

## ELECTRICAL INSTALLATION AND MAINTENANCE WORKS TEACHERS' PROFESSIONAL DEVELOPMENT NEEDS FOR EFFECTIVE TEACHING IN KWARA STATE

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### ABSTRACT

*The study was carried out to determine the electrical installation and maintenance work teachers' professional development improvement needs for effective teaching in Niger and Kwara States, Nigeria. Survey research design was adopted for the study. The population for the study was 71 respondents comprises of teachers of electrical installation and maintenance work and workshop assistants. There was no sampling because of manageable size of the population. A structure questionnaire was used as instrument for data collection. Cronbach alpha reliability method was used to determine the internal consistency of the instrument and 0.86 reliability coefficient value was obtained. two research questions and two null hypotheses were formulated for the study. Mean was used to analyse the data for answering research questions while t-test was used to test the hypotheses of no significant difference at 0.05 level of significance. The study found that 53 items on knowledge of subject matter, 47 items on teachers' practical skills, in Niger and Kwara States, Nigeria. There was no significant difference between the mean responses of electrical installation and maintenance work teachers and workshop assistant on the highly experienced EIMW teachers and those with low experience on the; 1. Teachers knowledge of subject matter, 2. Teachers' practical skills. Based on the findings of the study it is recommended that all skills identified should be packaged to train the graduates of EIMW, there should be retraining of teachers irrespective of their ranks and tools, equipment's should give to technical colleges. The following conclusions were drawn; opportunity available at technical colleges should be improved and expanded for self-reliance.*

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### INTRODUCTION

Electrical Installation and Maintenance works is offered in Technical Colleges preparing individuals with job-satisfaction required toward employment and self-reliance, according to Alegbemi (2010), is that aspect of technical education which

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deals primarily with electricity and principles of magnetism and devoted to the utilization of forces of nature and materials for the benefits of mankind. National Board for Technical Education NBTE, (2004), stated that electrical craftsmen are expected to test, diagnose, service, install and completely repair any fault on electrical machines and equipment using the manufacturer's manual. It provides technical training to meet the demand of industry and needs of individuals for job career.

The aim of Electrical Installation and Maintenance Work 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 2004). The electrical and electronic trade subjects in Nigerian technical colleges are: Domestic and industrial installation, cable joint and repairs, battery charging and repairs, winding of electrical machines, basic electricity, electrical/electronic drawing and calculations, radio communications and services, television services and repairs, electronic devices and circuits (NBTE, 2015). In most technical colleges these subjects are grouped into two to reflect departments.

Effective teaching and teaching effectiveness can be complex and controversial. 'Effectiveness' is a term that can evoke strong emotions because of its perceived links with notions of professional competency and high level of accountability in some systems. It may involve teachers' beliefs about their professional autonomy, notions of what constitutes high quality or good teaching, the idea that teaching is an art or a craft rather than a science (Muijs & Reynold, 2011). However, beliefs about what constitutes 'good' or 'high' quality practice in teaching can vary markedly for different age groups of students, at different times and in different contexts. According to Darling- Hammond (2010), effective teaching is define as multiple ways of engaging with students large, small, and individual face-to-face interactions in a classrooms, laboratories, studios and consultation in selecting the most appropriate combination from the various possibilities in determine discipline, specific learning outcomes, location of students, physical and technological infrastructure either directly or indirectly in the delivery of content by facilitating access to content from other sources. For teaching to be effective, there is always the service of a teacher, therefore any teacher that teach effectively is regard as an effective teacher.

An effective teacher according to Fldrez and Sammons (2013), strive to motivate and engage all their students in learning rather than simply accepting that some students cannot be engaged and are destined to do poorly. They believe every student is capable of achieving success at school and they do all they can to find ways of making each student successful (Kington etal, 2011). Effective teachers have high expectations of students in terms of both their standard of learning and their behaviour, and help their

