

ELECTRICAL INSTALLATION WORKS SKILLS REQUIRED FOR INDUSTRIAL DEVELOPMENT OF TECHNICAL COLLEGE GRADUATES IN RIVERS STATE

CHIORLU D. O., PhD.

Department of Industrial Technical Education
Faculty of Vocational and Technical Education
Ignatius Ajuru University of Education, Port Harcourt. Rivers State.

And

NWAUZI K. K.

Department of Electrical and Electronics
School of Engineering and Technology
Port Harcourt Polytechnic Rumuola
Rivers State

Abstract

The study assesses Electrical Installation works skills required for Industrial Development of Technical college graduates in Rivers State. Three purpose, research questions and hypotheses guided the study. This study adopted a survey research design. The study was carried out in Rivers State. The targeted population of the study was 190 respondents, comprising 80 electrical teachers and 110 industrial management Rivers States. Purposive sampling technique was used to select only electrical teachers and industrial management. This gave a total sample size of 190 respondents. A structured questionnaire instrument was used to collect data for this study titled 'Electrical Installation and Maintenance skills required for Industrial Development Questionnaire (EIMSRIDQ)'. The instrument was face-validated by three experts, Cronbach Alpha reliability coefficient formula was used to determine the reliability of the instrument which yielded a reliability coefficient of 0.81. Findings of the study revealed that domestic skills, Cable Jointing skills and winding of electrical machines skills are required for Industrial Development of Technical college graduates in Rivers State. It was recommended that (1) The Government should supply Electrical Installation and Maintenance equipment, materials and tools to the Colleges in large numbers to cater to the ever-growing population of students. (2) The government should train electrical teachers to enable to properly use the equipment in the Technical Colleges.

Keywords: Electrical Installation and Maintenance skills, domestic installation, Cable Jointing and winding of electrical machines and Technical college.

Introduction

No country grows above the standard of its technical institutions. Technical and Vocational 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. Skills and knowledge are the engines of economic growth and social development of any nation (Goel, 2010), and Technical Vocational Education and Training (TVET) holds the key to training the skilled and entrepreneurial workforce needed for the changing technological workforce (Afeti, 2010). Technical Vocational Education and Training (TVET) is used as a comprehensive term referring to those aspects of the educational process involving in addition to general education, the study of technologies and related sciences, and

the acquisition of practical skill, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life (UNESCO, 2002). According to Mclean and David (2009) TVET is concerned with the acquisition of knowledge and skills for the world of work to increase opportunities for productive empowerment and socio-economic development in knowledge economics and rapidly changing work environment. TVET thus equips people not only with technical and vocational skills, but with a broad range of knowledge, skills and attitudes that are now recognized as indispensable for meaningful participation in work and life. TVET has numerous goals which vary from countries to countries.

In Nigeria, TVET is part of the formal education system incorporated in the three levels of education (primary, secondary and tertiary) with a view to meeting the nation's need for skilled manpower and support the economic state of individual and the nation in general. As qualitative TVET is increasingly recognized as the bedrock of every development, quality assurance therefore is an indispensable process for achieving the national goals in TVET which will in turn lead to the production of qualitative human capital for sustainable national development. Technical Vocational Education and Training is the provision of skills, knowledge, attitude and values needed for a specific occupation. Osuala, (2006) explained that technical Vocational Education and Training is meant to prepare learners for careers based on manual and practical activities, understanding of laws of science and technology as applied to modern design and production which leads to the acquisition of skills. Skill, according to Osuala (2006) is the ability to perform expertly, facilitate performance during employment. It is also the ability to do something well. Skill is observable competence to perform a learned behaviour regarding the relationship between mental activity and body movements (Miller and Rosenbaum, 2007). This implies that to possess a skill is to demonstrate that habit of acting, thinking and behaving in a specific activity in such a way that the process becomes natural to the individual through repetition or practice. A skilled person in a job is an individual who has undergone some extensive training in such job and has thus mastered the activities that lead to successful performance in the job. Okorie (2001) stated that skill is manual dexterity through repetitive performance of an operation. Skill can be acquired through experience and training.

