

CONDUIT WIRING COMPETENCES IMPROVEMENT NEEDED FOR EFFECTIVE JOB PLACEMENT OF ELECTRICAL TECHNOLOGY GRADUATES OF TECHNICAL COLLEGES

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Abstract

Amongst the types of wiring, conduit wiring has apparently become the most preferred and commonly employed in most Nigerian modern residential and official buildings. This study therefore determined the conduit wiring competences' improvements necessary for effective job placement of electrical technology graduates of technical colleges in Nigeria. The study investigated competences in knowledge, use of tools and equipment and field practical. The descriptive survey research design was adopted for the study. A validated four-point scaled questionnaire was used for data collection, and its reliability coefficient of 0.83 was determined using the split half method. Copies of the questionnaire were administered to a sample size of 295 in south-southern geopolitical zone of Nigeria. The data collected were analysed using mean and independent sample t-test statistics. The findings revealed that it is very necessary that electrical graduates from technical colleges improve in the acquisition of the competences in conduit wiring to the extent that makes it easier for them to be effectively placed on the job independently. It was therefore recommended that emphasis should be placed on practical skills in conduit wiring when teaching electrical technology students of technical colleges and that school-industry collaboration should be strengthened in Nigeria.

Key Words: Conduit wiring, Competences, Electrical graduates, Technical College.

Introduction

The societal demand in the use of electrical fittings, accessory, materials, equipment and appliances has consistently increased over time in Nigeria probably because of the advancement in the fields of electrical and electronic technology in recent times. There is also the tendency of users of electrical and electronic appliances demanding more portable, durable and better appliance, with better job performance efficiency in installing the fittings, accessories and appliance in residential buildings and offices. These factors contribute to the reasons why educational institutions are trying periodically to improve in imparting related attitude, knowledge and on-the-job practical skills to learners in order to meet the demands of the society as well as the industrial innovations in technological advancement. In Nigeria, the level of education needed to meet these demands by producing technical middle manpower in electrical and electronic technology as craftsmen and technicians is the technical college education (Federal Republic of Nigeria, FRN, 2004; Basualdo & Toby, 2004; National Board for Technical Education, NBTE, 2011).

Education at the secondary level is meant to prepare individuals for useful living within the society and also for higher education (FRN, 2004), but the specific mandate on technical colleges in Nigeria, as part of the secondary education is unique, challenging, demanding and more tasking in terms of delivering the curriculum content of secondary education. According to Nwachukwu (2006) technical college education is specific in its goals when compared with the general secondary education in that it is meant to produce graduates who shall work in related industry or be self-employed with practical and technical skills in engineering education – automobile, building, electrical, electronic, mechanical and wood work trades.

These trades help to produce craftsmen and technicians as graduates of the technical colleges, but the electrical engineering trade is apparently the most lucrative in Nigeria.

The electrical engineering trade prepares graduates in areas such as electrical installation, radio, television and electronic works, appliances repairs (FRN, 2004; NABTEB, 2007). The electrical installation and maintenance work is an area that exposes the learners to acquire attitude, knowledge and practical skills regarding electrical drafting, electrical wiring and working diagram, winding of alternating and direct current machines, cables and cable joining and wiring systems such as surface wiring, conduit wiring, trunking and ducting (NABTEB, 2007; Ohikhuare, 2009; Osaigbovo, 2009). The emphasis on this study is the wiring system which is important in every building.

Amongst the wiring systems, the conduit wiring is apparently the most commonly preferred by residents and offices in Nigeria, hence the need to place emphasis on it in this study and to determine the competences required of electrical technology graduates of technical colleges, who are the middle manpower required in Nigeria to carry out such task. Electrical technology graduates of technical colleges, in the context of this study are individuals exposed to and acquired related skills in electrical engineering trades in technical colleges for self-employment or be employed in the industry to carry out tasks in electrical works. Ogbuanya and Ohanu (2010) affirmed that these categories of graduates are expected to attain some level of job entry skills and competences in electrical installation and maintenance works.

