Technical Skills Improvement Needs of Electrical Installation and Maintenance Work Trade Teachers for Effective Teaching in Technical Colleges in Kano State

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Abstract
The study assessed technical skills improvement needs of electrical installation and maintenance work trade teachers in technical colleges in Kano State. Two research questions and two null hypotheses were formulated to guide the study. A descriptive survey research design was used for the study. The target population for the study was 48 respondents comprising of graduate teachers and non-graduate teachers of Electrical Installation and Maintenance Work trade of Government Technical Colleges in Kano State. The entire population was used in the study. The instrument used for data collection was structured questionnaire developed by the researcher containing 38 items and titled "Technical and Skills Improvement Needs of Electrical Installation and Maintenance Work Trade Questionnaire (TSINEIMWTQ)". The questionnaire had a four point rating scale. Three experts validated the questionnaire and its reliability coefficient was established using Cronbach alpha having a value of 0.92. Mean and standard deviation were used to analyze data relating to the research questions and t-test was used to test the hypotheses at 0.05 level of significance. The findings reveal that the electrical installation and maintenance work trade teachers needed all 34 items of technical and pedagogical skills, which includes, among others: Possession of solar photovoltaic cells installation skills, Possession of skills in using AutoCAD for design working drawing, Ability to diagnose electrical system on malfunctions failure, significance difference did not exist in the mean response of graduate and non-graduate teachers of electrical installation and maintenance work on the needs of technical skills in domestic electrical installation and industrial electrical installation. Based on these findings, therefore, it was recommended, among others, that the employer and other important stakeholders should support the electrical installation and maintenance work trade teachers to enhance their technical skills in order to improve their skills in domestic electrical installation and industrial electrical installation. The government should organize training and seminars on the use of modern tools and equipment for teachers of electrical installation and maintenance work trade. Electrical installation and maintenance work trade teachers should be motivated through awards of scholarships for higher degrees.

Keywords: Technical Skills, improvement needs, electrical installation and maintenance work trade, teachers, and technical colleges

Introduction

The main objective of establishing Technical Colleges is the production of craftsmen who will meet the lower- level manpower demand of the nation's economy by filling up vacancies of craft level personnel's in Nigeria's industries and business sectors Federal Republic of Nigeria (FRN, 2013). Specifically, Technical Colleges were designed to produce craftsmen and Master Craftmen for industries and government establishments and craftsmen who shall be self-reliant economically, and usher in the desired technological advancement which is very much required for the elevation of the country from a "consumer nation" to a "producer nation", from a "developing nation to a developed nation".

Acquisition of appropriate technical skills is necessary to cope with the challenges presented by the needs of our industries; this plan can only be achieved by training and re-training of technical teachers in technical colleges (Mohammed & Raymond, 2019) [10].

Technical colleges are established to prepare individuals to acquire practical skills, basic scientific knowledge and attitude required by craftsmen at sub-professional level (Oviawe, Uwameiye and Uddin, 2017) [18]. The curriculum for technical colleges is structured in the foundation and trade modules. The programme offered in technical colleges include engineering trades, construction trades, miscellaneous trades and business studies while engineering trades comprise of electrical installation and maintenance work (EIMW) trades, mechanical engineering trades, fabrication and welding trades, agricultural equipment and implement mechanic works trades, radio and television trades and others (National Business and Technical Examination Board, NABTEB 2016). The curricula of Technical Colleges are centred on craft/engineering trades and agriculture which includes Agric-Mechanisation, Motor-mechanics, Building Construction, Woodwork, Metalwork, Plumbing, and Electrical Installation and Maintenance Work Trade among others (Hassan, Dauda and Badawi, 2019) [9]. In Kano State there is increased demand for Training the unemployed youths with Vocational and Technical skills for self-employment and this led to the establishment of 27 new technical colleges making total of 32 technical colleges where electrical installation and maintenance work trade is taught.

