2.85	3.80	3.16	Adequate
5.	Shoes with insulated soles	3.47	2.00	1.91	2.46	Inadequate
6.	Safety goggles	3.03	2.15	2.22	2.45	Inadequate
7.	Head hat	3.10	1.93	2.21	2.41	Inadequate
8.	Electric shields	3.00	3.15	3.00	3.38	Adequate
9.	Electrical testers	3.60	1.62	1.81	2.34	Inadequate
10.	Ground faulty circuit interrupter (GFCI)	2.97	2.77	3.00	2.91	Adequate
11.	Fuses	3.10	1.62	1.92	2.21	Inadequate
12.	Three prong plugs equipment	3.10	2.00	2.00	2.37	Inadequate
13.	Soldering vice	3.47	2.12	2.72	2.26	Inadequate
14.	Soldering stands	3.33	2.82	1.76	2.64	Inadequate
15.	Non-sparking induction motors	2.63	2.36	1.78	2.37	Inadequate

16.	Proper ventilation	3.27	3.00	2.79	3.02	Adequate
17.	Functional fire extinguishers	2.97	3.54	2.89	3.13	Adequate
18.	First aid box	2.30	2.26	2.56	2.37	Inadequate
19.	First aid personnel	2.41	2.61	2.10	2.37	Inadequate
20.	Caution signs and safety posters	2.97	3.15	2.94	3.02	Adequate
21.	Proper lighting	3.03	3.10	3.48	3.20	Adequate
22.	Fire alarm systems	2.40	2.05	2.15	2.20	Inadequate
23.	Safety belts	2.33	2.33	2.05	2.24	Inadequate

Key:- N_1=Number of Lecturers; N_2 =Number of technicians; N_3=Number of Students; $\overline{X}_1$ =Mean of Lecturers; $_2$ = Mean of Technicians; $_2$ = Mean of Students; $_t$ = Average Mean

The findings revealed that most of safety facilities in electrical and electronics workshop/laboratory are inadequate.

Research Question 2

What are the safety techniques to motivate skill leaning in electrical and electronics workshop/laboratory?

Table 2: Mean responses of lecturers, technicians and students on the safety techniques needed to motivate skill learning in electrical and electronics workshop/laboratory.

S/NO	ITEMS	X_1	X_2	X_3	X_{av}	REMARK
1.	Wearing proper work clothes shoes or feet protection.	3.40	3.23	3.41	3.35	Agreed
2.	Maintaining gentle work and avoid running in the workshop.	3.27	3.38	3.13	3.26	Agreed
3.	Decongesting the workshop.	2.90	2.23	3.36	3.16	Agreed
4.	Safety posters should be placed in locker rooms and passages for people to see.	2.77	3.69	3.29	3.25	Agreed
5.	Returning and signing off tools to the store at the end of work.	3.03	3.38	3.28	3.23	Agreed

7.	Keeping first aid box and firefighting equipment in appropriate location and be sure that they are functioning.	2.90	3.10	3.06	3.02	Agreed
8.	Maintaining electrical safety rules.	3.17	3.62	.2.94	3.24	Agreed
9.	Obtaining permission to use any machine.	3.50	3.15	3.19	3.28	Agreed
10.	Observing safety rules and regulation quite distinct from tools and equipment.	3.23	2.77	3.10	3.03	Agreed
11.	Operating machine with caution through appropriate guidelines.	2.97	2.74	2.89	2.87	Agreed
12.	Wearing masks for job that require their use.	2.83	3.85	3.22	3.3	Agreed
13.	Switching off the machine before and adjustment and use of machines.	3.17	2.85	3.10	3.04	Agreed
14.	Reporting any damage to the workshop supervisor no matter how minor it is.	2.97	3.23	3.26	3.15	Agreed
15.	Keeping wastes out of the workshop.	3.25	3.92	3.31	3.49	Agreed
16.	Analyzing electrical hazards to the student	3.37	3.46	3.50	3.44	Agreed

Table 2 shows that the three groups of respondents agree to all items as the safety techniques to motivate skill learning in electrical and electronic workshop/laboratory since they all have mean scores of 2.50 and above.