Competency according to Hamilton in Olaitan (2003) means behaviours, skills and attitudes that are required for successful performance of task. In the context of this study, competency has to do with the knowledge, attitudes, experiences and practical/psychomotor skills that electrical technology graduates of technical colleges have acquired from the school and through any other means while they were in school to enable them enter a job effectively for conduit wiring, and without detailed retraining in the rudiments necessary to carry out conduit wiring after graduation. In other words electrical graduates of technical colleges must have attained the competences necessary to perform conduit wiring independently in the world of work after graduation.

Conduit wiring, which may also be referred to as conduit installation has to do with the wiring method or system in which conduit pipes, cables, electrical fittings, appliances and accessories are installed in a building for domestic and/or office use. Conduit wiring is a type of wiring where insulated cables are drawn into metal or plastic tube (Ohikhuare, 2009; Osaigbovo, 2009). According to Pike (2013) conduit wiring provides mechanical protection and electrical safety to persons and properties and provides convenient and accessible ducts for the conductor. A well-designed electrical raceway system such as conduit wiring has adequate capacity for future expansion and is readily adaptable to changing conditions. It has to do with the careful laying of the metal or plastic pipes on the drilled walls and/or decks of a building, and thereby run the cables in the pipes, install the fittings and accessories, all being achieved with the use of appropriate and applicable tools, equipment and accessories.

In order to effectively and competently carry out the tasks involved in conduit wiring by any trained electrical craftsman or technician, there are several theoretical knowledge, materials, tools, equipment and on-the-job or field practical skills that must have been acquired by the craftsman while in school or on the job. These attributes are necessary to be investigated in this study if immediate electrical technology graduates from technical colleges in Nigeria will be effectively placed on the job just after graduation. These categories of graduates should not be allowed to join the unemployment or youth restiveness situation in Nigeria, and become nuisance in the country irrespective of what has been learnt in school.

Additionally, the little or no trust exercised by Nigerians on present day graduate electrical technicians in wiring skills may be traced from the fact that what is expected of the graduates, especially in conduit wiring, is not usually learnt substantially and in detail in the school, which may therefore create a gap between what is obtainable in the school and what is expected in the world of work. It is therefore necessary that competences improvements needed for effective job placement of electrical technology graduates of technical colleges in conduit wiring are determined in this study with the views of the electrical technology teachers who expose the graduates to the skills of this trade and the field practicing

electrical wiring technicians who are already on the job with experience. These foregoing so far formed the baseline and the problem of this study.

Purpose of the Study

The main purpose of the study was to determine the competences improvements in conduit wiring required of graduates of electrical technology from technical colleges in Nigeria for effective job placement. Specifically the study identified the knowledge competences, competences in the use of tools and equipment and practical competences for conduit wiring.

Research Questions

The following research questions guided the study.

1. What are the knowledge competences improvements necessary for effective job placement of electrical technology graduates of technical colleges in conduit wiring?
2. What are the competences improvements necessary in the use of tools and equipment for effective job placement of electrical technology graduates of technical colleges in conduit wiring?
3. What are the practical competences improvements necessary for effective job placement of electrical technology graduates of technical colleges in conduit wiring?

Research Hypothesis

The null hypothesis tested in this study at significance level of 0.05 is:

There is no significant difference between the mean responses of electrical technology teachers in technical colleges and field practicing electrical wiring technicians as regards the practical competences improvement needed for effective job placement of the graduates in conduit wiring.

Methodology

The descriptive survey research design was employed in this study in south-southern geopolitical zone of Nigeria in order to describe the findings of the study and apply them to other electrical technology graduates in Nigeria as regards conduit wiring. All the electrical technology teachers in technical colleges and the field practicing electrical technicians who are into conduit wiring, in south-southern geopolitical zone of Nigeria constituted the population of the study. The sample size of the study was 103 electrical technology teachers in technical colleges and 192 field practicing electrical wiring technicians. This was achieved with the use of convenient sampling technique from the five states in south-southern geopolitical zone of Nigeria.