However, Technical colleges are established by the Federal Government of Nigeria to prepare individuals to acquire practical skills, basic and scientific knowledge and attitude required by craft men and technicians at sub-professional level in order to achieve the goals of technical education, which shall be to:

- 1) Provide trained manpower in the applied sciences, technology and business particularly at craft, advance craft and technical levels.
- 2) Provide the technical knowledge and vocational skills necessary for agricultural, commercial and economic development.
- 3) Give training and impart the necessary skills to individual who shall be self-reliant economically. In pursuance of the above goals:
 - (a) The main features of the curriculum activities for technical college shall be structured in foundation and trade modules.
 - (b) The components are general education, theory and related courses; workshop practice and Industrial training/production work (Federal Republic of Nigeria, 2013).

According to Digbori-Besmart (2004) the venue for acquiring practical skills by technical college students is the workshop and industry. Technical college provide technical training in a number of courses including Automobile mechanics, Welding and Fabrication, Plumbing, Mechanics work, Auto-electrical work, Auto-mechanics works, Auto-body building, Auto parts merchandising, Metal Technology, Mechanical Engineering craft practice, Welding and Fabrication engineering craft practice, Foundry craft practice, Instruments mechanics work, Refrigeration and air-conditioning and Electrical craft practice.

Electrical craft practice is one the trades offered in the technical colleges. Amongst other courses offered in this trade includes Installation and Maintenance work. Installation and Maintenance work is taught as a Course/Module and is a body of knowledge and skills capable of being utilized on its own or as a foundation or pre-requisite knowledge for more advanced work in the same or other fields of study. Its aim 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). Each module when successfully completed can be used for employment purposes (NBTE, 2001). The units in these modules according to NBTE, (2001) includes: General Metal Work, Basic Electricity, Domestic Installation, Winding of Electrical Machines, Solid State Devices and Circuits, Electrical/Electronic Drawing, Advanced Courses, Industrial Installation, Advanced Winding, Industrial Installation and Electric Motors, Cable Jointing and Battery Charging and Repairs.

The goal of domestic installation according to Pops (2008) is to provide the trainee with the knowledge and skill to enable him carry out complete electrical installations in a building and its associated equipment. Litchfield and McAlister (2008) postulated that domestic wiring is the assembly of associated electrical equipment and wires in order to fulfill a specific purpose and having certain coordinated characteristics. The skills in domestic wiring involve the application of scientific knowledge and practical skills. The goal of domestic wiring according to National Board for Technical Education NBTE (2003) is to produce skilled craftsmen with good knowledge of the working principles of domestic wiring, the techniques and safety practices involved in its maintenance. Hans, Ulrich and Pierre (2009) further stated that domestic installation gives training and impart the necessary skills leading to the production of competent craftsmen, technicians and other skilled personnel who will be enterprising and self-reliant.

A cable includes a conductor and insulation and is suitable for being run underground or underwater. This is in contrast to an overhead line, which does not have insulation. High-voltage cables of differing types have a variety of applications in instruments, ignition systems, and AC and DC power transmission. In all applications, the insulation of the cable must not deteriorate due to the high-voltage stress, ozone produced by electric discharges in air, or tracking (Kießling, Nefzger, Nolasco & Kaintzyk 2003). The cable system must prevent contact of the high-voltage conductor with other objects or persons, and must contain and control leakage current. Cable joints and terminals must be designed to control the high-voltage stress to prevent breakdown of the insulation. Often a high-voltage cable will have a metallic shield layer over the insulation, connected to the ground and designed to equalize the dielectric stress on the insulation layer. High-voltage cables may be any length, with relatively short cables used in apparatus, longer cables run within buildings or as buried cables in an industrial plant or for power distribution, and the longest cables often run as submarine cables under the ocean for

power transmission. First, the outer conducting layers in both cables shall be terminated without causing a field concentration (Donald & Wayne 2007), similar as with the making of a cable terminal. Secondly, a field free space shall be created where the cut-down cable insulation and the connector of the two conductors safely can be accommodated (Ogbuanya, Abdulahi, and Ado, 2013).

