CHAPTER ONE

INTRODUCTION

Background to the Study

The 21st Century is best described as the age of science and technology, exploration, experimentation and development. This has resulted to innovations in all fields of human endeavour with its attendant socioeconomic consequences. Thus, every nation must be abreast with such innovations to be economically viable. In view of this, Dauda, Daniel, Paul and Danlami (2017) opined that Nigeria needs to grow and compete favourably with other nations in business and industry, in new methods and new techniques. This requires not only capital investment, but also a workforce that is knowledgeable and has the flexibility to acquire new skills for new jobs as the structures of the economy and occupations change. The search therefore, is for skilled workers and specialists in new and growing fields such as Technical Education. Training in vocational and technical education is primarily meant to equip the trainee with skills, knowledge and attitude to become self-reliant, enterprising and ready to create environment for self and societal empowerment. The flexibility and productivity of any workforce largely depends on the availability of skilled workers especially technicians and artisans.

An artisan is a skilled craft worker who makes or creates things by hand. Artisans are also referred to as crafts workers. Thus, artisans are said to possess psychomotor competencies or skills. Psychomotor competency is a competency that borders on manual dexterity and motor skills. Artisans in most cases have little or no theoretical knowledge of their trades. Tsoho (2013) rightly noted that in the present informal sector, electrical craft apprenticeship does not have scheme for training apprentices. Tsoho also observed that many artisans in Nigeria lack theoretical knowledge in their trade areas. This is based on the fact that many of them did not

undertake any formal training in their trade area. Very few of them that show little theoretical knowledge of their skills and trade areas passed through technical colleges.

There are many trades such as electrical/electronics, mechanic, building, fine arts among others that are prevalent in Nigeria. These trade areas give rise to various categories of artisans. Artisans are categorized based on their trade. For instance, there are electrical installation works artisans (usually called electricians), mechanical works artisans, building construction artisans among others.

Electrical installation work is a trade which consists of electrical installation work and repairs. Electrical Installation Works is also one of the trades involved in electrical craft work (Tsoho, 2013). In a more clear term, the Federal Republic of Nigeria in her National Policy on Education (2014) specified trades in electrical craft to include: electrical installation and maintenance work, radio, television and electrical works and appliance repairs. Specifically, National Board for Technical Education, NBTE (2001) listed components of Electrical Installation Works to include Domestic Installation, Industrial Installation, Cable Jointing, Winding of Electrical Machines, Battery Charging and Basic Electricity. In the non-formal sector, electrical installation works artisans usually specialize in one area of these components of Electrical Installation Works.

Training in Domestic Installation is meant to provide the trainee with the knowledge and skills for carrying out complete electrical installation in a building and its associated equipment (NBTE, 2001). Skills required for practice may include understanding of electrical drawings, knowledge of different types of domestic surface and conduit wiring, electrical devices' protection and installation, understanding sequence for inspecting and testing domestic installation, and understanding of various types of lamps for illumination and uses. These skills may be viewed as clusters in domestic installations. Electrical installation works artisans constitute a large percentage of the workforce in the power sector.

According to Agbo (2016), the workforce in the power sector includes: engineers, technologists, technicians, artisans or craft men. Electrical Installation Work artisans (EIWAs) are also involved in both industrial and domestic installations and repairs. This reveals that EIWAs constitute a vital part of the workforce that must be given due attention if development is a matter of concern. Development thrives where there is steady power supply and this cannot be achieved without well trained workforce of all categories.

Apart from increasing the workforce base of the power sector, EIWAs help to reduce the stigma of unemployment. The goal of training in Electrical Installation Works and other trades in Technical and Vocational Education and Training (TVET) is self-reliance. EIWAs trained in the informal setting contribute greatly to socioeconomic development and economic empowerment. Few decades ago, David and Paul (1996) rightly recognised that there has been a growing international interest in what is called the 'informal sector' as a viable means of employment and income generation in developing countries. In view of this, it is important to say that the training of EIWAs in the informal sector need to be given due attention in Nigeria and in the southeast in particular.

Electrical Installations Works is taught mainly in the formal setting at the technical colleges, Colleges of Education, Polytechnics and Universities while in the non-formal setting, it is taught by a master craftsman through apprenticeship system. Tsoho (2013) noted that Master Craftsmen are the brain behind the informal sector craft practice and apprenticeship training.

Apprenticeship is a system of training whereby the trainee (apprentice) learns skills of a given trade by observing the master craftsman doing the job. In the words of Stewart (2009), apprenticeship refers to a form of vocational training in the skilled trades that is primarily undertaken on-the-job under the supervision of certified master craftsman. Master craftsman is one who has acquired sufficient skills in the practice of a trade over a long period. An Electrical master craftsman is a person skilled in electrical installation works and repairs.

Apprenticeship can be formal or informal. According to the Centre for the Study of African Economics in Tsoho (2013), apprenticeship is classified into traditional, informal and modern or formal. Traditional apprenticeship refers to the well-organized transfer of skills within families. Informal apprenticeship is similar to the traditional apprenticeship apart from the fact that an apprentice can come from outside the family. The modern (formal) apprenticeship is regulated by an apprenticeship Act which stipulates the length of training period, training format and number of training hours. In Nigeria, informal apprenticeship is one of the ways by which EIWAs are trained (Uwameiye & Ede, 2002).

The informal apprenticeship system of training EIWAs has serious implication as far as Nigeria is concerned. This is based on the fact that in other developed nations, the non-formal apprenticeship is organised and guided by policies that ensure strict adherence to standards and content of training but such is not obtainable in Nigeria. According to Tsoho (2013), the present informal sector electrical craft apprenticeship is void of theoretical knowledge and scheme for training apprentices and practice. The master EIWA determines what skill is relevant and how to teach the apprentice. This means that the training is basically administered as it pleases the master craftsman. Hence there is no standard programme for training these trainees. On the other hand, there is also no policy in Nigeria that regulates the activities of the non-formal apprenticeship system such as Electrical Installation Works Apprenticeship. Alio (2006) recognised the absence of Government policies and regulations on the activities of the informal sector craft apprenticeship. Alio also observed that this adversely affects the growth and development of the craft practice and training.