Electrical Installation and Maintenance Works Trade (EIMWT) is made of the following modules: Electrical installation, Maintenance work, Electrical Principles, Cable Jointing Battery charging. Practical works in Electrical Installation and Maintenance Works (EIMW) in Technical Colleges involve various operations such as conduit wiring, trunking wiring, surface wiring and battery charging. It also includes; soldering, wiring of simple and advanced circuits, termination of cables (Ezugu, Duhu and Tanimu, 2020) [2]. The programme is designed to provide training for individuals interested in electrical works, competence in installation, performing routine and preventive maintenance on electrical circuits through fault diagnosis and constructing new electrical circuits, and consequently providing employment opportunities for earning a living (National Board for Technical Education NBTE 2011).

(NABTEB, 2007), stated that upon completion of Electrical Installation and Maintenance Works (EIMW) course in the technical colleges, students' academic performance is determined by their ability to install and maintain electrical and electronic devices; equipment and appliance and their ability to carry out major and minor domestic and industrial wiring. As viewed by (Moses, Wawo, Ibanga and Musa 2021) [11], Electrical Installation and Maintenance Work (EIMW) trade programme is aimed at producing craftsmen and other skilled personnel who will be enterprising and self-reliant with skills in domestic and industrial installation, as well as operate, maintain and repair electrical and electronic equipment, among other.

The technical skills, if developed and refined are useful or marketable during career development (Mbaga, 2011) [17]. Electrical installation and maintenance works is a technical trade, at Technical Colleges and is divided into five employability modules (Mbaga, Yusuf & Asukwo, 2022) [9]. The five modules are: domestic and industrial installation, cable jointing, battery charging and repair and winding of electrical machines (NABTEB, 2015). Each of these modules provides employable technical skills to the students. Domestic electrical installation is a term which is widely used as the electrical installation for domestic use of electricity (Mbaga, 2011) [17].

Technical skills refer to specialized knowledge and expertise needed to accomplish complex actions, tasks, and processes relating to computational and physical technology as well as a diverse group of other enterprises. Technical skills are sets of abilities or knowledge used to perform practical tasks in the areas of science, technology and engineering. Technical skills acquired in Technical colleges, largely depends on the quality of teachers who teach and impart skills to the students. Hence, teacher is a crucial factor in achieving academic objectives. This is supported by the National policy on Education which states that no education system can rise above the quality of its teachers (FRN, 2009). Therefore, the effectiveness or ineffectiveness of teaching is highly linked to teachers' competence. Subtly, the effectiveness of all educational programmes is dependent largely on the devotion and technical skills of teachers who implement the educational programme (Mbaga, Wampana and Shanga, 2017) [8].

A teacher is a professional person, a leader, an important personality in the classroom situation, who is highly knowledgeable in the subject matter. The teacher is not a material that can be created overnight. It takes a long time to train a teacher. The teacher is crucial because, regardless of the available resources, a student cannot effectively teach themselves without the support of a teacher (Ademumi, 2009) [1]. The teacher, in relation to this study is an Electrical Installation and Maintenance Work Trade Teacher who has acquired professional training in teaching with relevant skills in the use of hand tools and machines. In tertiary institutions, Electrical Installation and Maintenance Work Teacher are generally professional teachers or instructors, who have served for many years and are regarded as experienced teachers. Experienced teachers are those teachers who possess knowledge and skills through involvement in or exposure to something over a period of time. A person with considerable experience can gain a reputation as an expert.

Electrical installation and maintenance work trade teachers are trained in Colleges of Education (Technical) and Universities. Such teachers are trained in order to teach electrical installation competently among others. Products of colleges of education (Technical) with NCE (Technical) are referred to as non-graduate teachers while products of University with B.Tech Ed. and B.Engn with PGDE are regarded as graduate teachers (Shetima, 2010) [23].

Statement of the Problem

The primary objectives of technical colleges is to produced skilled, self-reliant and enterprising craftmen and advance craftmen who can apply their technical knowledge and vocational skills in solving industrial, agricultural and economic problems of the nation (National Policy on Education NPE, 2013). Technical colleges were established to train individuals to acquire practical skills, basic scientific knowledge and attitudes required as craftmen at sub professional level to meet the manpower for national development.