The cable module is designed to provide the trainee with the knowledge and skill to enable him undertake with proficiency various methods of cable jointing and terminations (Raghuvir 2004). On completion of this module Lynne (2003) explained that the trainee should be able to: Know how to make simple joints and terminations. Know various types of armoured cables, their applications, jointing and terminations. Know the installation of underground cables. Understand the installation of overhead wires and cable for distribution/transmission system and know the various types of data and communication cabling methods used for wiring of electrical machines.

Electric machine is a general term for machines using electromagnetic forces, such as electric motors, electric generators, and others (Fiona 2003). They are electromechanical energy converters: an electric motor converts electricity to mechanical power while an electric generator converts mechanical power to electricity. The moving parts in a machine can be rotating (rotating machines) or linear (linear machines). Besides motors and generators, a third category often included is transformers, which although they do not have any moving parts are also energy converters, changing the voltage level of an alternating current (Wald, 2008). Electric machines in the form of generators produce virtually all electric power on Earth and in the form of electric motors consume approximately 60% of all electric power produced.

The electric machine module is aimed at providing the trainee with the knowledge and skill to enable him wind or rewind AC and DC rotating/static machines up to 10 KVA (Jacob 2001). On completion of this module, the trainee should be able to: Understand and apply all statutory regulations during electrical winding work. Identify and select appropriate tools and equipment used for winding jobs. Acquire skills for preparation and interpretation of winding drawing. Acquire skills for dismantling machines for rewinding them. Understand the rewinding of burnt static/rotating machines. Know the skimming/undercutting of armature, commutators and slip rings and inspect rewind electrical machines and equipment and test for continuity, insulation, correct rotating voltage. The above competencies are required of students in technical colleges.

However, the rapid industrialization of any nation is tied to the acquisition of vocational and technical education (Amaechi, Obed, Orlu and Thomas 2017). Fundamentally, it is a systematic way of exposing individuals to the practical training for developing and producing goods and services for the citizens in any country. Nigeria as a developing country has failed to achieve any meaningful Industrial development because of a number of factors principal among them is overdependence on imported goods from the developed countries. Nigeria has abundant natural resources but lacks the necessary vocational and technical knowledge and manpower to transform these resources into finished products. Therefore, acquisition of vocational and technical education is imperative to attaining industrial development, for it is a type of education that involves the application of the rudiments of science and technology for industrial design, production, distribution and services.

Statement of the Problem

To enhance productivity, stimulate competitiveness, and bring about economic growth, skill development is important (Amaechi, Obed, Orlu and Thomas 2017). Hence the goal of Electrical Installation and Maintenance work in technical colleges according to NBTE (2001) is to produce skilled craftsmen with good knowledge of the working principles of machines and the techniques and safety practices involved in its maintenance. Technical college graduates have prospects of setting-up their own machine-shop workshops and become self-employed. Better still, technical college graduates have the opportunity of furthering their education in higher institutions.

However, the skills Electrical Installation and Maintenance work for industrial development in technical college graduates in Rivers states is lacking. According to Obed and Amadi (2016) who explained that majority of Electrical craft students have been completing their program with very poor academic performance and inadequate skills which is incapable of earning them a living. They further stated that in this regard, the employers of labour responded by non-demand of the graduates of technical colleges. This decline in acquisition of appropriate Electrical Installation and Maintenance work skills by electrical students gave rise to the topic under investigation. Hence the problem of the study is what are the Electrical Installation and Maintenance skills required for Industrial Development of Technical college graduates in Rivers State? The foregoing therefore underscores the need to explore Electrical Installation and Maintenance skills required for Industrial Development of Technical college graduates in Rivers State.