Training is very crucial as far as TVET (of which Electrical Installation Works is a part) is concerned. The products of any training undoubtedly reveal the quality of the training they received. One of the theories of TVET is that the training environment of trainees should be a replica of where they will eventually work upon completion of their training (Prosser & Allen,

1925). This theory cannot be ascertained regarding the training of EIWAs all over Nigeria since there is no standard programme of training and consequent policies for its regulation. The absence of this standard programme has adverse effect on the quality of EIWAs and consequently on the workforce and socioeconomic development of the nation.

As a result of lack of standard training programme, Walther (2007) noted that there is no way to ascertain the minimum skills an EIWA trainee should possess. In the same vein, no one can also ascertain the quality of skills possessed by these master craftsman in the informal Electrical Installation Apprenticeship. One can only give what one has. Hence the master craftsmen can at best impart the skills they have to their trainees. This kind of system rarely incorporates innovations.

As earlier stated, science and technology is dramatically changing the operations and techniques in every area of human endeavour. This kind of electrical installation works apprenticeship system that is run according to the discretion of the master craftsman can only allow apprentices imbibe innovations to the extent the master craftsman allows. This entails that innovations will be lacking since many of the master EIWAs rarely upgrade themselves. The master craftsmen rarely upgrade their skills to the modern practice in their profession. World Bank (1995) noted that informal sector master craftsmen mostly pass on their skills and knowledge to apprentices; they rarely create new knowledge. Hence they keep passing on to their trainees skills without regard to their employability in the world of work. When there is a standard programme of training, it will be easy to review the programme in order to be abreast with technological advancement.

Over the centuries and in many countries, indigenous craft practice training such as Electrical Installation Works, have been the bed rock of modern technological development and growth, and a means of fighting unemployment. Developed countries like Germany, England, USA, Japan, and Russia developed indigenous craft practice in the informal sector through

appropriate and effective policy formulation and legislation, and developed a standard programme of training (Walther, 2007). Hence it is vital, at this stage of development in Nigeria in which unemployment is at a pitiable rise, to develop and validate a psychomotor competency-based programme for training and retraining EIWAs.

Statement of the Problem

Electrical Installation Works is a trade that is majorly psychomotor based. Psychomotor based training deals with motor skills and manual dexterity. Hence in the non-formal sector, training of EIWA is achieved through apprenticeship. In this system, the trainee learns by observing the trainer. In Nigeria, this system of training is unorganised and has unstructured content. Tsoho (2013) observed that the present informal sector electrical craft apprenticeship does not have scheme for training apprentices. National Master Plan on Technical and Vocational Education Development noted that the informal apprenticeship lacks organization and its practice unsystematic (Federal Ministry of Education, 2000). Therefore, the content of their training is as deemed necessary by the trainer.

The training of EIWAs and their practice in the informal sector has no regulation that guides it. Alio (2006) noted the absence of government policies and regulations in the operations of the craftsmen. This is traceable to lack of standard programme for the training of EIWAs. This has resulted in producing EIWAs that lack appropriate skills for the modern day practice of electrical installation works. Hence many EIWAs trained in the informal sector apprenticeship find it difficult to secure employment or establish their own workshop (Nwokike, 2014).

In a bid to change the situation, the Federal Government of Nigeria has made several attempts to train artisans in various trade areas and conduct accreditation of the informal sector craft practice. For instance, Uwameiye and Ede (2002) stated that the Federal government of Nigeria directed that these roadside apprenticeship centres should be accredited by National

Board for Technical Education (NBTE). However, Uwameiye and Ede observed that this plan failed; partly due to lack of standard programme that clarifies benchmark for such accreditation. Furthermore, Omofonmwan and Chukwuedo (2013) observed gross deficiency in tools and equipment in the training of artisans in digital electronics under the National Open Apprenticeship Scheme (one of the several attempts by the Federal Government to train artisans). This may be as result of lack of standard training programme which specify facilities required for such training. Also, in February 2016, the senior special assistant to the Vice President of Nigeria on Job Creation and Youth Empowerment, Afolabi Imoukhude disclosed the plan of the Federal Government to train 370, 000 artisans to boost skills development and employment generation (Ekwealor, 2016). These artisans were meant to be trained in various trade areas. The bugging question still remains "if the Federal Government decide to keep her promise against her norms, what will be the programme for training those in Electrical Installation Works since such is not in existence yet?" If any programme is provided, how valid is it?

Nigeria has many EIWAs training centres, yet she has continued to hire foreigners to work in her power sector and also in various companies across the nation. The Minister of Power, Housing and Development in this regard, noted that investing in the training of artisans will not only boost the workforce but will also put an end to shipping foreign artisans into Nigeria to work (Ekwealor, 2016). It is disheartening to know that Nigeria, after over 100 years of existence as a nation, still hires foreign EIWAs to fix installations as common as street lights. This may be attributed to the fact that the indigenous EIWAs lack requisite skills required to ameliorate the situation.

Lack of training programmes (manual) and standards relevant to the industry/market needs has been noted as a major setback to apprenticeship training of artisans in the informal sector in Nigeria (UNESCO, 2015). Consequent upon this and the fact that the informal electrical

installation work practice is a psychomotor based trade, it is imperative to develop and validate a psychomotor competency-based programme for retraining electrical installation works artisans.

Purpose of the Study

The main purpose of the study is to develop and validate a psychomotor competency-based programme for retraining electrical installation works artisans. Specifically, the study was to;

1. determine the objectives of the psychomotor competency-based retraining programme.
2. determine the content of the psychomotor competency-based retraining programme.
3. determine the appropriate instructional strategies for the psychomotor competency-based retraining programme.
4. ascertain the facilities needed for effective psychomotor competency-based training in EIW.
5. identify evaluation techniques for the psychomotor competency-based retraining programme.
6. develop the psychomotor competency-based retraining programme for EIWAs.
7. validate the psychomotor competency-based retraining programme for EIWAs.
8. find the effectiveness of the psychomotor competency-based retraining programme in achieving the objectives of EIW.