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students meet those expectations. They also have high expectations of themselves and their own learning which lead them to professional development in their subject area. There are number of areas teachers are expected to be highly skilled in, for them to be effective in their jobs, these areas are referred to as Professional Development Needs. Professional Development Needs are methods of technical knowhow of a particular teacher's skills in carrying out his job effectively on the teaching and learning process. In summary, professional development has been categorising under these headings: (1) knowledge of subject area matter, (2) skills in electrical and electronic and (3) pedagogy of electrical and electronic (OECD,2009). Knowledge of subject area is the total know how of the teacher in is subject area for effective teaching and learning of the skills acquired (Amenger, 2013). Ball, Hill and Bass (2005), opined that contribution of a teacher depend on is knowledge of subject area matter as they have the experience gain from actual practice and are therefore in a position to evaluate their needs in terms of the qualifications that can facilitate their work and guarantee their effectiveness. Individual teacher training plan provide the necessary flexibility to account for the various and diverse needs of trainees including subject knowledge (Hill, Rowan & Bass, 2005). Therefore, it is the knowledge on scope of content of the subject matter that open teachers' eye to the skills involve in carrying out is job. Practical skill means to demonstrate the habit of acting, thinking or behaving in a specific activity in such a way that the process becomes natural to the individual through repetitive practices. Ferguson (2007), remarked that skills are practical know-how, scientific skills and knowledge to make the recipient (individual) to be creative and productive in order to function as a performing member of the society. Abdullahi (2010) opined that skill in Electrical Installation and Maintenance work is the capability of accomplishing a job with precision of certainty, practical knowledge in combination with ability, cleverness and expertness. EIMW skills are the basic rudiments that a learner should possess in the area of his study based on the designed modules of the curricula (Oduolowu, 2007). Therefore, the EIMW teachers who are responsible for the training and preparation of students for skills acquisition have great challenges in the cause of delivering their duties so as to prepare them for labour market (Omo-ojugo & Ohiwerei, 2008). For a teacher to carryout his/her assignment in the classroom he most has to bear in mind some basic principles, which are knowledge of subject matter to be taught, practical skills and pedagogical knowledge. Pedagogical knowledge refers to the specialised knowledge of teachers for creating effective teaching and learning environments for all students. Pedagogical knowledge has been defined as "the intersection of knowledge of the subject with knowledge of teaching and learning" (Niess, 2005). According to Lowery (2002), suggest that

domain of teachers' knowledge that combines subject matter knowledge and knowledge of pedagogy". In even broader terms, pedagogical knowledge is defined simply as "the product of transforming subject matter into a form that will facilitate student learning" (de Berg & Greive, 1999). Pedagogical knowledge is important because it helps a teacher to better understand student's specific learning needs, interaction issues, as well as interpreting and solving his problems. One of the purposes of education is the provision of manpower able to fit in to the everyday need. Proper knowledge and skills are important, Anaele (2002) stated that the amount of knowledge and skill imparted to the students should meet the demand of industries and that the academic environment in technical colleges ought to be a replica of what is found in industries. This can be achieved if the teachers are well qualified on pedagogy and skills on professional development. This therefore means that knowledge of subject matter, practical skills and pedagogical skills are important for the professional development of the EIMW teacher, hence it merits a research attention.

### **STATEMENT OF THE PROBLEM**

Technical colleges (TC) were established to train individuals to acquire practical skills, basic scientific knowledge and attitudes required as craftsmen and technicians at sub-professional level, to meet the manpower needs for national development. Graduates of technical colleges (TC) needs to acquire the necessary new trend of knowledge of subject matter, practical skills and pedagogical knowledge for effective outcome of the goals and objective TC. This has however not been the case in an ideal situation, for effective teaching and learning of electrical and electronic course, the teachers should possess adequate knowledge of the subject matter, the skills needed to impart the knowledge and pedagogical expertise.

### **RESEARCH QUESTION**

The following research questions were formulated to guide the study:

1. What are the improvement needs of electrical installation and maintenance work (EIMW) teachers on the knowledge of subject matter for effective teaching in technical colleges in Kwara and Niger States?
2. What are the improvement needs of electrical installation and maintenance work (EIMW) teachers on the practical skill for effective teaching in technical colleges in Kwara and Niger States?

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## **METHODOLOGY**

A descriptive survey research design will be employed for carrying out the study. A descriptive survey research design is a method of collecting data using questionnaire or interview from a sample of population and analysing it to get a generalised ideal, also survey is a data collection technique in which information is gathered from individual called respondents, by having them respond to questions. According to Nworgu (2006), is one in which a group of people or items is studied by collecting and analysing data from only a few people or items considered to be representative of the entire group. Gall, Gall and Borg (2007), also opined that survey is a method of data collection using questionnaire or interviews to collect data from a sample that has been selected to represent a population to which the findings of the data analysis can be generalised. Since the study entails the collection of data from the respondents through the use of questionnaire to identify electrical installation and maintenance works teachers' professional development improvement needs for effective teaching in Niger and Kwara and Niger States. This research design was considered suitable for the study because it gives the opinion of the respondents on the items since the total population is covered for ten technical colleges in Niger and kwara States.