Purpose of the Study

The general purpose of the study is to assess Electrical Installation and Maintenance skills required for Industrial Development of Technical college graduates in Rivers State. Specifically, the study determined the followings:

1. domestic installation skills required for Industrial Development of Technical college graduates in Rivers State
2. Cable Jointing skills required for Industrial Development of Technical college graduates in Rivers State
3. winding of electrical machines skills required for Industrial Development of Technical college graduates in Rivers State

Research Questions

Three research questions were formulated to guide the study:

1. What is the domestic installation skills required for Industrial Development of Technical college graduates in Rivers State?
2. What is the cable Jointingskills required for Industrial Development of Technical college graduates in Rivers State?
3. What are the winding of electrical machineskills required for Industrial Development of Technical college graduates in Rivers State?

Hypotheses

Three hypotheses were formulated to guide the study and was tested at 0.05% level of significance

Ho₁ There is no significant difference in the mean ratings of technical college teachers and industrial management on the domestic installation skills required for Industrial Development of Technical college graduates in Rivers State.

Ho₂ There is no significant difference in the mean ratings of technical college teachers and industrial management on the cable Jointingskills required for Industrial Development of Technical college graduates in Rivers State.

Ho₃ There is no significant difference in the mean ratings of technical college teachers and industrial management on the winding of electrical machines skills required for Industrial Development of Technical college graduates in Rivers State.

Methodology

Design of the Study

This study adopted a survey research design. According to Gall, Gall and Borg (2007), a survey research is a method of data collection in which questionnaires or interview is utilized in collecting data from a sample that has been selected to represent a population to which the findings of the data analysis can be generalized. The survey research design was considered suitable because the study elicits data/information on Electrical Installation and Maintenance skills required for Industrial Development of Technical college graduates in Rivers State.

Area of the Study

The study was carried out in Rivers State. The state areas has companies and industries that needs the graduates of electrical craft practice. More also, the area has technical institutions that offer assess Electrical Installation and Maintenance work. These teachers and industrial management are suitable to form the population of the study.

Population of Study

The targeted population of the study was 190 respondents, comprising 80electrical teachers and 110industrial management in Rivers State.

Sample and Sampling Techniques

Purposive sampling technique was used to select only electrical teachers and industrial management. This gave a total sample size of 190 respondents. Comprising 80electrical teachers and 110industrial management State.

Instrument for Data Collection

A structured questionnaire instrument was used to collect data for this study titled 'Electrical Installation and Maintenance skills required for Industrial Development Questionnaire (EIMSRIDQ)'. The instrument was developed after the review of relevant literature on Electrical Installation and Maintenance skills required for Industrial Development of Technical college graduates in Rivers State. The instrument contains two sections A-C.

Validation of the Instrument

The instrument was face-validated by three experts from the Department of Technical education, Ignatius Ajuru University of Education Rivers State. The validates were requested to read through the questionnaire items in terms of clarity and appropriateness based on the research questions for the study under investigation. The expert's comment and suggestions were utilized to structure the new questionnaire instrument.

Reliability of the Instrument

To establish the reliability of the instrument, 30 copies of the questionnaires was trial-tested among technical institutions in Bayelsa state, hence this did not form the part of the main population of the project. Cronbach Alpha reliability coefficient formula was used to determine the reliability of the instrument which yielded a reliability coefficient of 0.81. This indicated that the instrument was reliable.

Method of Data Collection

The researcher administered the questionnaire personally together with the help of two research assistants. The researcher informed the research assistance on the procedures required in administering the questionnaire instruments. The completed copies of the questionnaire was also be retrieved by the researcher and the two research assistants within a week to help maximize the return rate of the questionnaire for data analysis.

Method of Data Analysis

Data collected from the respondents was analyzed on four point scale using mean and standard deviation to answer the three research questions. T-test statistics was used to test the null hypotheses at 0.05 probability level of significance. Decision was taken as follows: if the calculated value is greater or equal to the table value, the null hypothesis will be rejected. On the other hand if the calculated value is less than the table value, the null hypothesis will not be rejected.