Significance of the Study

The findings of this study would be of great benefit to the Electrical Installation Works trainers and their trainees, Federal and State governments, Policy makers, National Board for Technical Education (NBTE), National Directorate of employment (NDE) and the society at large.

The outcome of the study would help the electrical installation works master craftsmen to be abreast with the current trends of operation in electrical installation works and then the need for upgrade their skills where they are found lacking. Consequently, the danger of going out of job due to lack of trending skills in this trade area will be prevented. In the same vein, these trainers of EIWAs will be better equipped to train other artisans and in maintaining standard.

The product of this study would enable the apprentices know exactly what is the content of their training and as well enable them to evaluate their progress. The knowledge of exact contents of the training programme shuts room for gambling. In essence, confidence will be engendered on the part of the trainers in the sense that what is expected is what is delivered. With such confidence developed, the belief is that the trainees would fit in the work environment upon completion of their training with every conviction on the trainees' effectiveness in the world of work.

Currently, there is no policy and regulation guiding apprenticeship training of EIWAs. The findings of this study would equip policy makers with the knowledge of the content of the training of EIWAs which is necessary for policy and regulation formulation. Hence the product and findings of this study would aid the Federal and State governments in the formulation of appropriate policies and regulations for apprenticeship training of EIWAs to provide self-employment for unemployed youths.

The findings of the study would be of great benefit to the National Assembly in formulation of laws or Acts on apprenticeship training modalities. In this regard, the apprenticeship training would receive sufficient funding and formal recognition to reduce unemployment among youths in the country. As a follow up, more value will be accorded to EIWAs in the society.

The Psychomotor competency-based programme would be of immense benefit to NBTE in the accreditation of the non-formal sector Electrical Installation Works. NBTE attempted carrying out such accreditation in the past. However, the accreditation failed. This was partly as a result of lack of standard for conducting accreditation of EIWAs in the informal sector. Hence findings of this study will serve as a benchmark for conducting such accreditation.

National Directorate of employment (NDE) would benefit from the study by using the product of this study in assessing the master craftsmen they employ to train apprentices in the National open apprenticeship scheme. This will help to ensure that master EIWAs employed possess the requisite skills. It will also serve as a comprehensive guide for the training of EIWAs in such apprenticeship centres across the country.

Finally, the society will be served better when the EIWAs are well-trained using the product of this study. There will be reduction in substandard installations, wastage and risk of accident due to substandard installations.

Scope of the Study

The study is delimited to developing and validating psychomotor competency-based programme in domestic installation. Areas such as industrial installations, cable jointing, winding of electrical machines and battery charging were not covered.

Research Questions

The following research questions guided the study.

1. What are the objectives of the psychomotor competency-based retraining programme?

2. What are the contents of the psychomotor competency-based retraining programme?

3. What are the appropriate instructional strategies for the psychomotor competency-based retraining programme?

4. What are the facilities needed for effective psychomotor competency-based retraining in EIW?

5. What are the appropriate evaluation techniques for the psychomotor competency-based retraining programme?

6. What is the difference between the mean ratings of artisans retrained using the psychomotor competency-based programme and those retrained conventionally, before and after retraining?

Hypothesis

The null hypothesis was formulated to guide the study and was tested at 0.05 level of significance;

1. There is no significant difference in the psychomotor competency mean ratings of EIWA retrained using the psychomotor competency-based programme and those retrained conventionally.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

The review of related literature in this study was carried out under the following sub-headings:

Conceptual Framework

Psychomotor Competency

Electrical Installation Works

Electrical Installation Works Artisans

Theoretical Framework

Cognitive Apprenticeship Theory

Curriculum Development Theory: Ralph Tyler's Model, Wheeler's Model and Nicholl and Nicholl

Theoretical Studies

Development and Validation of a Training Programme

Components of Electrical Installation Works

Training of Electrical Installation Work Artisans

Psychomotor Competency-based Programme

Review of Related Empirical Studies

Summary of Review of Related Literature

Conceptual Framework

Psychomotor Competency

The word "psychomotor" is gotten from "psyche" meaning mind and "motor" which talks about performance or doing. Whenever one is exposed to any form of teaching or instruction, one hopes to bring about certain changes. Although these changes are not spelt out in certain situation yet they occur. Such changes are termed learning outcome. Learning outcome takes many forms such as behavioural change, change in one's feeling, attitude, emotion, interest, and change in the

way one thinks. The change in behaviour has to do with performance of or doing certain tasks such as cutting a log of wood, dressing, cleaning. Behavioural changes such as these are called motor skills. Therefore, when learning objectives of a given instruction borders on motor skills and manual dexterity, such objectives are called psychomotor learning objectives. According to Bloom, Englehart, Furst, Hill and Krathwohl (1956), educational objectives are classified into cognitive domain, affective domain and psychomotor domain. The psychomotor domain is the skill-based domain. Hence psychomotor objectives are all about skill-based objectives.

On the other hand, competency means an ability or skill. If a student is said to have competency in operating a certain machine, it implies that the student is skilled in operating those machines. Therefore, psychomotor competency is seen as such abilities that border on motor skills and manual dexterity. It is a learning objective of instruction (formal or informal) in which the learner is expected to be able to perform certain tasks. For instance, a trainee in Electrical Installation Works that is observing the master fix a socket outlet over certain period of time is expected not just to identify a socket and where it should be fixed but be able to fix it correctly when asked to do so.

Electrical Installation Works

Electrical installation works is a trade area that comprises of domestic installation, industrial installation, cable jointing, battery charging and repairs, and winding of electrical machines. In the informal sector, due to broadness of the trade, those who take career in electrical installation works usually specialize in one or two areas of electrical installation works mentioned above.