Research Question 3

What are the roles of lecturers/technicians in motivating skill learning?

Table 3: Mean responses of lecturers, technicians and students on the roles of lecturers/technicians in motivating skill learning.

S/NO	ITEMS	X_1	X_2	X_3	X_{av}	REMARK
2.	Teach students to take protective measures	3.24	3.77	3.47	3.49	Agreed
3.	Allowing students to practice and demonstrate skill with tools and machines.	3.37	3.15	3.50	3.34	Agreed
4.	Make students identify inflammable or corrosive Liquids gasses and other chemicals	2.83	3.62	3.15	3.20	Agreed
5.	Teach the students the use of firefighting equipment	3.47	3.15	3.10	3.24	Agreed

6. Make k nown to students any hazards that may exist when performing an operation.	3.13	2.92	3.50	3.18	Agreed
7. Safety slogans should be encouraged among students	3.50	3.68	2.81	3.33	Agreed
8. Label all safety equipment and maintain it in good operating condition.	3.00	3.23	3.18	3.14	Agreed
9. Seeking information or advice where necessary before carrying out new unfamiliar work.	2.79	3.6	3.30	3.23	Agreed
10. Orientate students on hazarders and how to avoid, eliminate or minimize them.	3.50	3.38	3.00	3.29	Agreed
11. Students are disciplined for non compliance with safety rule.	2.71	3.2	2.25	2.72	Agreed
12. Student with known heath problems are restricted from certain job and treated specially.	2.86	3.6	3.31	3.26	Agr eed
13. Effective supervision o f op eration and student work.	2.86	3.6	3.10	3.19	Agreed
14. Student should be encouraged to have good maintenances culture for machine and equipment.	3.14	3.6	2.9	3.21	Agreed
15. The use of instructional method that give safe working habit associated with practical's	2.83	3.92	3.20	3.32	Agreed
16. Allowed students to asked questions that will stimulate learning .	3.47	2.92	2.79	3.06	Agreed
18. Preparation of workshop/laboratory before					
19. Demonstration method should be used when teaching.	3.70	3.54	3.01	3.42	Agreed
20. Lecturers/technicians should develop good relationship					

Table 3, above shows that the roles stated above of lecturers/technicians in motivating skill learning are highly needed since all respondents agreed with the items possessing mean scores of 2.50 and above.

Hypothesis 1

Table 4: ANOVA summary table of respondents on the level of adequacy of safety facilities in electrical and electronics workshop/laboratory.

SOURCE OF VARIATION	SS	df	MS	F_{CAL}	F_{CRIT}	Decision
Between groups	36.81	2	18.405			
Within groups	3,573,113.19	195	17,865.57	0.0010	3.07	NS*
TOTAL	**3,573,150.00**	**197**				

that there is no significant difference between the responses of the three groups.

Hypothesis 2

There is no significance difference between the mean responses of lecturers, technicians and students on the safety techniques needed to motivate skill learning in electrical and electronics workshop/laboratory.

Table 5: ANOVA summary table of respondents on the safety techniques to motivate skill learning in electrical and electronic workshop/laboratory.

SOURCE OFVARIATION	SS	df	MS	F_{CAL}	F_{CRIT}	Decision
Between groups	8,632.49	2	196.971			
Within groups	3,844,343.39	195	19,221.72	0.22	3.07	NS*
TOTAL	**3,852,975.88**	**197**				

that there is no significant difference between the responses of the three groups.