Electrical installation and maintenance work trade

curriculum provides opportunity for acquisition of skills like domestic installation, industrial installation, cable jointing, battery charging and winding of electrical machines among others which will enable graduates of technical college to be both employable and self-reliant. However the graduates are not competent in the trade of electrical installation and maintenance work trade to be self-reliant and enterprising.

Oyeniyi and Michael (2019) [19] asserted that technical college graduates specializing in electrical installation and maintenance work trade areas such as electrical installation are unemployed and thereby roam the streets because they acquired little or no practical skills during the formal training. As a result of poor skill acquisition, they find it difficult to set up their own workshops. Graduates of technical colleges need to acquire the necessary new trend of knowledge of subject matter, practical skills for effective outcome of the goals and objectives. As supported by (Mbaga et al., 2017) [8] stated that effective teaching of any technical subject is rooted in adequate skills and knowledge of the subject matter. Inability of many teachers to effectively impart the subject matter to students is partly due to poor technical skills among teachers and has led to an increase in the rate of unemployment among graduates. There is certainly a need to pinpoint the needs of those subject-area teachers in order to pinpoint their areas of strength and weakness and offer suggestions for how to meet those requirements in order to help them effectively teach their students. If the shortcomings of the teachers are not addressed, the students' ability to learn the trade of electrical installation and maintenance will be compromised, and the goal of the programs offered by technical colleges will be harder to attain.

Improvement of technical skills by technical teachers in Government Technical Colleges will solve the problem of unemployment among the graduate. The problem of this study is to determine the technical skills improvement of electrical installation and maintenance work trade teachers in technical colleges for improving the quality of Government technical Colleges students. This study is therefore imperative to come up with the technical skills needed by technical teachers.

Objective of the Study

The purpose of the study was to determine the technical skills improvement needs of electrical installation and maintenance work trade teachers for effective teaching in government technical colleges in Kano state. Specifically, the study seeks to determine:

1. The technical skills improvement needs of electrical installation and maintenance works trade (EIMW) teachers for effective teaching of domestic electrical installation
2. The technical skills improvement needs of electrical installation and maintenance works trade (EIMW) teachers for effective teaching of industrial electrical installation

Research Questions

The following research questions were used to guide the study:

1. What are the technical skills improvement needs of electrical installation and maintenance works trade (EIMW) teachers for effective teaching of domestic electrical installation?
2. What are the technical skills improvement needs of electrical installation and maintenance works trade (EIMW) teachers for effective teaching of industrial electrical installation?

Hypotheses

The following hypotheses were tested at 0.05 level of significance.

1. **Ho_1:** There is no significant difference between the mean responses of graduate and non-graduate electrical installation and maintenance work trade teachers on their technical skills improvement needs for effective teaching of domestic electrical installation.
2. **Ho_2:** There is no significant difference between the mean responses of graduate and non-graduate electrical installation and maintenance work trade teachers on their technical skills improvement needs for effective teaching of industrial electrical installation.

Methodology

Descriptive Survey research design was adopted for the study. The area of the study is Kano state, which is located in North-West geopolitical zone of Nigeria. Kano state boarders Katsina state by the North-West, Jigawa state by the East, Bauchi and Kaduna state at the South. It is located between longitude 11.74710N and latitude 8.52470E. The population of the study is 48 teachers consisting of 28 graduate teachers and 20 non-graduate teachers of EIMWT. There was no sampling for this study. Because of its manageable size. The instrument for data collection was structured questionnaire developed by the researcher containing 38 items and titled "Technical Skills Improvement Needs of Electrical Installation and Maintenance Works Trade Questionnaire (TSINEIMWTQ). The instrument was validated by three expert from the Department of Electrical Technology Education, Madibbo Adama University, Yola. The reliability of the instrument was obtained via Cronbach Alpha with a coefficient index of 0.92. Two research questions were answered using mean and standard deviation, the corresponding hypotheses were tested using t-test at 0.05 level of significance. The decision to consider any item with a mean value of 2.50 and above, response is regarded as needed and any item whose mean falls below 2.50 is regarded as not needed.