However, in the technical colleges, electrical installation Works is offered as Electrical Installation and Maintenance Work. It is one of the trade subjects offered mainly in technical colleges in Nigeria whose major objective is to provide trained manpower in the applied science, technology and commerce at sub-professional grades (Federal Republic of Nigeria, 2009). Its

content majorly dwells on workshop safety rules and regulation, electrical installation, tools, materials and accessories, workshop practices and protective devices and maintenance. Cable jointing, Battery Charging and repairs, Winding of Electrical Machines are offered as separate subjects from Electrical Installation and Maintenance Work. Students are usually at liberty to choose from these subjects as areas of specialization.

In this study, electrical installation works is seen as an electrical trade area consisting of domestic installation, industrial installation, cable jointing, battery charging and repairs, and winding of electrical machines. Most artisan workshops specialize in one area of electrical installation works. Hence only domestic installations will be used for this study.

Electrical Installation Works Artisans

Electrical installation Works artisans are artisans trained in any area of electrical installation works such as domestic installation, industrial installation, cable jointing, battery charging and repairs, and winding of electrical machines. Most of the artisans are graduates of technical colleges and secondary schools while some are school dropouts. In this study, EIWAs concerned are those trained in the non-formal sector. Some of these EIWAs may have obtained formal education but not in Electrical Installation.

Theoretical Framework

Cognitive Apprenticeship Theory

Cognitive apprenticeship theory was propounded by Collins, A., Brown, J. S., and Newman, S. E. in 1989. The concept of cognitive apprenticeship has its roots in social learning theories. Cognitive apprenticeship states that learning takes place through guided experience on cognitive and meta-cognitive, rather than physical, skills and processes (Collins, Brown, & Newman, 1989). One cannot engage in a cognitive apprenticeship alone, rather it is dependent on expert demonstration (modelling) and guidance (coaching) in the initial phases of learning. Learners are challenged with tasks slightly more difficult than they can accomplish on their own

and must rely on assistance from and collaboration with others to achieve these tasks. In other words, learners must work with more experienced person (s) and with time move from a position of observation to one of active practice. For instance, a new apprentice would learn television servicing in a busy television servicing workshop, where he or she is surrounded both by master television artisan and other apprentices, all engaged in the practice of servicing televisions at varying degree of expertise.

The tasks to be learnt in cognitive apprenticeship should progress from simple tasks and increase in complexity and diversity over time as the learner becomes more experienced. A television servicing apprentice will have to learn the art of opening televisions before learning to troubleshoot a faulty television. A major advantage of learning by cognitive apprenticeship as opposed to traditional classroom-based methods is the opportunity to see the subtle, tacit elements of expert practice that may not otherwise be explained in a lecture or knowledge-dissemination environment.

Instructional Strategies and Models Associated with Cognitive Apprenticeship

Although cognitive apprenticeships may occur on their own, without intervention, certain instructional strategies characterize the theory and can be purposely implemented to support learning. According to Collins et al (1989), intentional teaching and learning through cognitive apprenticeship require making tacit processes visible to learners so they can observe and then practice them. The basic model consists of the following strategies:

- ❖ Modelling: Demonstrating the thinking process
- ❖ Coaching: Assisting and supporting learner cognitive activities as needed with scaffolding (explanation).
- ❖ Reflection: Self-analysis and assessment
- ❖ Articulation: Verbalizing the results of reflection
- ❖ Exploration: Formation and testing of one's own hypotheses

Note that these strategies refer to the teacher's or expert's actions; the learners in cognitive apprenticeships (CAs) are engaged in acts of observation, practice, and reflection. According to Dijkstra, Krammer, and Van Merrienboer in Abd-El-Aziz (2013), masters teach apprentices through a combination of activities called modelling, coaching and fading. In this sequence of activities, the apprentice repeatedly observes the master or expert performing to-be-learned process (or modelling) with explanations (or scaffolding), which usually involves many different but related sub-skills. This observation allows the apprentice to build a conceptual model of the processes required to accomplish the task. The apprentice then attempts to execute each process with guidance and help from the master (that is, coaching) substantiated with explanations (scaffolding). A key aspect of coaching is the provision of "scaffolding," which is the support, in the form of reminders or help, (explanations of any forms) that the apprentice requires to approximate the execution of the entire complex sequence of skills. In addition, the presence of other learners provides the apprentice with calibrations of his own progress, helping him to identify his own strengths and weaknesses and thus to focus his efforts for improvement. Once the apprentice has a firm grip of the entire process, the master reduces his participation (that is, fading), providing only limited hints, refinements, and feedback to the apprentice, who practises by successively approximating smooth execution of the entire process.

Collins et al (1989) cognitive apprenticeship theory model is generally considered the foundational one, but other slightly different versions have been proposed. For instance, Gallimore and Tharp (1990) identified six forms of scaffolded assistance such as instructing, questioning, modelling, feeding back, cognitive structuring and contingency management. Liu (2005), who also used a cognitive apprenticeship approach to support pre-service education, offers instructional designers a three-phase Web-based Cognitive Apprenticeship model with a dynamic relationship between the initial modelling–observing phase and the second scaffolding–practice phase, which then is followed by the guiding–generalizing phase. The similarities across

these models are their reliance on instructional strategies that provide learner guidance and engage learners in different types of practice until the guidance is no longer needed.

This theory rightly provides a theoretical base upon which the apprenticeship system of training artisans is run. In a typical non-formal apprenticeship setting, the apprentice learns by observing the master. As the apprentice observes the master for a given period, the master assigns tasks (from simple to complex) to the apprentice while playing a supervisory role. Hence this model informed the development and validation of the psychomotor retraining programme for EIWA in terms of training and retraining strategies. However, this theory does not have a base for the processes involved in development and validation of the psychomotor retraining programme for EIWA.

Curriculum Development Theory: Tyler, Wheeler, Nicholls and Nicholls

Curriculum development theories are theories that model the intricacies of curriculum development processes and implementation. Models are used to give a more graphical or visual representation of a process or phenomenon. Therefore, to provide a robust theoretical base for this study which involves development of a retraining programme, three models of curriculum development theories; Tyler, Wheeler, Nicholas and Nicholls, are used.

