Assessing the Adequacy of Skills Required of Electrical Technology Students in Rivers State Technical Colleges in Domestic Wiring.

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Abstract

The aim of this study was to investigate on the adequacy of skills required of electrical technology students among Rivers state technical colleges in domestic wiring. Three purposes and three research questions guided the study. Two null hypotheses were tested at 0.05% level of significance were formulated. This study adopted a descriptive research design and was carried out in four technical colleges in Rivers State. The total population for the study was 172 respondents. A questionnaire based on four point scale was used as the data collection instrument. The instrument used for data collection was a structured questionnaire. The instrument was structured on a 4-points scale of Strongly Agreed (SA), Agreed (A), Disagreed (D) and Strongly Disagreed (SD). The questionnaire was validated by three experts from the Department of Industrial Technology Education, Ignatius Ajuru University of Education, Rumuolumini. The study has a reliability index of 0.942 using Cronbach Alpha reliability method. Results were analyzed using the followings: items with a mean value within the real limit of numbers 0-1.49 was regarded as strongly disagreed, 1.50-2.49 was regarded as disagreed, 2.50-3.49 was regarded as agreed and 3.50-4.00 was regarded as strongly agreed. T-test was used to test the Null Hypothesis of no significant difference at a 0.05 level of Significance. Any item whose P-Value is greater than 0.05 was accepted while any Item whose P-value is less than 0.05 was rejected. The findings of the study revealed that ability to identify common types of protective devices, ability to explain the

principles and application of circuit breakers and fuses in electrical installation, ability to determine current rating of fuses are the skills required of Electrical Technology Students Among Rivers State Technical Colleges In Domestic Wiring. The study recommended amongst others that (1) Electrical courses required the services of well trained and qualified Electrical teacher to utilize and handle the complex and sophisticated tools and equipment to teach the theoretical and practical aspects of the subject. (2) Collaboration between private sectors and the technical colleges can enhance the theoretical and practical skills required by the electrical students. (3) The technical colleges' curriculums should emphasize more on practical skills as this can enable electrical students to possess the skills required by the industries.

KEYWORDS: Skills, Electrical Technology, Domestic Wiring and Technical Colleges.

Introduction

Vocational technical education is the foundation of nation's wealth and development. It is a type of education that is meant to produce skilled and technical manpower necessary to restore, revitalize, energize, operate and sustain the national economy and substantially reduce unemployment and create wealth for the electrical graduate. According to Amadi, Ikedi and Obed (2015), technical and vocational education is a form of education involving, in addition to general education, the study of technologies and related sciences and the acquisition of practical skills, attitudes, understanding and knowledge relating to a particular occupation for wealth creation and social life. This specialized education offered in technical institutions is saddled with training of middle level manpower in Technical Colleges.

Technical Colleges in Nigeria are established to produce craftsmen at the craft level and master craftsmen at the advance craft level (Federal

Ministry of Education, 2013). The courses offered at the technical colleges leads to the award of National Technical Certificate (NTC) and Advance National Technical Certificate (ANTC). The curriculum programmes of technical colleges according to Federal Government of Nigeria (2013) are grouped into related trades. These include; the computer technology, building technology, wood technology, mechanical technology and electrical technology. Electrical technology is one of the vocational education programmes taught in technical colleges in Nigeria. The aim of Electrical technology is to give training and impact the required skills leading to the production of skilled male and female who will be enterprising and self reliant and to enable the students have an intelligent understanding of the increasing and changing complexity of technology (National Policy of Education, 2004). This programme trains individual in the skill needed for domestic residential wiring. Domestic Wiring is one of the Technical College subjects taught in years I, II and III, as stipulated by the National Policy on Education (FRN, 2004). Domestic wiring is the assembly of associated electrical equipment and wires in other to fulfill a specific purpose and having certain coordinated characteristics: such as Basic Electricity, Domestic Installation, Industrial Installation and Electric Motors, Cable Jointing, Battery Charging and Repairs, Winding of Electrical Machines, Solid State Devices and Circuits and Electrical/Electronics Drawing. The skills in this area include: domestic installation, principles of protecting electrical devices/ installation and conduit wiring. The aim of domestic wiring according to NBTE (2001) is to provide the trainee with the knowledge and skill to enable him carry out complete electrical installations in a electrical and its associated equipment. In extension, the trainee on completion of the programme should be able to:

- Understand electrical working diagrams.
- Know different types of domestic surface wiring.
- Know different types of domestic conduit wiring.
- Understand the principles of protecting electrical devices and installation.
- Understand sequence for inspecting and testing domestic installations.
- Understand the terms used in illumination.
- Know various types of lamps for illumination.