A four point scale questionnaire of 38 items was used as the instrument for data collection. The questionnaire was scaled highly necessary (HN), moderately necessary (MN), slightly necessary (SN) and not necessary (NN), with nominal values of 4, 3, 2 and 1 respectively. The questionnaire was validated by experts and its reliability coefficient of 0.83 was determined using the split half method. The administration of the questionnaire was done by the researchers with the help of five research assistants, one each from the five states in the geopolitical zone. The data collected were analysed using the mean to answer the research questions and the independent sample t-test was used to test the hypothesis at significance level of 0.05.

In order to answer the research questions, the decision rule for each item of the questionnaire was based on real limit of values ranging from 3.50 to 4.00 for HN, 2.50 to 3.49 for MN, 1.50 to 2.49 for SN and 1.00 to 1.45 for NN. For the hypothesis, if the probability value is less than or equal to the alpha value of 0.05 it will be rejected, otherwise it will be accepted.

Data Presentation and Analysis

The results of the data obtained and analysed are presented in order of research questions and hypothesis.

Research Question 1: What are the knowledge competences improvements needed for effective job placement of electrical technology graduates of technical colleges in conduit wiring?

Table 1: Mean Responses on the Knowledge Competences Improvements needed for Effective Job Placement of the Electrical Technology Graduates in Conduit Wiring

SN	Knowledge Competences of Conduit Wiring	Teachers		Technicians	
		Mean	Remark	Mean	Remark
1	Describe electrical/conduit symbols and fittings	3.54	HN	3.31	MN
2	Explain the principles of preparing wiring diagram/layout	3.51	"	3.21	"
3	Conceptualize the principles of electrical/circuit theory	3.52	"	2.78	"
4	Explain the regulations guiding conduit installations	3.32	MN	2.55	"
5	Distinguish the types of conduit wiring	3.53	HN	2.97	"
6	Determine the safety practices in conduit installation	3.52	"	3.23	"
7	Conceptualize the principle of electricity distribution	2.96	MN	2.67	"
8	Explain the principle of threading pipes	3.15	"	3.04	"
9	Determine the maintenance procedures in conduit wiring	3.11	"	3.33	"
10	Differentiate the conditions in the use of cables for conduit	3.51	HN	3.11	"
11	Interpret a wiring diagram or layout	3.55	"	3.42	"
12	Explain method of calculating bill of quantity	2.77	MN	2.81	"

Source: Field study 2013-2014. MN: moderately necessary, HN: highly necessary

Table 1 shows the extent knowledge competences improvements needed in conduit wiring are necessary for effective job placement of electrical graduates of technical colleges as perceived by the teachers and field practicing technicians. The mean values for the teachers responses ranged from 2.77 to 3.55, indicating that the teachers perceived it moderately necessary for the graduates to improve in the acquisition of five of the knowledge competences and highly necessary to improve in the acquisition of seven of the knowledge competences for effective job placement. From the responses of the technicians, the mean values ranged from 2.55 to 3.42, which means that the technicians perceived it moderately necessary for the graduates to improve in the acquisition of all the knowledge competences for effective job placement. In summary, the knowledge competences identified in this study are necessary for improvements for effective job placement of electrical graduates of technical colleges in Nigeria.

Research question 2: What are the competences improvements necessary in the use of tools and equipment for effective job placement of electrical technology graduates of technical colleges in conduit wiring?

Table 2: Mean Responses on the Competences Improvements needed in the Use of Tools and Equipment for Effective Job Placement of the Electrical Technology Graduates in Conduit Wiring

SN	Competences in the Use of Tools/Equipment	Teachers		Technicians	
		Mean	Remark	Mean	Remark
13	Ability to use wire strippers	3.54	HN	3.57	HN
14	Ability to use variety of hammers	3.66	"	3.79	"
15	Ability to use wire rippers	3.55	"	3.60	"
16	Ability to use electric drills	3.32	MN	3.52	"
17	Ability to use variety of pliers	3.52	HN	3.76	"
18	Ability to use multimeter	3.68	"	3.79	"
19	Ability to use conduit rammer	3.37	MN	3.53	"
20	Ability to use pipe bender/bending tools and machines	3.35	"	3.52	"
21	Ability to use hex wrenches (Allen keys)	3.63	HN	3.68	"
22	Ability to use knock-out punches	3.56	"	3.61	"
23	Ability to use outlet boxes	3.58	"	3.59	"
24	Ability to use fish tape	3.42	MN	3.57	"