Tyler's Curriculum Development Model

Tyler's Curriculum Model was propounded by Ralph Tyler in 1949. Tyler's curriculum rationale was in terms of four questions which he argued, must be answered in developing any curriculum plan of instruction. The questions are;

1. What educational purposes should the school seek to attain?

2. What educational experiences should be provided that will likely enable the school attain these purposes?

3. How should these educational experiences be effectively organized?

4. How should we determine whether the purposes are being attained?

These questions culminated to a four-step process: stating aims and objectives, selecting learning experiences, organizing learning experiences, and evaluating the curriculum. These four-step processes are referred to as Tyler's curriculum model.

Fig. 1: Tyler's Curriculum Model

Tyler presented a linear relationship among the four steps as shown in Fig.1. Tyler (1949) opined that this linear representation of curriculum model was accepted and practised by scholars for providing a complete understanding of the planning activities and led to refinements such as system analysis and classification of learning. Let's look at the components of Tyler's model.

Aims and Objectives

Tyler was interested in how learning related to the issues of society, and believed studies of contemporary life provided information for learning objectives. He defines the learning objectives in terms of knowledge, communication skills, social and ethical perspective, quantitative and analytical skills, and cognitive/taxonomy. He proposes that educational objectives originate from three sources: studies of society, studies of learners, and subject-matter specialists. These data systematically collected and analysed, form the basis of initial objectives to be tested for their attainability and their efforts in real curriculum situations.

Learning Experiences

Once the first step of stating and refining objectives is accomplished, the rationale proceeds through the steps of selection and organization of learning experiences as the means for achieving outcomes, and, finally, evaluating in terms of those learning outcomes. The term "learning experience" refers to the interaction between the learner and the external conditions in the environment to which he can react. Tyler argues that the term "learning experience" is not the same as the content with a course which deals with activities performed by the teacher. Learning takes place through the active behaviour of the student; it is what he does that he learns not what the teacher does. So, the learning experience of students refers to activities in the learning process. What should be asked in this experience is "what will be done and have been done by the students" not "what will be done and have been done by teachers."

Tyler recognizes a problem in connection with the selection of learning experiences by a teacher. The problem is that by definition a learning experience is the interaction between a student and her environment. That is, a learning experience is to some degree a function of the perceptions, interests, and previous experiences of the student. Thus, a learning experience is not totally within the power of the teacher to select. Nevertheless, Tyler maintains that the teacher can control the learning experience through the manipulation of the environment, resulting in stimulating situations sufficient to evoke the desired kind of learning outcomes.

There are several principles in determining student's learning experiences, which are: (a) students experience must be appropriate to the goals you want to achieve, (b) each learning experience must satisfy the students, (c) each design of student learning experience should involve students, and (d) in one learning experience, students can reach different objectives.

Organization of Learning Experiences

Tyler asserted that organization is seen as an important problem in curriculum development because it greatly influences the efficiency of instruction and the degree to which major educational changes are brought about in the learners. He believes three major criteria are required in building organized learning experiences: Continuity, sequence, and integration. Students need concrete experiences to which the readings are meaningfully connected

Tyler maintains that there are two ways of organizing learning experiences, which are; organizing vertically and horizontally. There are three criteria, according to Tyler in organizing learning experiences, which are: continuity, sequence, and integration. The principle of continuity means that the learning experience given should have continuity and it is needed for learning experience in advance.

Principles of content sequence means that the learning experience provided to students should pay attention to the level of student's development. Learning experience given in class five should be different from learning experiences in the next class.

The principle of integration means that the learning experience provided to students must have a function and useful to obtain learning experience in other sectors. For instance, learning experience in Basic Electricity should be able to form learning experience in other subject area.

Evaluation and Assessment of the Learning Experiences

Evaluation is the process of determining to what extent the educational objectives are being realized by the curriculum. In other words, the statement of objectives do not only serve as the basis for selecting and organizing the learning experiences, but also serves as a standard against which the program of curriculum and instruction is appraised. Thus, according to Tyler,

curriculum evaluation is the process of matching initial expectations in the form of behavioural objectives with outcomes achieved by the learner.
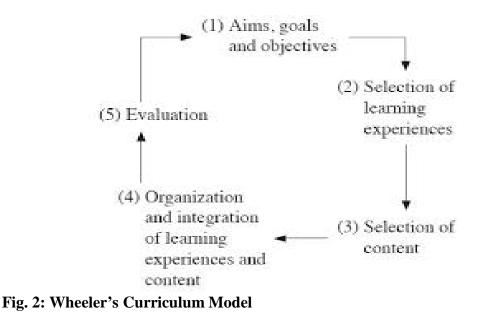
There are two functions of evaluation. First, the evaluation used to obtain data on the educational goals achievement by the students (called the summative function). Second, the evaluation used to measure the effectiveness of the learning process (called the formative function).

The process of assessment is critical to Tyler's Model and begins with the objectives of the educational program. There are two aspects that need to be concerned with evaluation, namely: the evaluation should assess whether there have been changes in student behaviour in accordance with the goals of education which have been formulated, and evaluation ideally use more than one assessment tool in a certain time.

Tyler's model has been criticized by scholars for presenting curriculum development process as rigidly sequential steps rather than interdependent steps. It also failed to clearly differentiate between content and learning experience. However, this study will adopt ideas from Tyler's curriculum model since one of its major thrust is to develop a retraining programme for EIWA.

Wheeler's Curriculum Model

D. K. Wheeler in 1976 developed a five-stage curriculum design in which each stage relates to each other in a cyclical form. Wheeler's model for curriculum design is an improvement upon Tyler's model. However, Wheeler's model is cyclical model instead of a linear model developed by Tyler. Evaluation in Wheeler's model does not terminate the curriculum planning process. Findings from the evaluation are fed back into the objectives and the goals, which influence other stages. Fig. 2 shows Wheeler's curriculum design.

Fig. 2: Wheeler's Curriculum Model

Wheeler contends that:

❖ Aims should be discussed as behaviours referring to the end product of learning which yields the ultimate goals. One can think of these ultimate goals as outcomes.

❖ Aims are formulated from the general to the specific in curriculum planning. This results in the formulation of objectives at both an enabling and a terminal level.