Results

Research Questions

Six research questions were raised and answered using descriptive statistics of mean and standard deviation.

Research Question One

What are the technical skills improvement needs of electrical installation and maintenance works trade (EIMW) teachers for effective teaching of domestic electrical installation?

Table 1: Mean and Standard Deviation of Responses of Teachers on Technical Skills Improvement Needs of Teachers for Teaching Domestic Electrical Installation

		Responses						
		Graduate Teachers N_1 = 28		Non-Graduate Teachers N_2 = 20		Overall Responses N= 48		
S/NO	ITEMS	$\bar{x}_1$	σ_1	$\bar{x}_2$	σ_2	$\bar{x}_G$	σ_G	Remark
1.	Possession of solar photovoltaic cells installation skills.	3.60	0.50	3.65	0.49	3.62	0.50	Needed
2.	Possession of the skills in using AutoCAD for design working drawing.	3.43	0.69	3.70	0.47	3.54	0.60	Needed
3.	Improvement on modern safety skills required for domestic installation.	3.71	0.53	3.30	0.57	3.54	0.55	Needed
4.	Ability to install solar inverter batteries.	3.60	0.50	3.45	0.51	3.54	0.50	Needed
5.	Ability to determine cable size using simulation software.	3.54	0.58	3.45	0.51	3.50	0.55	Needed
6.	Needs to know modern type protective devices.	3.68	0.48	3.65	0.49	3.67	0.48	Needed
7.	Ability to install emergency alarm signal.	3.29	0.66	3.35	0.59	3.30	0.63	Needed
8.	Ability to determine current rating of fuses for a circuit.	3.57	0.69	3.30	0.47	3.46	0.60	Needed
9.	Ability to select protective circuit breakers.	3.60	0.57	3.50	0.51	3.56	0.54	Needed
10.	Ability to install and maintain electrical systems, equipment and devices.	3.60	0.57	3.30	0.57	3.48	0.57	Needed
11.	Ability to carry out simple surface wiring of domestic building.	3.54	0.58	3.50	0.60	3.52	0.59	Needed
12.	Ability to use surface wiring tools appropriately.	3.54	0.64	3.60	0.50	3.57	0.58	Needed
13.	Ability to select appropriate wiring type for a building.	3.50	0.69	3.50	0.51	3.50	0.62	Needed
14.	Improvement in carry out continuity test of a conduit wiring.	3.46	0.64	3.55	0.60	3.50	0.62	Needed
15.	Improvement in carry out polarity test of a conduit wiring	3.39	0.63	3.60	0.59	3.48	0.61	Needed
16.	Improvement in carry out earth leakage test of a conduit wiring	3.25	0.70	3.10	0.55	3.19	0.64	Needed
17.	Ability to apply appropriate procedure for preparing conduit installation work	3.50	0.58	3.40	0.50	3.46	0.55	Needed
18.	Ability to select appropriate tools for conduit wiring	3.68	0.55	3.55	0.51	3.63	0.53	Needed
19.	Ability to install earthing devices	3.43	0.50	3.60	0.50	3.50	0.50	Needed
20.	Improvement in carry out simple conduit wiring for a domestic building.	3.50	0.75	3.35	0.93	3.44	0.83	Needed
21.	Ability to select types of PVC, MICC, Armoured standard size of cable	3.43	0.74	3.55	0.60	3.48	0.68	Needed
22.	Ability to identify types of conduits	3.35	0.68	3.45	0.51	3.39	0.61	Needed
	Grand Mean	**3.50**		**3.47**		**3.49**		**Needed**