To achieve this noble objective, there should be functional workshop with well equip and adequate tools and equipment and conducive learning colleges which reviewed that many technical colleges have their electrical technology equipment installed but there is no adequate power supply to make use of the machines because of trend, and that a good number of these equipment have been vandalized, the state of some of the equipment have become deplorable due to lack of maintenance. The tools and equipment being supplied to schools are grossly inadequate (not enough), few in number in relation to the students/population while some of the tools and equipment are outdated and awkwardly small in size in comparison to what is obtainable in the world of work (the factories and industries). This makes the teaching and learning of practical aspect of electrical technology very difficult and tedious because it is emphasized that there will be no meaningful electrical technology education if adequate facilities (physical facilities), tools, equipment and competent teaching staff are not adequately supplied and utilized for the purpose of teaching and learning. Also, most technical colleges have the problem of not having functional workshop, consumable materials are not available and where they are available it will be very few that it cannot go round the students. In technical colleges, it is discovered that less practical work is done during the teaching and learning processes in electrical technology for a considerable period of time, the utmost

neglect of practical work has led to lack of maintenance of the available hand tools, equipment, machines and keeping them in a bad condition, of course some have gone bad but the maintenance is necessary for development of skills.

Skill according to Osinem (2005) is the proficiency displayed by someone in the performance of a given task. In the context of this study, skill is the ability that an individual has acquired that enables him perform a task efficiently such as using electrical hand tools. To effectively use these machines the teacher/students must possess relevant electrical skills. Electrical skill is often associated with the use of tools, equipment related to work, as well as all technical matters.

Domestic wiring is a vocational education programme that requires the training of students in Technical Colleges, Colleges of Education and Universities. The basic aim of domestic wiring in technical colleges is to give training and impart the necessary skills leading to the production of craftsmen, technicians and other skilled personnel who will be enterprising and self-reliant (NBTE, 2001).

Contrary to achieving the above goal, majority of electrical technology students have been completing the programme with very poor skills performance in domestic wiring and inadequate skills which is incapable of earning them a living. In this regard, the employers of labour responded by non-demand of the graduates of technical colleges. Employers prefer to develop their own in-house craftsmen instead of employing the half-baked graduates produced in technical colleges. This decline in students performance has been associated to a number of factors, among which is the inadequacy of electrical machines, facilities, materials and tools in the workshop (Akinyele, 2000).

This unsatisfactory situation could result to inadequate resources in the workshop which the educational

authority has failed to supply, thereby contributing to the poor performance of students in the domestic wiring as perceived by the industries. Instructors in technical colleges are not with the right competence to handle the material resources for teaching domestic wiring. The lack of updating programmes of electrical technology teachers and students to suit the industry causes a great deal of problems on the performance of students in the domestic wiring. The above underscore the need to access the adequacy of skills required of electrical technology students among rivers state technical colleges in domestic wiring. Hence the problem of the study is: how adequate are skills required of electrical technology students among rivers state technical colleges in domestic wiring?

The general purpose of the study is to Assess the Adequacy of Skills Required of Electrical Technology Students in Rivers State Technical Colleges In Domestic Wiring.

Specifically, the study explored the following:

1. Assessing the adequacy of skills required of electrical technology students among rivers state technical colleges In Domestic installation.
2. Assessing the adequacy of skills required of electrical technology students among rivers state technical colleges In Different types of domestic conduit wiring
3. Assessing the adequacy of skills required of electrical technology students among rivers state technical colleges In Principles of protecting electrical devices and installation

Research Questions

1. What is the adequacy of Domestic installation skills possessed by electrical technology students in Rivers State Technical Colleges?