❖ Content is distinguished from the learning experiences which determine that content.

In the context of this study, content is used to refer to the knowledge and skills that the master craftsman is expected to impart into their trainee. According to Wheeler's Model, learning experiences determine the content. However, in this study, learning experiences are viewed as integral part of the content rather than a separate entity.

Wheeler's design, which is an improvement upon Tyler's model, is also appropriate for this study. It implies that the result of evaluation will help to refocus the aims and objectives as well as other stages. Thus, this model makes provision for curriculum revision with time.

Nicholls and Nicholls Model of Curriculum Development Theory

MODEL NICHOLLS

Situation analysis

Selection of objectives

Evaluation

Selection and organisation
of content

Selection and or
organisation of
methods

Fig. 3: Nicholls and Nicholls Model

Nicholls Audrey and Nicholls Howard in 1978 developed a five cyclical model of curriculum development. Nicholls and Nicholls model include situational analysis, content, methods, and evaluation. The learning experiences in Tyler's model are what Nicholls and Nicholls referred to as content and organization of learning experiences as method. This model is shown in Fig. 3.

Nicholls and Nicholls model is similar to Wheeler's Model in that it maintained Wheeler's position that curriculum development is a cyclical and continuous process. However, Nicholls and Nicholls Model recognized situational analysis as the first step in curriculum development process. Situational analysis involves facility requirement for the implementation of the curriculum. Thus, this model is relevant to this study since development and validation of psychomotor competency programme for retraining EIWAs require; identifying the objectives, determining the suitable content/learning experiences, organising the content/learning

experiences, clear description of minimum facilities needed for its implementation, instructional strategies and evaluating the selected content and learning experiences in terms of the objectives.

Theoretical Studies

Development and Validation of a Training Programme

Training refers to the act of inculcating certain skills, values, knowledge into someone. Training can occur in diverse forms. It can be structured or unstructured, formal or informal. For instance, a student in a school and an apprentice in a workshop are undergoing one form of training or the other.

A programme is a plan of how an event or activity will be carried out. It simply refers to an organised plan of activities aimed at achieving defined goals or objectives. A programme is also defined as an arrangement of knowledge, attitude, and manipulative skills to be imparted to a learner or group of learners (Rishipal, 2011). It can be regarded as manual or curriculum for training in a given occupational area. For instance, the curriculum of a subject such as Basic Technology is a programme.

Training programme therefore refers to a detailed plan of a training content. Training programme is a programme designed for training people to gain specific skills, knowledge, interest, values, attitude or certain traits. Training programme is designed to achieve the objectives and goals of the training. This implies that the essence of a training programme is to enable the trainer achieve certain specific objectives.

As earlier stated, a programme is a curriculum for training in a given occupational area. Hence programme development is also viewed as a curriculum development. Curriculum development is the process of planning learning content meant to change a learner in a certain way and the assessment of the extent to which these changes is achieved (Onyike, 1981). In the same vein, programme development is the process of organising learning exposures targeted to impart certain knowledge, attitude, interest, values and skills to a learner and the assessment of

the extent to which the knowledge, attitude, interest, values and skills are imparted to the learner. Development of a training programme therefore constitutes setting out the objectives, the learning experiences, content, content delivery strategies, facilities and evaluation component.

When a training programme is developed, it is vital to ascertain that the programme is capable of achieving the objectives for developing it. This process is called validation. According to Uzoagulu (2011), validation is the process of determining the extent an instrument measures what it is supposed to measure. Therefore, validation of a training programme involves ascertaining its consistency in measuring what it is supposed to measure. Hence the programme will be validated to check the extent to which it will be appropriate for retraining EIWA. This is the thrust of this study.

Components of Electrical Installation Work

Electrical Installation Work Trade is a complex vocational trade area with various areas of specialization. According to National Board for Technical Education, NBTE (2001), Electrical Installation Works consists of Domestic Installation, Industrial Installation, Cable Jointing, Winding of Electrical Machines, Battery Charging and Basic Electricity. NBTE categorized each of the components as a module. Undoubtedly, this is as a result of the bulkiness of the course when offered as a whole. In the same vein, personal visit to several technical colleges reveals that these components are offered separately and taught by different teachers. However, in the National Business and Technical Examination Board (NABTEB) examination, Basic Electricity is written as a separate subject whereas Domestic and Industrial Installation, Cable Jointing, Winding of Electrical Machines and Battery Charging are written as a subject called Electrical Installation and Maintenance Work.

In the informal sector, artisans in the electrical installation work trade usually specialize in one of these components. As a result, many of the artisans receive training in one out of the six components. Therefore, in practice, we have those who specialize in Domestic Installation and/or

Industrial Installation, Cable Jointing, Winding of Electrical Machines and Battery Charging. Each of these components of electrical installation work has distinct skills requirement.

Domestic Installation

The goals of Domestic Installation module are to provide the trainee with the knowledge and skill to enable trainees carry out complete electrical installation in a building and its associated equipment (NBTE, 2001). Skills required for practice may include understanding of electrical drawings, knowledge of different types of domestic surface and conduit wiring, electrical devices' protection and installation, understanding sequence for inspecting and testing domestic installation, and understanding of various types of lamps for illumination and uses.

Installation deals with an assemblage of electric equipment in a given location designed for co-ordinate operation, properly erected and wired (Nwokike, 2014). This may be in domestic or industrial premises. Domestic installation is the installation of electrical systems in residential buildings. These also include some other electrical installations that do not require industrial fittings such as wiring of shops, churches, schools.

Electrical systems are installed to serve a variety of purposes such as lighting, air conditioning and refrigeration, climate control security, communication, electronics controls for machines in business and industry. Electricians install, maintain and test electrical systems, equipment and appliances according to strict safety regulations. Their responsibilities according to Institute of Electrical and Electronics Engineering, IEEE in Nwokike (2014) include:

❖ Working from technical plans and drawing in the installation of lighting, sockets and switches and the maintenance of electrical appliances.

❖ Ensuring the safe use of electrical installations through periodic testing in accordance with healthy and safety regulations.