Key: $\bar{x}_1$= Mean of Graduate Teachers, $\bar{x}_2$ = Mean of Non-Graduate Teachers, σ_1= Standard deviation of Graduate Teachers, σ_2 = Standard deviation of Non-Graduate Teachers, $\bar{x}_G$= Grand Mean, σ_G = Grand Standard deviation, N_1 = Number of Graduate Teachers, N_2 = Number of Non-Graduate Teachers, N = Total Number of Respondents

Table 2: Mean and Standard Deviation of Responses of Teachers on Technical Skills Improvement Needs of Teachers for Teaching Industrial Electrical Installation

	Responses							
		Graduate Teachers N_1 = 28	Non-Graduate Teachers N_2 = 20	Overall Responses N= 48				
S/NO	Items	$\bar{x}_1$	σ_1	$\bar{x}_2$	σ_2	$\bar{x}_G$	σ_G	Remark
1.	Ability to diagnose electrical system on malfunctions failure.	3.46	0.74	3.60	0.59	3.52	0.68	Needed
2.	Improvement in carry out various connections such as star-delta.	3.36	0.68	3.50	0.60	3.42	0.65	Needed
3.	Ability to explain safety standard procedure.	3.68	0.55	3.65	0.59	3.67	0.57	Needed
4.	Ability to perform programme logic controllers/automation in the industry.	3.18	0.77	3.35	0.59	3.25	0.70	Needed
5.	Ability to explain simple conduit wiring for industrial installation	3.43	0.57	3.50	0.69	3.46	0.62	Needed
6.	Ability to explain surface wiring for industrial installation	3.07	0.81	3.05	0.83	3.06	0.82	Needed
7.	Ability to carry out conduit wiring system of an industry	3.39	0.57	3.45	0.60	3.42	0.58	Needed
8.	Ability to carry out surface wiring system of an industry for a circuit.	2.89	1.10	3.50	0.76	3.14	1.00	Needed
9.	Ability to differentiate between AC DC Motors and Generators	3.71	0.59	3.55	0.51	3.64	0.56	Needed
10.	Improvement in carry out test on machines.	3.60	0.57	3.40	0.75	3.52	0.65	Needed
11.	Ability to apply lubricants on machines	3.29	0.76	3.60	0.59	3.42	0.69	Needed
12.	Ability to demonstrate the use of Tools/Equipment for maintenance of machines the used of each	3.43	0.63	3.35	0.59	3.39	0.61	Needed
13.	Ability to understand the use of starter for electric motors.	3.39	0.79	3.35	0.75	3.37	0.77	Needed
14.	Ability identify duct wiring of an industry	3.57	0.50	3.25	0.79	3.44	0.62	Needed
15.	Ability to explain open circuit with examples in electrical installation.	3.46	0.64	3.20	0.62	3.35	0.63	Needed
16	Ability to explain short circuit with examples in electrical installation	3.43	0.74	3.40	0.75	3.42	0.74	Needed
	Grand Mean	3.39		3.42		3.40		Needed

Key: $\bar{x}_1$= Mean of Graduate Teachers, $\bar{x}_2$ = Mean of Non-Graduate Teachers, σ_1= Standard deviation of Graduate Teachers, σ_2= Standard deviation of Non-Graduate Teachers, $\bar{x}_G$= Grand Mean, σ_G = Grand Standard deviation, N_1 = Number of Graduate Teachers, N_2 = Number of Non-Graduate Teachers, N = Total Number of Respondents

Table 1 presents the mean and standard deviation of respondents on the technical skills for effective teaching of domestic electrical installation. The table revealed that the items have mean responses which range between 3.19 to 3.67 which is above cut off mean of 2.50 and having corresponding standard deviation which range between 0.48 to 0.82. The grand mean of all the items on the table is 3.49. This shows that the respondents needed all the technical skills for teaching domestic electrical installation in technical colleges in Kano State.

Research Question Two

What are the technical skills improvement needs of electrical installation and maintenance works trade (EIMW) teachers for effective teaching of industrial electrical installation?