2. What are the Different types of domestic conduit wiring skills possessed by electrical technology students in Rivers State Technical Colleges?
3. What is the adequacy of Principles of protecting electrical devices and installation skills possessed by electrical technology students in Rivers State Technical Colleges?

Hypotheses

Two hypotheses were formulated to guide the study and were tested at 0.05% level of significance.

1. There is no significant difference in the mean score of respondents in the adequacy of Domestic installation skills among electrical technology students in Rivers State Technical Colleges.
2. There is no significant difference in the mean score of respondents in the Different types of domestic conduit wiring skills among electrical technology students in Rivers State Technical Colleges.

METHOD

This study adopted a descriptive research design and was carried out in three selected oil spills communities in Rivers State. The total population for the study was 172 respondents. No sampling was done as the population is of manageable size. A questionnaire based on four point scale was used as the data collection instrument. The instrument used for data collection was a structural questionnaire. This developed questionnaire was structured and grouped into five parts. Part1: Seeks on personal data of the respondents. Part 2: Contains items which seek information on adequacy of Domestic installation skills among electrical technology students in Rivers State Technical Colleges. Part 3: Deals with items which seek information on adequacy of Different types of domestic conduit wiring skills

among electrical technology students in Rivers State Technical Colleges. Part 4: Deals with items which seek information adequacy of Principles of protecting electrical devices and installation skills among electrical technology students in Rivers State Technical Colleges. Section 2 was structured on a 4-points scale of Strongly Agreed (SA), Agreed (A), Disagreed (D) and Strongly Disagreed (SD). The questionnaire was validated by three experts from the Department of Industrial Technology Education, Ignatius Ajuru University of Education, Rumuolumini. For the purpose of obtaining the internal consistency of the instrument, Cronbach Alpha reliability method was used and Cronbach alpha of 0.942 value obtained represent the reliability coefficient of the instrument.

Method of Data Analysis

Results were analyzed using the following: Any item with a mean value within the real limit of numbers 0-1.49 was regarded as strongly disagreed, 1.50-2.49 was regarded as disagreed, 2.50-3.49 was regarded as agreed and 3.50-4.00 was regarded as strongly agreed. T-test was used to test the Null Hypothesis of no significant difference at a 0.05 level of Significance. Any item whose P-Value is greater than 0.05 was accepted while any Item whose P-value is less than 0.05 was rejected.

RESULTS

Research Question 1: What is the adequacy of Domestic installation skills possessed by electrical technology students in Rivers State Technical Colleges?

Table 1: Mean and SD of Respondents on the adequacy of Domestic installation skills among electrical technology students.

S/N	Items	X	SD	Remark
1.	Ability to identify symbols used in electrical engineering drawing of an electrical installation.	3.43	.832	A
2.	Ability to interpret the scale used in working drawing	3.11	.891	A
3.	Ability to locate the position of the various accessories on a drawing	2.98	.932	A
4.	Ability to list all the electrical accessories required for a job from the working drawing	3.09	.925	A
5.	Ability to interpret the distribution system from a drawing	3.30	.864	A
6.	Ability to fixing cable to a surface	2.83	.958	A
7.	Ability to identify cable types and sizes used for lighting, heating, cooker and socket outlets.	2.91	1.069	A
8.	Ability to identify cable rating, maximum load demand and ambient temperature	2.75	1.120	A
9.	Ability to use plumbline, chalk line and spirit level.	2.91	1.013	A
10.	Ability to carry out simple, surface wiring of building (residential) using appropriate tools.	3.00	.953	A
11.	Ability to explain relevant statutory regulations regarding surface wiring	3.57	.700	SA
12.	Ability to apply the regulations of Electrical Board of Nigeria and Power Holding Company of Nigeria (PHCN) on surface wiring.	3.29	.785	A

Table 1 revealed that item 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 12 had mean of 2.83-3.48. The values of the 11 items were within the real limit of numbers 2.50-3.49 indicating that the 11 items are in agreement with the items as the adequacy of Domestic installation skills among electrical technology students. Further-more, item 11 had a mean 3.57. The value of the item was within the real limit of numbers 3.50-4.00 indicating that the item is in strong agreement with the items as the adequacy of Domestic installation skills among electrical technology students.