❖ Identifying faults and administering repairs to faulty electrical equipment to faulty electrical equipment.

According to Kavanaugh (1982), the following are lists of domestic installation skills required of electrical technician for self-reliance:

❖ Electrical Domestic Installation Skills working drawing skills

1. Identify symbols used in electrical engineering

2. Interpret the scale used in working diagrams.

3. Locate the position of the various accessories on a drawing.

4. Identify and list all the electrical accessories required for a job for thedrawing.

5. Interpret the distribution system from a drawing.

6. Drawing electrical installation diagram for a living house.

❖ Surface Wiring Skills

1. Identify and use various types of wiring clips, gim pins, raw/drills and raw plugs.

2. Identify types and sizes of cables and conductors used for lighting, heating, socket outlet and cooker circuits e.g. PVC armoured etc.

3. Use the plumb line, chalk line and spirit level.

4. Carry out simple surface wiring of building using the appropriate tools.

❖ Conduit Wiring Skills

1. Identify types of conduit e.g. steel conduct and flexible conduits.

2. Cut and thread conduit pipe using appropriate tools, e.g. dies, reamers and backsaw stock.

3. Use running couplers, conduct boxes bend, elbows, tees and accessories for conduit work.

4. Carry out simple surface and concealed conduit installation work observing relevant regulations.

5. Drawing in cables with fishing tape wire.

6. Inspect and test the installation as stipulated by the statutory regulations.

7. Maintain tools and equipment used on conduits.

❖ Installation of Protective Devices Skills

1. Identify and select common types of protective devise e.g. circuit breakers and their appropriate uses.

2. Determine current rating of fuses, fusing factors and fusing current rating.

3. Carryout earth installation and devices.

4. Use current and voltages operated earth leakages circuit breakers.

❖ Observing Statutory Regulations Inspection and Testing of Domestic Installation Skills

1. Visually inspect and detect mechanical and electrical loose connections.

2. Carry out polarity test using the appropriate instruments e.g. ball and battery or test lamp.

In a similar manner, Mbaylorgu (2003) classified the domestic installation skills into six categories which are thus;

❖ Thinking skills

General: Apply theories and principles for proper installations, troubleshooting, maintenance and repair of electrical components and systems.

Specific: Read the National Electric Code, Diagrams, tables, charts and graphs.

1. Read residential, commercial and industrial blue prints schematics and wiring diagrams.

2. Take measurements and conversions.

3. Measure and calculate electrical values.

4. Interpret readings on analog and digital meters, oscilloscopes, and other measuring device

5. Identify names and functions of residential, commercial and industrial wiring circuits and systems.

6. Explain operating characteristics and control of AC and DC machinery.

7. Identify tools and materials

8. Memorize safety procedures

9. Inspect and test electrical components and system

❖ Sensory/Observation Skills

General: Use sensory cues to conduct inspections and tests to determine root causes of failures and respond properly.

Specific: Take readings with analog and digital meters, oscilloscopes.

1. Distinguish and identify colours of wires, push buttons indicating lights and other objects.

2. Select appropriate materials, tools and equipment for installation, maintenance and repairs.

3. Detect and respond to warning indicators malfunctions.

❖ Motor Skills

General: Possessing sufficient physical strength flexibility, dexterity to safety and perform electrical work.

Specific: Operating necessary tools, equipment and machinery.

❖ Bahavioural Skills

General: Behaving appropriately and safety in cooperative learning environment. Specific: Fulfilling personal and shared responsibilities.

1. Working, cooperatively with partners and groups.

2. Exercising good judgement.

3. Following safety procedure

❖ Environment Tolerance Skill

General: Functional safety in an electrical shop environment. Sharp tools and material, electrical equipment, chemicals and toxins, heat, dust and fumes, machinery with moving parts, noise, variation in lighting, slippery surfaces.

Occupational Analysis in Domestic Installation

Occupational analysis is a rigorous analysis and specification of skills and sub-skills within a given occupation. This is very imperative for developing a training manual and training purposes. Related skills required for competence in a section of the occupation is referred to as cluster whereas the unit of activities in a cluster is called task. For instance, Metal work is an occupation or trade which has clusters such as welding, fabrication among others. In welding, there are tasks that must be carried out for one to say that welding has taken place. The tasks may include cutting, filing, hammering among others.

According to National Board for Technical Education (FRN, 2001), the clusters in domestic installation are thus: electrical working diagrams, domestic surface wiring, domestic conduit wiring, principles and installation of electrical protective devices, inspection and testing of domestic installations, and illumination. Also, National Training Agency (N.D) presented the following clusters for domestic electrical installation;

1. Principles of Occupational Health and Safety

2. Drawing and Interpreting Sketches and Simple Drawings

3. Preparing for Electrical Conduits/Wiring Installation

4. Installing Electrical Fittings/Fixtures

5. Installing the Final Sub-circuit

6. Installing Distribution Panels

7. Building Meter Circuits and preparing for final inspection

Based on these, the clusters for domestic installation in this study are modified thus: domestic installation safety, working drawing, preparation for surface/conduit installations, surface wiring installation, installation of conduit wiring, installation of final sub-circuits/protective devices, and inspection and testing of domestic installations.

Training of Electrical Installation Works Artisans

Artisans in electrical installation works are trained via many channels. These channels are either formal or informal. In the formal setting, artisans are trained in schools such as technical colleges, colleges of education (technical) and training schools established by several companies (UNESCO, 2015). In the formal setting, training of EIWA is usually organized and based on curriculum which usually embodies theory and practice. The informal EIWA training is administered via apprenticeship system (Tsoho, 2013).

Apprenticeship system of training is defined as a system of training where an individual called the learner is attached to a master craftsman for the purpose of learning the skills in the trade. According to Microsoft (2009), apprenticeship is a system of learning the skills of a craft or trade from experts in the field by working with them for a set period of time. Adekola (2013) also saw apprenticeship as the process of learning/skill acquisition through enlistment with a master craftsman. In other words, it is a method of developing craftsman.