Source: Field study 2013-2014. MN: moderately necessary, HN: highly necessary

The data presented in Table 2 show the extent competences improvements needed in the use of tools and equipment for conduit wiring are necessary for effective job placement of electrical graduates of technical

colleges as perceive by the teachers and field practicing technicians. From the teachers responses, the mean values ranged from 3.32 to 3.68, indicating that the teachers perceived it moderately necessary for the graduates to improve in the acquisition of four competences in the use of tools and equipment, and highly necessary to improve in the acquisition of eight of the competences for effective job placement. The responses of the technicians show mean values ranging from 3.52 to 3.79, which mean that the technicians perceived it highly necessary for the graduates to improve in the acquisition of all the competences in the use of tools and equipment for effective job placement. In summary, the competences needed in the use of tools and equipment for conduit wiring identified in this study are highly necessary for improvements for effective job placement of electrical graduates of technical colleges in Nigeria.

Research Question 3: What are the practical competences improvements necessary for effective job placement of electrical technology graduates of technical colleges in conduit wiring?

Table 3: Mean Responses on the Practical Competences Improvements necessary for Effective Job Placement of the Electrical Technology Graduates in Conduit Wiring

SN	Practical Competences in Conduit Wiring	Teachers		Technicians	
		Mean	Remark	Mean	Remark
25	Manipulate the tools and equipment for conduit wiring	3.54	HN	3.69	HN
26	Employ the use of working diagram/layout in conduit	3.50	"	3.61	"
27	Drill holes on the walls/decks of buildings	3.42	MN	3.53	"
28	Fixing of conduit fittings and boxes	3.52	HN	3.57	"
29	Cutting, threading and bending conduit pipes	3.33	MN	3.51	"
30	Fix conduit pipes in the walls/decks of building	3.45	"	3.55	"
31	Run cables in conduit pipes	3.54	HN	3.62	"
32	Make cable joining/termination at boxes and accessories	3.55	"	3.68	"
33	Fix electrical accessories to screwed conduit fittings/boxes	3.53	"	3.64	"
34	Design wiring diagram for conduit wiring	3.53	"	3.59	"
35	Re-run damaged cables in the pipe	3.55	"	3.60	"
36	Prepare bill of quantity for costing conduit wiring job.	3.34	MN	3.57	"
37	Apply safety precaution in conduit wiring	3.59	HN	3.68	"
38	Perform proper finishing techniques in conduit wiring	3.54	"	3.61	"

Source: Field study 2013-2014. MN: moderately necessary, HN: highly necessary

Data presented in Table 3 reveals the extent practical competences improvements needed in conduit wiring are necessary for effective job placement of electrical graduates of technical colleges as perceive by the teachers and field practicing technicians. The teachers responses show mean values ranging from 3.33 to 3.59, indicating that the teachers perceived it moderately necessary for the graduates to improve in the acquisition of four of the practical competences and highly necessary to improve in the acquisition of ten of the practical competences for effective job placement. From the responses of the technicians, the mean values ranged from 3.51 to 3.69, which mean that the technicians perceived it highly necessary for the graduates to improve in the acquisition of all the practical competences for effective job placement. In a summary, the field practical competences identified in this study are highly necessary for improvements for effective job placement of electrical graduates of technical colleges in Nigeria.

Hypothesis: There is no significant difference between the mean responses of electrical technology teachers in technical colleges and field practicing electrical wiring technicians as regards the practical competences improvements needed for effective job placement of the graduates in conduit wiring.