Research Question 2: What are the Different types of domestic conduit wiring skills possessed by electrical technology students in Rivers State Technical Colleges?

Table 2: Mean and SD of Respondents on the adequacy of Different types of domestic conduit wiring skills among electrical technology

S/N	Items	X	SD	Remark
1.	Ability to explain the meaning of conduit	2.99	.988	A
2.	Ability to explain the advantages and disadvantages of conduit installation.	3.03	.900	A
3.	Ability to identify types of conduits; steel conduit, flexible conduit and PVC conduit.	3.00	1.057	A
4.	Ability to explain the applications of sticks, taps and dies, and hacksaw	2.89	.999	A
5.	Ability to explain relevant conduit statutory Regulations	3.21	.870	A
6.	Ability to explain appropriate procedures for preparing conduit for Installation	3.08	.926	A
7.	Ability to use of running coupler, conduit boxes, bend, elbows, tees and accessories for conduit work.	3.15	.827	A
8.	Ability to draw in cables using fishing tape	3.35	.747	A
9.	Ability to test the installation as stipulated	3.32	.828	A

by the statutory regulations			
10. Ability to maintain tools and equipment used on conduit installation.	3.06	.770	A
11. Ability to determine set and bend permissible radial length	3.15	.936	A

Table 2 revealed that item 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, and 11 had mean of 2.89-3.35. The values of the 11 items were within the real limit of numbers 2.50-3.49 indicating that the 11 items are in agreement with the items as the adequate are Different types of domestic conduit wiring skills among electrical technology.

Research Question 3: What is the adequacy of Principles of protecting electrical devices and installation skills possessed by electrical technology students in Rivers State Technical Colleges?

Table 3: Mean and SD of Respondents on the adequacy of Principles of protecting electrical devices and installation skills among electrical technology students.

S/N	Items	X	SD	Remark
1.	Ability to identify common types of protective devices	3.18	.882	A
2.	Ability to explain the principles and application of circuit breakers and fuses in electrical installation	3.26	.859	A
3.	Ability to determine current rating of Fuses	3.03	.908	A
4.	Ability to identify the earthing system of electrical installations and devices	3.27	.905	A
5.	Ability to explain the regulations relating to various types of protective devices	3.01	.930	A
6.	Ability to use current and voltage operated earth leakage circuit breaker observing relevant regulations.	2.92	.972	A

Table 3 revealed that item 1, 2, 3, 4, 5, and 6 had mean of 2.89-3.35. The values of the six items were within the real limit of numbers 2.50-3.49 indicating that the six items are in agreement with the items as the adequacy of Principles of protecting electrical devices and installation skills among electrical technology students.

Hypotheses

Hypothesis1: There is no significant difference in the mean score of respondents in the adequacy of Domestic installation skills among electrical technology students in Rivers State Technical Colleges.

Table 1: ***The t-test analysis of Difference between Students and Lecturers on the adequacy of Domestic installation skills among electrical technology students.***

S/N	Items		X	SD	T-test	Remark
	Ability to identify symbols used in electrical engineering drawing of an electrical installation.	Students	1.108	.424	.692	Accepted
		Lecturers	1.133	.342		
	Ability to interpret the scale used in working drawing	Students	3.238	.870	.458	Accepted
		Lecturers	3.133	1.032		
	Ability to locate the position of the various accessories on a drawing	Students	3.074	.922	.009	Rejected
		Lecturers	2.700	.961		
	Ability to list all the electrical accessories required for a job from the working drawing	Students	3.047	.931	.250	Accepted
		Lecturers	2.883	.922		
	Ability to interpret the distribution system from a drawing	Students	3.136	.911	.151	Accepted
		Lecturers	2.933	.936		
	Ability to fixing cable to a surface	Students	3.278	.874	.830	Accepted
		Lecturers	3.250	.894		
	Ability to identify cable types and sizes used for lighting, heating, cooker and socket outlets.	Students	2.898	.948	.797	Accepted
		Lecturers	2.933	.756		
	Ability to identify cable rating, maximum load demand and ambient temperature	Students	2.972	1.065	.170	Accepted
		Lecturers	3.200	1.101		
	Ability to use plumbline, chalk line and spirit level.	Students	2.823	1.108	.254	Accepted
		Lecturers	3.016	1.026		
	Ability to carry out simple, surface wiring	Students	2.870	1.080	.628	Accepted