Results

Research Question 1: What is the domestic installation skills required for Industrial Development of Technical college graduates in Rivers State?

Table 1: Mean ratings and standard Deviation of teachers and Industrial Management on domestic installation and Electric Motors skills required for Industrial Development of Technical college graduates in Rivers State.

S/N	ITEMS	Electrical Teachers			Industrial Management		
		X	SD	RMK	X	SD	RMK
	Ability to :						
1	Interpret electrical working drawing of a factory	3.68	0.56	A	3.59	0.69	SA
2	Carry out Simple surface wiring for industrial installation	3.66	0.78	A	3.57	0.67	A
3	Carry out Conduit wiring for industrial Installation	3.61	1.01	A	3.59	0.70	SA
4	Identify the different types of ducts and trunking e.g. metallic and non - metallic.	3.79	0.85	A	3.97	0.60	SA
5	Identify, select and maintain tools and equipment used for ducts and trunking systems.	3.91	0.79	A	3.82	0.38	SA

6	Apply the necessary safety measures as provided for by the prevailing statutory regulations	3.79	0.79	A	3.76	0.42	A
7	Lift, handle, mount, and align AC and DC machines and equipment.	4.00	0.83	A	4.31	0.83	A
8	Test for correct rotation, short circuit and earth fault	4.15	0.84	A	4.37	0.63	A
9	Investigate and describe an electrical control circuit consisting of a stop/start station, overloads, two-3phase motors (which have isolating switches).	4.92	0.85	A	4.29	0.80	SA
10	Investigate and describe the operation and structure of programmable Logic Control Systems including programming for basic logic factors	4.92	0.85	A	4.29	0.80	A
Grand Mean		4.04	0.81	SA	3.93	0.65	SA

Data in table 1 revealed that Electrical Teachers had a mean range of 3.61-4.92 and standard deviation range of 0.56 to 1.01. While the Industrial Management had a mean range of 3.57-4.37 and standard deviation range of 0.38-0.80. The standard deviation shows the homogeneity of the respondents. The mean shows that the respondents agreed that domestic installation skills are required for Industrial Development of Technical college graduates in Rivers State.

Research Question 2: What are the Cable Jointing skills required for Industrial Development of Technical college graduates in Rivers State?

Table 2: Mean ratings and standard Deviation of teachers and Industrial Management on Cable Jointing skills required for Industrial Development of Technical college graduates in Rivers State

S/N	ITEMS	Electrical Teachers			Industrial Management		
		X	SD	RMK	X	SD	RMK
Ability							
1	Prepare PVC taped and braided cables for termination.	2.69	0.98	A	3.39	0.79	A
2	Make different type of joint using prepared Cable end	2.75	0.88	A	2.80	0.92	A
3	Prepare cable joints for insulation using rubber tape and PVC	3.21	1.15	A	3.27	0.93	A
4	Prepare two different type of cable conductors for jointing using tinning	3.32	1.08	A	3.39	0.97	A
5	Prepare the right size of Cable for soldering lug and glands	2.89	1.15	A	3.34	0.88	A
6	Melt the solder and skin any impurity from	3.90	1.06	A	2.81	0.87	A

7	the surface and warm the ladle Fill the socket with molten solder and tip it out quickly	2.68	1.15	A	3.27	0.76	A
8	Test for electrical continuity, short circuit and insulation remittance	3.31	0.99	A	2.88	1.01	A
9	Select and prepare different type of armoured cable ends	2.79	0.93	A	3.24	0.81	A
10	Joint and terminate armoured cables at intermediate positions	3.24	0.79	A	2.87	1.12	A
11	Dig and prepare ground for laying of underground cable.	2.82	1.02	A	3.31	0.81	A
12	Show how to use pot and laddle in soldering/joining underground armoured cable.	3.31	0.95	A	2.81	1.07	A
13	Demonstrate how to repair damaged underground armoured cable.	2.63	0.97	A	3.39	0.84	A
	Grand Mean	2.83	1.00		3.13	0.84	

Data in table 2 revealed that the respondents had a ground mean of 2.83, 3.13 and standard deviation of 1.00, 0.84. Further-more, the items mean ranges between 2.63-3.90, and 2.80-3.39 with standard deviation of 0.88-1.15 and 0.76-1.12. the homogeneity of the standard deviation showed that the respondents were no too far in their ratings. Therefore the respondents agreed that the items are Cable Jointing skills required for Industrial Development of Technical college graduates in Rivers State.