The population for the study consist of seventy-one (71) respondents, comprising of fifty-four (54) teachers and seventeen (17) Workshop Assistant (W/A) in the technical colleges of Kwara and Niger States.

## **METHOD OF DATA ANALYSIS**

Data collected from the respondents will be analyse using mean to answer research questions. For decision, items with mean values of 2.50 and above will be considered needed, while those with mean values below 2.50 will be considered not needed. The two hypotheses will be tested using the t-test at 0.05 level of significance. Any item whose t-cal less than t-table will be accepted but any item that its t-cal greater than t-table will be rejected.

### **Research Question 1**

What are the improvement needs of electrical installation and maintenance work (EIMW) teachers on the knowledge of subject matter for effective teaching in technical colleges Kwara and Niger State?

The data for answering research question 1 are presented in Table 1

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**Table 4.1**

**Mean responses of Respondents on Improvement Needs of EIMW Teachers' Knowledge of Subject Matter for effective. N=71**

S/N	Items	$\bar{X}$	SD	Remark
1.	Type of wiring systems	3.05	0.80	needed
2.	Soldering and brazing system	3.19	0.74	needed
3.	Mega testing operational instrument	3.17	0.63	needed
4.	Thermal tripping devices	3.36	0.69	needed
5.	Earthing system	3.20	0.61	needed
6.	Installation of mineral insulated	3.29	0.69	needed
	copper cable (MICC)	3.27	0.61	needed
7.	Connection of distribution board (DB)	3.34	0.79	needed
8.	Electrical working diagram	3.12	0.61	needed
9.	Installation of cable	3.37	0.68	needed
10.	Maximum load demand and ambient			
	Temperature	3.35	0.65	needed
11.	Type of cables	3.36	0.79	needed
12.	cooker control unit socket outlet	3.29	0.71	needed
13.	Various items of accessories on			
	wiring system	3.24	0.81	needed
14.	Appropriate distribution units for			
	single and ploy-phase	3.12	0.74	needed
15.	IEE regulation on domestic wiring	3.21	0.94	needed
16.	Circuit breaker	3.12	0.72	needed
17.	Clip, gimlet pins used in wiring system	3.19	0.82	needed
18.	Tools and materials related to			
	cable installations	3.23	0.72	needed
19.	Connection of distribution board in			
	wiring system	3.20	0.73	needed
20.	Connection of fire alarm	3.24	0.76	needed
21.	Different types of conductors			
	(copper and (aluminium)	3.29	0.64	needed
22.	Connection of thermal tripping device	3.21	0.76	needed
23.	Understanding of conduit demonstration			
	on wiring board	3.21	0.65	needed
24.	Duct wiring	3.17	0.75	needed
25.	Different type of trunking	3.34	0.66	needed

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26. Demonstration on bus-bar trunking and wiring	3.25	0.72	needed
27. Appropriate accessories on trunking	3.26	0.66	needed
28. Earth continuity on ducting and trunking	3.32	0.72	needed
29. Principles of generators and motors	3.30	0.68	needed
30. Difference between AC and DC motors and generators	3.19	0.74	needed
31. Types of DC motors (series, shunts and compound)	3.21	0.75	needed
32. Insulation materials of copper and aluminium	3.1	0.75	needed
33. Understanding on merit and demerit of conductors (copper and aluminium)	3.16	0.70	needed
34. Demonstration of shaping of conductors	3.25	0.77	needed
35. Selection of lugs and glands used for Terminations	3.31	0.65	needed
36. Different armoured cable	3.23	0.72	needed
37. Usefulness of armoured cable	3.23	0.63	needed
38. Constructional parts of armoured cable	3.37	0.69	needed
39. Understanding on joining to length of armoured cable and demonstrate how to terminate armoured cable	3.39	0.59	needed
40. Factor affecting underground cable and type need for the system	3.29	0.75	needed
41. How to prepare trench depth for the cable laying	3.26	0.63	needed
42. Understanding laying the cable in trench using jacks and roller	3.29	0.72	needed
43. Maintenance of the machine	3.28	0.60	needed
44. Repair of charging machine	3.35	0.70	needed
45. Operation of charging machine	3.27	0.62	needed
46. IEE regulation on the use of conductors, varnishes and oven	3.38	0.62	needed
47. Understanding appropriate tools used in winding work	3.21	0.64	needed
48. Wave winding	3.44	0.58	needed
49. Different type of winding (wave and lap winding)	3.17	0.66	needed
50. Techniques of lap winding	3.25	0.73	needed