Table 4: The t-test Analysis of Electrical Teachers and Field Practicing Technicians as Regards Practical Competences needed in Conduit Wiring for Job Placement

Variables	Respondents	N	Mean	SD	df	t-cal	P	Decision
Practical competences improvements necessary in conduit wiring for job placement.	Teachers	103	3.495	0.64	293	-1.67	0.18	NS
	Technicians	192	3.604	0.42				

Source: Field study 2013-2014. NS: not significant

The t-test result of Table 4 shows the clustered mean responses of the teachers and technicians are 3.495 and 3.604 respectively, indicating that the technicians desired more field practical skills from the graduates in terms of conduit wiring. The result however showed that the p-value of 0.18 is greater than the alpha value of 0.05; hence the null hypothesis is upheld. This means that the mean responses between the teachers and the technicians did not significantly differ as regards field practical competences improvements in conduit wiring necessary for job placement of electrical graduates of technical colleges.

Discussion of Findings

The findings of Table 1 for research question 1 revealed that field electrical technology teachers perceived that majority of the conduit wiring knowledge competences are highly necessary for improvements for effective job placement of electrical graduates from technical colleges than the extent to which the field practicing technicians perceived the necessity of the knowledge competency. In consensus, however, the conduit wiring competences improvements are necessary for effective job placement of the graduates. This is in line with documentations of Langlois and Abbott (2010) and Thomson Rivers University (2014), which showed that it very necessary to assess electrical graduates in basic knowledge of electrical wiring for competition exercise which is used to access their knowledge in electrical wiring such as conduit wiring.

The results of Table 2 showed that both electrical teachers and field practicing technicians perceived that the use of tools and equipment in conduit wiring are highly necessary for improvements for effective job placement of electrical graduates from technical colleges in order words, both categories of respondents did show disparity on the necessity of improvements in the use of conduit wiring tools and equipment for effective job placement of the graduates. It therefore means that high competences improvements in the use of tools and equipment for conduit wiring are very necessary for effective job placement of electrical graduates of technical colleges in Nigeria. The findings are in consonant with the documentation of Langlois and Abbott (2010) and Thomson Rivers University (2014), which showed the varieties of tools and equipment in electrical wiring competition for graduates that must be used for assessment in electrical wiring.

Based on the findings of research question 3, the results of Table 3 showed that conduit wiring field practical competences improvements are highly necessary for effective job placement of electrical technology graduates from technical colleges in Nigeria. The findings of the hypothesis are in consensus with that of the research question three. The practical competences are apparently the competences that determine the level of acquisition of the other two competences (knowledge and use of tools and equipment). The findings of research question 3 and the hypothesis are in line with that of Ogbuanya and Ohanu (2010) who found that conduit wiring skills are entry level skills required by electrical graduates of technical colleges.

Conclusion

The increasing demand in conduit wiring in modern building has no doubt called for competent electrical technicians/technologists for effective job placement and performance in domestic electrical installation and maintenance works in Nigeria. In order that demand driven graduates of electrical technology from

technical colleges, who are the unavoidable electrical middle manpower, are produced, this study determined that conduit wiring competences are highly necessary for job placement of the graduates. In line with findings of the study, it is concluded that conduit wiring competences' improvements are very necessary in the teaching of conduit wiring skills in technical colleges under electrical installation works; hence it should not be compromised in order to produce high competent middle manpower in conduit wiring. It is highly necessary to improve in the teaching and learning of competences in general electrical installation and maintenance works.

Recommendations

In line with the findings of the study, the following recommendations are made:

1. Teachers should place complementary emphasis on the practical skills in conduit wiring (the know-how skills) rather than placing more emphasis on theoretical skills so that the graduates will be less dependent on training and retraining syndromes after graduation and during job placement. This is because the findings of this study determined that the graduates need improvement in conduit wiring.
2. Non-governmental and governmental organisations should unanimously help in providing modern tools and equipment used in carrying out tasks in conduit wiring in order to improve the teaching of conduit wiring in technical colleges.
3. School-industry collaboration in technical colleges should be strengthened in wiring trades to enable students become more exposed to the practical skills required in the world of work. This is because the competences in the use of tools/equipment and that of the practical skills cannot be fully acquired in the school, hence the need for functional intervention such as school-industry collaboration.

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