Research Question 3: What are the winding of electrical machines skills required for Industrial Development of Technical college graduates in Rivers State?

Table 3: Mean ratings and standard Deviation of teachers and Industrial Management on winding of electrical machines skills required for Industrial Development of Technical college graduates in Rivers State

S/N	ITEMS	Electrical Teachers			Industrial Management		
		X	SD	RMK	X	SD	RMK
	Ability to:						
1	apply all statutory regulations during electrical winding work	4.48	0.76	A	3.57	0.57	SA
2	select appropriate tools and equipment used for winding jobs	4.31	0.71	A	3.59	0.53	SA
3	Apply skills for preparation and interpretation of winding drawing	4.37	0.92	A	4.53	0.61	SA
4	Apply skills for dismantling machines for rewinding them	4.29	0.73	A	3.63	0.66	SA
5	Carryout the rewinding of burnt static/rotating machines	4.15	0.90	A	3.57	0.70	SA
6	Carry out the skimming/undercutting of armature, commutators and slip rings	4.42	0.78	A	3.65	0.65	SA

7	Inspect rewind electrical machines and equipment and test for continuity, insulation, correct rotating voltage	4.29	0.83	A	4.43	0.72	A
8	Prepare and interpret simple wave winding, drawings	4.11	0.74	A	3.86	0.40	SA
9	Assemble systematically; Ensure End Shields are in Position; Apply Grease to appropriate parts.	4.11	0.94	A	4.43	0.60	A
10	Test for Speed with Tachometer, ensuring conformity to Manufacturer's specification	4.34	0.72	A	4.45	0.75	A
Grand Mean		4.28	0.83	A	3.97	0.62	AS

Data in table 3 revealed that Electrical Teachers had a mean range of 4.11-4.48 and standard deviation range of 0.71 - 0.83. While the Industrial Management had a mean range of 3.53-4.45 and standard deviation range of 0.40 - 0.75. The standard deviation shows the homogeneity of the respondents. The mean shows that the respondents agreed that winding of electrical machines skills are required for Industrial Development of Technical college graduates in Rivers State.

Hypotheses

Ho₁ There is no significant difference in the mean ratings of technical college teachers and industrial management on the domestic skills required for Industrial Development of Technical college graduates in Rivers State.

Table 4: The t-test analysis of difference in the mean ratings of technical college teachers and industrial management on the domestic skills required for Industrial Development of Technical college graduates in Rivers State

Respondents	N	X	SD	P-value	DF	t-Cal	t-Crit	RMK
Teachers	80	4.04	0.81	0.05	188	1.28	1.96	No Sig
Industrial Management		110	3.93	0.65				

Result in table 4 revealed that t-cal (1.28) is less than t-crit (1.96) which indicates that the hypothesis stated is accepted. Therefore there is no significant difference in the mean ratings of technical college teachers and industrial management on the domestic Installation and Electric Motors skills required for Industrial Development of Technical college graduates in Rivers State.

Ho₂ There is no significant difference in the mean ratings of technical college teachers and industrial management on the Cable Jointing skills required for Industrial Development of Technical college graduates in Rivers State.