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51. How to fix and replace the brush	3.21	0.70	needed
52. Different insulation materials and their classification	3.25	0.73	needed
53. Understanding ambient temperature of a particular connection	3.24	0.70	needed

**Key,  $\bar{X}$  = Average mean, SD= Standard Deviation, SN= Serial number, N= number of the respondents**

The data presented in Table 4.1 revealed that all the 53 items have their mean values ranged from 3.05 to 3.44. This show that the mean value of each item was above the cut-off point of 2.50, indicating that 53 improvement needs on knowledge of subject matter are needed for EIMW Teachers' for effective teaching. The table also showed that the standard deviation (SD) of the items are within the range of 0.58 to 0.94, this indicated that the value of SD of the respondents were not far from each other in their responses.

### Research Question two

What are the improvement needs of electrical installation and maintenance work (EIMW) teachers on the subject matter for effective teaching in technical colleges in Niger and Kwara states?

**Table 4.2**

**Mean responses of the respondents on Improvement needs of EIMW Teachers' on the Practical Skills for effective teaching. N=71**

**Ability to:**

S/N	Item	Statement	$\bar{X}$	SD	Remark
1.	carry out simple house wiring		3.21	0.63	needed
2.	cut PVC twin core cable to specification		3.23	0.69	needed
3.	do soldering		3.25	0.62	needed
4.	brazing of a component		3.28	0.66	needed
5.	carry out mega-testing operational instrument testing		3.23	0.63	needed
6.	connection of electrical component		3.35	0.64	needed
7.	inspection and testing of conduit wiring		3.38	0.57	needed
8.	installation of cables		3.35	0.58	needed
9.	Installation of distribution board		3.31	0.60	needed



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10. connection of earthing system	3.35	0.60	needed
11. carry out connection of cables in proportion to their rating and capacity	3.25	0.56	needed
12. inspection and testing of polarity	3.32	0.61	needed
13. undergo inspection and testing continuity, insulation and earthing	3.32	0.59	needed
14. fixing cable to the surface	3.39	0.59	needed
15. cut PVC twin core cable to specification	3.31	0.63	needed
16. carry out connection on heating socket outlet	3.40	0.63	needed
17. connect circuit breaker (CCT)	3.28	0.51	needed
18. connect fire alarm	3.33	0.68	needed
19. connect thermal tripping device	3.16	0.58	needed
20. carry out ducting and trunking	3.34	0.66	needed
21. install lath machine	3.12	0.61	needed
22. carry out maintenance on drilling machine	3.27	0.65	needed
23. repairing of AC generator	3.28	0.53	needed
24. service of DC machines	3.30	0.60	needed
25. maintaining AC and DC motors	3.22	0.62	needed
26. service different type of DC motors (series, shunt and compound)	3.35	0.68	needed
27. connection of star-delta-star starter	3.32	0.60	needed
28. connection appropriate starter on a particular motor	3.18	0.62	needed
29. diagnoses fault finding	3.27	0.63	needed
30. repair drilling equipment	3.05	0.66	needed
31. do simple joint terminations	3.27	0.68	needed
32. do light and heavy soldering and brazing	3.28	0.57	needed
33. install underground cables	3.17	0.61	needed
34. install overhead wires and cables for transmission and distribution systems	3.26	0.71	needed
35. do maintenance on battery	3.24	0.66	needed
36. repair breaking cell	3.27	0.58	needed
37. refill acid on battery	3.26	0.65	needed
38. Check for voltage	3.26	0.58	needed
39. check for current	3.22	0.66	needed
40. rewinding an electric motor	3.30	0.66	needed
41. select appropriate tools for winding job	3.27	0.64	needed
42. rewinding static/rotating machines	3.35	0.52	needed

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43. inspection and test for continuity	3.28	0.63	needed
44. carry out lap winding on motor	3.22	0.60	needed
45. work on wave winding motors	3.25	0.70	needed
46. fixing and replacing of carbon brush	3.28	0.57	needed
47. test for continuity and installation resistance using megger tester	3.27	0.57	needed

**Key, N= Number of the respondents,  $\bar{X}$  = Average value of the mean, SD= Standard Deviation.**

The data presented in Table 4.2 revealed that all 47 items have their mean values ranged from 3.05 to 3.40. This showed that the mean value of each item was above the cut-off point of 2.50, indicating that 47 improvement needs are needed for teachers on practical skills for effective teaching. The table also showed that the standard deviations (SD) of the items are within the range of 0.51 to 0.80, this indicated that the mean values of the respondents were not far from each other in their responses.