Table 2 presents the mean and standard deviation of respondents on the technical skills for effective teaching of industrial electrical installation. The table revealed that the items have mean responses which range between 3.06 to 3.67 which is above cut off mean of 2.50 and having corresponding standard deviation which range between 0.56 to 1.00. The grand mean of all the items on the table is 3.40. This shows that the respondents needed all technical skills for teaching industrial electrical installation in technical colleges in Kano State.

Hypotheses

Two hypotheses were formulated and tested at 0.05 level of significance using t-test.

Hypothesis One

There is no significant difference between the mean response of graduate and non-graduate teachers of electrical installation and maintenance work trade on their technical skills improvement needs for effective teaching of domestic electrical installation.

Table 3: t-test Analysis of Difference between the Mean Responses of Graduate and Non-graduate Teachers of electrical installation and maintenance work trade on their technical skills improvement needs for effective teaching of domestic electrical installation

Respondents	N	Mean	SD	Df	T	P – value	Remark
Graduate	28	3.50	0.55				
				46	0.241	0.811	Not Significant
None-Graduate	20	3.47	0.48				

P >0.05 N= Number of respondents, SD= Standard Deviation

Table 3 shows the result obtained when the hypothesis 1 was tested at degree of freedom (df= 46) and 0.05 level of significance. From the table, the calculated p-value of 0.811 is greater than the level of significance value of 0.05. This result shows that there is no significant difference between the mean response of graduate and non-graduate teachers of electrical installation and maintenance work trade on their technical skills for effective teaching of domestic electrical installation. Therefore, the null hypothesis is accepted.

Hypothesis Two

There is no significant difference between the mean response of graduate and non-graduate teachers of electrical installation and maintenance work trade on their technical skills improvement needs for effective teaching of industrial electrical installation

Table 4: t-test Analysis of Difference between the Mean Responses of Graduate and Non-graduate Teachers of electrical installation and maintenance work trade on their technical skills improvement needs for effective teaching of industrial electrical installation

Respondents	N	Mean	SD	Df	T	P – value	Remark
Graduate	28	3.39	0.63				
				46	-0.118	0.906	Not Significant
None-Graduate	20	3.42	0.60				

P >0.05 N= Number of respondents, SD = Standard Deviation

Table 4 shows the result obtained when the hypothesis 2 was tested at degree of freedom (df= 46) and 0.05 level of significance. From the table, the calculated p-value of 0.906 is greater than the level of significance value of 0.05. This result shows that there is no significant difference between the mean response of graduate and non-graduate teachers of electrical installation and maintenance work trade on their technical skills for effective teaching of industrial electrical installation. Therefore, the null hypothesis is accepted.

Findings of the Study

Based on the results presented, the following findings were made:

1. Technical skills improvement needs of teachers for teaching domestic electrical installation are: Possession of solar photovoltaic cells installation skills, Possession of skills in using AutoCAD for design working drawing, Improvement on modern safety skills required for domestic installation, Ability to install solar inverter batteries, Ability to determine cable size using simulation software, among others.
2. Technical skills improvement needs of teachers for teaching industrial electrical installation are: Ability to diagnose electrical system on malfunctions failure, Improvement in carry out various connections such as star-delta, Ability to explain safety standard procedure, Ability to explain surface wiring for industrial installation, and Ability to carry out conduit wiring system of an industry, among others.
3. There was no significant difference between the mean responses of Graduate Teachers and non-graduate teachers of electrical installation and maintenance work trade on their technical skills improvement needs for effective teaching of domestic electrical installation in Technical Colleges in Kano state.
4. There was no significant difference between the mean responses of Graduate Teachers and non-graduate teachers of electrical installation and maintenance work trade on their technical skills improvement needs for effective teaching of industrial electrical installation in

Technical Colleges in Kano state.

Discussion of Findings

The following discussion done based on findings of the study.