Table 5: The t-test analysis of difference in the mean ratings of technical college teachers and industrial management on the Cable Jointing skills required for Industrial Development of Technical college graduates in Rivers State

Respondents	N	X	SD	P-value	DF	t-Cal	t-Crit	RMK
Teachers	80	2.79	0.79	0.05	188	1.65	1.96	No Sig
Industrial Management		110	3.29	0.64				

Result in table 5 revealed that t-cal (1.65) is less than t-crit (1.96) which indicates that the hypothesis stated is accepted. Therefore there is no significant difference in the mean ratings of technical college teachers and industrial management on the Cable Jointing skills required for Industrial Development of Technical college graduates in Rivers State.

Ho₃ There is no significant difference in the mean ratings of technical college teachers and industrial management on the winding of electrical machines skills required for Industrial Development of Technical college graduates in Rivers State.

Table 6: The t-test analysis of difference in the mean ratings of technical college teachers and industrial management on the winding of electrical machines skills required for Industrial Development of Technical college graduates in Rivers State

Respondents	N	X	SD	P-value	DF	t-Cal	t-Crit	RMK
Teachers	80	4.28	0.83	0.05	188	1.83	1.96	No Sig
Industrial Management		110	3.97	0.62				

Result in table 6 revealed that t-cal (1.83) is less than t-crit (1.96) which indicates that the hypothesis stated is accepted. Therefore there is no significant difference in the mean ratings of technical college teachers and industrial management on the winding of electrical machines skills required for Industrial Development of Technical college graduates in Rivers State.

Discussion of Findings

The study revealed that domestic installation skills required for Industrial Development of Technical college graduates in Rivers State. Further-more there is no significant difference in the mean ratings of technical college teachers and industrial management on the domestic skills required for Industrial Development of Technical college graduates in Rivers State. This is in line with Okorie (2000) who postulated 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.

The findings of the study also revealed that Cable Jointing skills would enhance Industrial Development of Technical college graduates in Rivers State. More also, there is no significant difference in the mean ratings of technical college teachers and industrial management on the Cable Jointing skills required for Industrial Development of Technical college graduates in Rivers State. This is in line with Obed, Chiorlu, and Nwauzi (2017) who posited that one the aim of Electrical Installation and Maintenance work is to produce skilled

craftsmen with good knowledge of the working principles of Installation system, the techniques and safety practices involved in its maintenance.

Finally, the findings of the study revealed that winding of electrical machines skills required for Industrial Development of Technical college graduates in Rivers State. Furthermore there is no significant difference in the mean ratings of technical college teachers and industrial management on the winding of electrical machines skills required for Industrial Development of Technical College graduates in Rivers State. This is in line with Chiorlu, Ogundu, and Obed (2016) who explained that the school environment should expose students to the use of the Electrical Installation and Maintenance equipment in a way that will lead students to acquire relevant knowledge and skills.

Conclusion

The study focused on assesses Electrical Installation and Maintenance skills required for Industrial Development of Technical college graduates in Rivers State. It is recognized globally that technical college workshop, etc should be well equipped with instructional facilities. In short the school workshops should look like the workshop where the students will work after the training. It is only through this way that the students' effectiveness and efficiency in the world of work can be ensured after training. These skills cannot be acquired in a vacuum but rather in a well- established and functional workshop with the right tools, equipment and machines for effective implementation of TVE program. However, the desire to produce competent graduates of Electrical Installation and Maintenance work can be achieved when the facilities in the workshops are relevant and adequate for the programs as demanded by the curriculum of the programs.

Recommendation

- (1) The government should supply Electrical Installation and Maintenance work equipment, materials and tools to the Colleges in large numbers to cater to the ever-growing population of students.
- (2) The government should train electrical teachers to enable properly use the equipment in the Technical Colleges.
- (3) The Electrical Installation and Maintenance work equipment, materials and tools supplied to the Technical Colleges should be installed and adequate power supply from the Power Holding Company of Nigeria (PHCN) must be made available.
- (4) Electrical Installation and Maintenance work courses require the services of a well-trained and qualified Electrical Installation and Maintenance work teacher to utilize and handle the complex and sophisticated tools and equipment and to teach the theoretical and practical aspect of the subject.

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