## Testing of Hypotheses

### Hypothesis 1

There is no significant difference between the mean responses highly experienced electrical installation and maintenance work teachers and those with low experience with respect to teachers' knowledge of subject matter for effective teaching in technical colleges.

The summary, of the data collected for the purpose of providing test of this hypothesis are presented in Table 4.5

**Table 4.5**

**The t-test Analysis of the Mean Responses of Electrical Installation and Maintenance Work Teachers and Workshop assistants with below five years and above five years' experience on Teachers' Knowledge of Subject Matter for effective teaching.**

	N	Mean	T	df	Sig. (2-tailed)	Remark
Teachers( $X_1$ )	54.000	3.250	-.053	69	0.96	NS
Workshop Assistants( $X_2$ )	17.000	3.260	-.049		0.96	

Key,  $S=X_1$  = Mean of EIMW Teachers,  $X_2$  = Mean of EIMW workshop Assistant, Df = 69, P = 0.05, t-table = 1.68, S Significant, NS = Not Significant

Data presented in Table 4.5 revealed that since sig (2-tailed) (0.96, 0.96) is greater than 0.05, it implies that there is no significant difference in the mean responses of the respondents. Each of the 53 items had their calculated t- value which were less than t-table value of 1.68 at 0.05 level of significant and at 69 degree of freedom (df). This indicated that there was no significant between the mean responses of EIMW teachers with below five years and above five years of teaching experience on the knowledge of subject matter for effective teaching in Kwara and Niger States was upheld.

## Hypothesis 2

There is no significant difference between the mean responses of highly experienced EIMW teachers and those with low experience with respect to teachers' practical skills for effective teaching in technical colleges in Kwara and Niger States

The summary, of data collected for the purpose of providing test of this hypothesis are presented in Table 4.6

Table 4.6

	N	Mean	T	df	Sig. (2-tailed)	Remark
Teachers( $X_1$ )	54.000	3.260	-.113	69	0.91	NS
Workshop Assistants( $X_2$ )	17.000	3.280	-.119		0.91	

The data presented in Table 4.6 revealed that the sig (2-tailed) (0.91, 0.91) is greater than 0.05, it implies that there no significant difference in the mean responses of the respondents. Each of the 47 items had their calculated t- value which were less than t-table value of 1.68 at 0.05 level of significance and at 69 degree of freedom (df). This indicated that there was no significant difference between the mean responses of EIMW teachers with below five years and above five years of teaching experience on the teachers' practical skills for effective teaching Kwara and Niger States was upheld.

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## **Conclusion**

Based on the findings of the study, the following conclusions were drawn:

1. There are many unemployed EIMW graduates from technical colleges, if all these are implemented the graduates of technical colleges will be self-reliance and the economic wellbeing of the country will be improved.
2. It is also discovered that there are opportunity for expansion and improvement in technical college
3. Evidence from the study indicated that there should be government support programmes to boost self-employment.
4. Government agency like National Directorate of Employment should partner with technical colleges to empower youths for self-employment.
5. Government should be ready to provide adequate tools, machine, equipment and some of the consumable materials in technical colleges for effective teaching learning process.

## **Recommendations**

Based on the findings of the study the following recommendations were made:

1. All the skills identified should be packaged and use to retrain the graduates of EIMW.

2. Government should continue to retrain teachers irrespective of his or her rank
3. Community and institution partnership should be encouraged
4. Necessary tools and equipment should be donated to youths ready to embark on self-employment
5. Relevant equipment and machines should be given to technical colleges.
6. competent teachers of EIMW should be employed by the government to teach in technical colleges of States.
7. Electrical workshop of technical colleges in the states should be equipped with relevant modern machines and tools for the train of EIMW students.

### **Suggestion for the Further Research**

The following related areas have been suggested for further research:

1. EIMW teachers' professional development improvement needs for effective teaching in technical colleges of other states of the federation.
2. EIMW teachers' professional development needs for effective teaching in colleges of education and polytechnics in Nigeria.

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