of building (residential) using appropriate tools.	Lecturers	2.950	1.032		
Ability to explain relevant statutory regulations regarding surface wiring	Students Lecturers	3.040 3.116	1.039 .958	.627	Accepted
Ability to apply the regulations of Electrical Board of Nigeria and Power Holding Company of Nigeria (PHCN) on surface wiring.	Students` Lecturers	3.038 3.011	.656 .617	.790	Accepted

Table 4 presents the summary of t-test analysis of the responses of the respondents on adequacy of Domestic installation skills among electrical technology students. Data from the table revealed that item 1, 2, 4, 5, 7, 8, 9, 10 and 11 had P-values ranged from 0.151-0.830 which are all greater than 0.05% level of significance. However, item 3 had a mean of 0.009 which is below 0.05% indicating that there is a significant difference in the mean response of the respondents on the adequacy of Domestic installation skills among electrical technology students.

Hypothesis2: There is no significant difference in the mean score of respondents in the Different types of domestic conduit wiring skills among electrical technology students in Rivers State Technical Colleges

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Table 2: ***The t-test analysis of Difference between Students and Lecturers on the Different types of domestic conduit wiring skills among electrical technology students.***

S/N	Items		X	SD	T-test	Remark
1.	Ability to explain the meaning of conduit	Students	1.108	.424	.692	Accepted
		Lecturers	1.133	.342		
2.	Ability to explain the advantages and	Students	3.421	.784	.739	Accepted
	disadvantages of conduit installation.	Lecturers	3.383	.666		
3.	Ability to identify types of conduits;	Students	3.142	1.040	.962	Accepted
	steel conduit, flexible conduit and	Lecturers	3.150	.819		
	PVC conduit.					
4.	Ability to explain the applications of	Students	2.911	1.065	.620	Accepted
	sticks, taps and dies, and hacksaw	Lecturers	2.833	.923		
5.	Ability to explain relevant conduit	Students	2.816	1.000	.049	Rejected
	statutory Regulations	Lecturers	3.116	.958		
6.	Ability to explain appropriate procedures	Students	2.884	1.030	.757	Accepted
	for preparing conduit for Installation	Lecturers	2.933	1.039		
7.	Ability to use of running coupler, conduit	Students	2.843	.991	.881	Accepted
	boxes, bend, elbows, tees and accessories	Lecturers	2.866	1.049		
	for conduit work.					
8.	Ability to draw in cables using fishing tape	Students	3.166	.826	.011	Rejected
		Lecturers	2.877	.935		
9.	Ability to test the installation as stipulated	Students	3.233	.830	.256	Accepted
	by the statutory regulations	Lecturers	3.122	.999		
10.	Ability to maintain tools and equipment	Students	3.283	.691	.322	Accepted
	used on conduit installation.	Lecturers	3.183	.899		
11.	Ability to determine set and bend	Students	3.316	.812	.304	Accepted
	permissible radial length	Lecturers	3.031	.642		

Table 5 presents the summary of t-test analysis of the responses of the respondents on the Different types of domestic conduit wiring skills among electrical technology students. Data from the table revealed that item 1, 2, 3, 4, 7, 9, 10 and 11 had P-values ranged from 0.256-0.962 which are all greater than 0.05% level of significance. However, item 5 and 8 had mean of 0.049 and 0.011 which is below 0.05% indicating that there is a significant difference in the mean response of the respondents on the

Different types of domestic conduit wiring skills among electrical technology students.