The Finding of the study with regard to research question one revealed that the electrical installation and maintenance work trade teachers needed technical skills in all the 22 skills used for investigation. They include the following among others: photovoltaic installation, AutoCAD for design working drawing, safety skills, install solar inverter batteries, determine cable size using simulation software, install emergency alarm signal, determine current rating of fuses for a circuit and all 22 items were found to be needed. The finding is in agreement with the work Saminu & Mahmud (2021) [21] who found out that Electrical Installation and Maintenance Work (EIMW) Trade teachers should have frequently participate in workshops and seminars in order to improve their technical skills in domestic electrical installation. Also the findings are in agreement with the study carried out by Omolola (2012) [17] to identify supervisory skills in building construction required by building technology teachers in technical colleges in Ondo State. It was found out that skills are essential to train technical students for capacity building.

The Finding of the study with regard to research question two revealed that the electrical installation and maintenance work trade teachers needed technical skills in all the 16 skills used for investigation. They include the following among others: the ability to explain safety measures in carry out conduit wiring in an industrial installation, carry out trunking wiring system of an industry, carry out surface wiring in an industry, identify duct wiring in an industry are needed technical skills. The respondents also perceived that technical skills in the use of appropriate tools in trunking wiring, ability to diagnose electrical system on malfunctions failure, understanding the difference between motor and generator, use of starter in electric motor, improvement in carry out test on machines are needed and so on. These findings support that of Mbaga, Wampana and Shanga (2017) [8], who identified the ability to carry out conduit wiring, ability to explain safety major, ability to carry out trunking wiring as some of the important technical skills teachers should possess. Again, Payne and Virginia (2021) [20] supported the finding as it asserted that technical teachers needs in-service training in order to possess the required skills. The responses of the respondents on technical skills buttressed what Hassan, Dauda and Badawi (2019) [6] noted teachers should regularly be sent on professional courses to update and boost their technical skills for teaching activities in technical colleges.

The findings of the study with regard to research hypothesis one revealed that there was no significant difference between the mean response of graduate teachers and non-graduate teachers of electrical installation and maintenance work trades on their technical skills improvement needs for effective teaching of domestic electrical installation in technical colleges in Kano State. The result of the findings supports the position of Mbaga (2011) [17] that there is a lack of technical competency by some electrical installation and maintenance work trade teachers in the teaching of domestic electrical installation. This finding is in concord with Mbaga, Wampana and Shanga (2017) [8] who reported that there was no significant difference between graduate and non-graduate teachers on domestic electrical installation.

The findings of the study with regard to research hypothesis two revealed that there was no significant difference between the mean response of graduate teachers and non-graduate teachers of electrical installation and maintenance work trades on their technical skills improvement needs for effective teaching of industrial electrical installation in technical colleges in Kano State. The findings support the findings of Shanga (2021) [22] and Halton (2014) [5] that some teachers need technical skills in industrial electrical installation for effective teaching.

Conclusion

Based on the findings of the study, it was concluded that graduate and non-graduate teachers in technical colleges in Kano State needed the following technical and pedagogical skills: technical skills improvement needs in all the items listed in domestic electrical installation; technical skills improvement needs in all the items listed in industrial electrical installation; technical skills improvement needs in all the items listed in rewinding of electrical machines; pedagogical skills improvement needs in all the items listed in instructional planning; pedagogical skills improvement needs in all the items listed in instructional management; and pedagogical skills improvement needs in all the items listed in instructional evaluation. The findings of this study have educational implications in that technical and pedagogical skills are now crucial for the efficient instruction of electrical installation and maintenance work trades in Kano State's technical colleges. Therefore, having skilled trade teachers for electrical installation and maintenance work becomes essential. This suggests that ineffective electrical installation and maintenance work trade teachers should be sent for training to develop the essential technical and pedagogical skills, and that the government should only employ competent teachers in this field.

Recommendations

Based on the study's findings, the following recommendations were made

1. The employer and other important stakeholders should support the electrical installation and maintenance work trade teachers to enhance their technical skills in order to improve their skills in domestic electrical installation, industrial electrical installation, and winding of electrical machine.
2. The government should organize training and seminars on the use of modern tools and equipment for teachers of electrical installation and maintenance work trade.

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