Discussion of Findings

This discussion of the findings is based on the research questions posed for the study and the hypotheses. The findings of the study indicate that protective clothing like nose mask and ear muffles are inadequate in the workshop. Possessing some facilities without the other is as if nothing is available. There should be a

place. This would enable students to acquire skills related to the use of these facilities and how they are used. The findings also indicated that proper grounding of electrical and electronics appliance is one of the essential needs in a workshop settings. This is in line with Schuler (1999), who states that grounding of electrical and electronics appliances helps to reduce hazard in the workshop and will reduce the rate at

which appliances get damaged in the workshop. Proper insulation of electrical wires will also reduce contact with human body thereby reducing shock hazard. It can also be seen from this findings that the stairways and floors of the workshops are always cleared to ensure free movement by personnel's or students working and moving around in the workshop. Unclear ways could pose the danger of hitting of legs, getting contact with conductors.

The findings also indicated that fire extinguishers are adequate where fire outbreak is likely to occur. It is

are made available in order to help fight any fire outbreak that may head to accidents or injuries. According to Umoh (1993), the causes of fire may range from electrical faults, smoking, poor house-keeping, faulty electrical equipment and installations, overloading of transformers and sockets to open flames. Umoh,

the growth, escalation and subsequent outbreak of domestic and industrial fire, thereby preventing accidents or injuries to people and damages of appliances or equipments.

The findings also showed that failure of student to wear protective clothing is an unsafe act in the workshop. This is considered an ignorantly risk behavior on the path of the student or technicians and it tends to undermine whatever safety measures that might have put in place by either the school management or regulatory bodies towards ensuring and promoting health and safety in the workshop. The safety of lives of personnel and the safeguarding of schools property from damage cannot be guaranteed in an atmosphere of high disregard for occupational health and safety standards and regulations (ILO, 2000). The table also showed that lack of punishment of student for disturbing results and regulations has also contributed to failure to tackle accidents in the workshop. It is believed that penalties or punishments are aimed towards

even when due, is a promotion and encouragement of punishable habit or behavior. It therefore follows that those students who purposely disobey safety rules and regulations to the detriment of their own safety, the safety of colleagues and of the school's property should be made to face the penalties for their decisions and actions. Geoff, Kellie, and Roy, (2004), comments that whenever accidents occur, it is an indication that somebody somewhere has failed to do what should have been done.

The findings also indicated that caution signs and safety posters are displayed wherever high voltages are involved. Since it is always very difficult to know the component or conductor to which high voltages are connected, it then follows that caution signs and safety posters be properly used as indicators of potentially dangerous places with high voltages. Umoh, (1993) identifies caution signs and safety posters as being used for conveying instructions, warnings or general information on safety to a targeted public or group of people. It also agrees that they are useful supplements but not substitutes for protective measures.

students to learn the required skills and knowledge. They should be able to teach students various causes of accidents, identify protective measures, the need for guard on moving part of the machine, create awareness to students etc. This will motivate student to learn in electrical/electronics workshop.

Conclusion

It is evident that there is probably no other problem which is of more increasing everywhere, be it at home, in the high way, industry and institutions of learning than safety. Safety involves correct human behavior of being sensible and not fooling around as one step into any workshop or laboratory. If learners can be prevailed upon to develop proper attitudes and behaviours in the workshop, safety will be evident in all their endeavours. The Lecturers and instructor therefore, should take full advantage of his position and regard safety as one of the most important aspects of his responsibilities before the learner, the community and the state.

Recommendations

The following recommendations were made based on the findings of the study

1. Actively practice and develop in their students proper attitudes towards workshop safety and health matters.
2. Ensure that safe practices are developed and maintained at all times.
3. Ensure that the facilities and equipment provided for staff and students are safe and suitable for the types of work to be carried out.
4. Adequate provisions should be made for protective equipment use plugs and muffs for ears, hard hat, flame-retardant cap, acid proof hoods, safety glasses, splash-proof goggles, face shield welder's mask, gloves, safety shoes, safety belts etc.
5. Label all safety equipment and maintain it in good operating condition. Check and inspect safety equipment for correct operation in accordance with the manufacturer's instructions and report to workshop supervisor, any requirement for maintenance.
6. Students should be taught to regard all substances as hazardous unless there is definite information to the contrary.

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