Discussion of Findings

The findings of the study revealed that Ability to identify symbols used in electrical engineering drawing of an electrical installation. Ability to interpret the scale used in working drawing, Ability to locate the position of the various accessories on a drawing, Ability to list all the electrical accessories required for a job from the working drawing, Ability to interpret the distribution system from a drawing, Ability to fixing cable to a surface, Ability to identify cable types and sizes used for lighting, heating, cooker and socket outlets, Ability to identify cable rating, maximum load demand and ambient temperature, Ability to use plumbline, chalk line and spirit level, Ability to carry out simple, surface wiring of building (residential) using appropriate tools, Ability to explain relevant statutory regulations regarding surface wiring and Ability to apply the regulations of Electrical Board of Nigeria and Power Holding Company of Nigeria (PHCN) on surface wiring are the Domestic installation skills required among electrical technology students in Rivers State Technical Colleges. This is in line with the findings of Ukoha (2007) encourages teachers to teach through practice as experience shows that students learn best by practice, especially with regard to psychomotor activities, which in turn become more advanced. Therefore, there is no significant difference in the mean score of respondents in the adequacy of Domestic installation skills among electrical technology students in Rivers State Technical Colleges.

The findings of the study revealed that Ability to explain the meaning of conduit, Ability to explain the advantages and disadvantages of conduit installation, Ability to identify types of conduits; steel conduit, flexible conduit and PVC conduit, Ability to explain the applications of

sticks, taps and dies, and hacksaw, Ability to explain relevant conduit statutory Regulations, Ability to explain appropriate procedures for preparing conduit for Installation, Ability to use of running coupler, conduit boxes, bend, elbows, tees and accessories for conduit work, Ability to draw in cables using fishing tape, Ability to test the installation as stipulated by the statutory regulations, Ability to maintain tools and equipment used on conduit installation and Ability to determine set and bend permissible radial length are the Different types of domestic conduit wiring skills required among electrical technology students in Rivers State Technical Colleges. This is in line with Okorie (2000) who dictated that the school environment should expose students to the use of the Basic Electricity equipment in a way that will lead students to acquire relevant knowledge and skills. Hence, there is no significant difference in the mean score of respondents in the Different types of domestic conduit wiring skills among electrical technology students in Rivers State Technical Colleges.

The findings of the study revealed that Ability to identify common types of protective devices, Ability to explain the principles and application of circuit breakers and fuses in electrical installation, Ability to determine current rating of Fuses, Ability to identify the earthing system of electrical installations and device, Ability to explain the regulations relating to various types of protective devices and Ability to use current and voltage operated earth leakage circuit breaker observing relevant regulations are the Principles of protecting electrical devices and installation skills required among electrical technology students in Rivers State Technical Colleges. This is in line with Okorie (2000) contends that the workshops, laboratories and the overall vocational education environment must be adequately equipped so as to reflect the

actual working environment beyond the classroom.

Conclusion

The findings of the study revealed that Ability to identify symbols used in electrical engineering drawing of an electrical installation. Ability to interpret the scale used in working drawing, Ability to locate the position of the various accessories on a drawing, Ability to list all the electrical accessories required for a job from the working drawing, Ability to interpret the distribution system from a drawing, Ability to explain the applications of sticks, taps and dies, and hacksaw, Ability to explain relevant conduit statutory Regulations, Ability to identify common types of protective devices, Ability to explain the principles and application of circuit breakers and fuses in electrical installation, Ability to determine current rating of Fuses and Ability to identify the earthing system of electrical installations and device are of skills required of electrical technology students In domestic wiring. The two hypotheses were accepted which indicates that there is no significant difference in the mean score of respondents in the skills required of electrical technology students In domestic wiring in Rivers State Technical Colleges.

Recommendations

(1) The government should supply Electrical equipment, materials and tools to the Colleges in large numbers to cater for the ever-growing population of students.

(2) The government should train Electrical teachers to enable them properly use the equipment in the Technical Colleges.

(3) The Electrical equipment, materials and tools supplied to the Technical Colleges should be installed and adequate power supply from the Power Holding Company of Nigeria (PHCN) should be made available.

(4) Electrical courses required the services of a well trained and qualified Electrical teacher to utilize and handle

the complex and sophisticated tools and equipment to teach the theoretical and practical aspect of the subject.

(5) Collaboration between private sectors and the technical colleges can enhance the theoretical and practical skills required by the electrical students.

(6) The technical college curriculum should emphasize more on practical skills as this can enable electrical students to possess the skills required by the industries.

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