According to UNESCO (2015), three types of apprenticeship exist which include traditional, formal and informal apprenticeship. Traditional apprenticeship relies on informal, oral agreements and is bound to strong traditional rules and kinship, particularly in rural areas. This type of apprenticeship does not include school-based training. Apprenticeship occupations in traditional apprenticeship are sometimes subject to a strict gender division. Informal apprenticeship is also based on informal agreements and takes place in informal workshops or companies. Sometimes, the businesses are organized into guilds that act in the interest of their members. In other cases (particularly in the low-income segments of the informal economy) master-craftsmen might lack quality skills training themselves and only pass on a limited quality and scope of skills to their apprentices. For many youth, this is the only way to get some skills training, particularly for youth from low-income groups. Usually, this form of apprenticeship is not complemented by school-based training. Formal apprenticeship (which may be company-based or school-based) is regulated by law but takes place only in companies and schools.

The apprenticeship system was used extensively by the craft guilds in the middle ages. It continued to be important in learning a trade until the industrial revolution in the 18th century, after which it was largely replaced by the factory system. Revived in the 20th century, apprenticeship is used in the United States by industries that require highly skilled workers. The terms of modern apprenticeships are specified in a contract and are regulated by trade unions and laws. The National Apprenticeship Act passed in 1937 led to the establishment of the Bureau of Apprenticeship and Training in the U.S. Department of Labour, which works with employers, labour groups, and schools to promote apprenticeship programs (Microsoft, 2009).

Historically, Britain has long outstanding track record practices of apprenticeships. According to Richard (2011), apprenticeships in Britain started back in the middle ages and were closely related to the mediaeval craft guilds. In 1563 the Statute of Artificers created a more regulated and prescribed system by setting out more precise conditions and terms. These included the duration of the apprenticeship and very importantly the relationship between the master and apprentice. Also it limited the master to a maximum of three apprentices. Surprisingly, apprenticeships were not necessarily voluntary and in some cases there were instances of compulsion. Basically apprenticeships evolved by way of a contractual agreement between the master and apprentice initially in a few trades. The regulation was through indentures that were legally binding documents. Indentures were written and agreed, binding the servant and master and in which the master took responsibility for the apprentice's training and welfare and provided him with accommodation. Also there were conditions about how the apprentice should behave outside his workplace and these conditions were stated explicitly in the indenture. Note at this time all apprentices were male.

Apprenticeships lasted for two to seven years depending on the particular trade after which the apprentice became a journeyman. The term is derived from the French word for "day" that is 'journee' and basically meant that the journeyman would be paid by the day for his work. After a period of extensive experience the journeyman could submit a piece of his best work to the

appropriate guild for assessment and approval. If this 'master piece' was accepted he could become a master craftsman and set up his own workshop and train apprentices.

The following two centuries recorded a significant expansion in apprenticeships accompanied by gradually improved legislation on working conditions including those in the workplace environment. However, there was an eventual decline in the general popularity of apprenticeships due to the exploitation of young apprentices and the awful conditions in many factories. In 1802 the Health and Morals of Apprentices Act laid down additional conditions including a 12- hour working day and a requirement that a factory apprentice should be taught arithmetic, reading and writing. In 1814 following the 1802 Act, the 1563 Statute was dissolved. As a result, practicing an un-apprenticed trade was legal and the requirement for a minimum of seven year apprenticeships was also removed. Apprenticeships remained relatively popular with many occupations that involved practical skills such as building, shipbuilding, woodworking, electrical work, among others. Towards the end of the 19th century, approximately 340,000 apprentices were churned out annually.

Participation in apprenticeships reached its zenith in the years following 1945 and reflected a strong relationship between the community, employers and the apprentice. The apprenticeships were at this time still subjected to a time served contract and were in the main determined, to varying degrees by the trade unions, employers, and a number of guilds and employers' associations. Interestingly, the State played little role either by support or intervention.

The mid-1960s witnessed around 33% of male school leavers aged 15-17 entering some form of apprenticeship programme. However after the 1960s the numbers engaged in apprenticeships declined significantly across most occupational areas as various industries themselves declined. Surveys showed that the number of apprenticeships in employment decreased from 370,000 in 1979 to 180,000 in 1995. Although there were approximately 171,000 apprentices in 1968 they had declined to approximately 34,500 in 1990. A few sectors continued

to recruit apprentices including catering, construction and engineering but the numbers were much reduced compared to previous decades.

In the 1960s the effectiveness of the existing model for apprenticeships was questioned. It was criticized for;

- ❖ Not keeping pace with the ever accelerating pace of industrial, technological and scientific advances of the time.

- ❖ Focusing on serving duration rather than outcomes

- ❖ Neglecting issue of standards because of the time served approach.

- ❖ Excluding women from training in many industries as data shows that the programme participants were exclusively male.

After 1960, a large number of initiatives were introduced to address some of the weaknesses in the apprenticeship model. These included the creation of the Industrial Training Boards (ITBs), the Certificate of Pre-Vocational Education (CPVE) and numerous MSC initiatives including Youth Training (YT) and the Technical and Education Initiative (TVEI). These and other schemes ultimately failed to create a well-qualified and up-to-date workforce. The majority of these initiatives catered for the young unemployed who would have been eligible for the old style apprentice unfortunately much of the new provision was of poor quality and further contributed to the already low standing and esteem of technical and vocational training. These initiatives were more about social engineering, cheap labour and massaging/fixing the unemployment statistics for political advantage.

From the mid-1990s successive governments paid some attention to apprenticeships and attempted to reconfigure the programmes by prescribing more precisely the delivery, funding and inspection systems. The level of support from the state for the traditional model in the middle ages of master and apprentice relationship varied from levy-funded programmes of the Industrial Training Boards in the 1960s/70s to non-existent support or state intervention in the early 1990s. Since the early 1990s successive governments have introduced a number of reforms with a

multitude of titles and operating rationales. For instance, Modern Apprenticeships (MAs) were introduced in 1994 for 16 to 24 year olds in 14 industrial sectors and then later expanded to cover 80 different occupational areas. Following these numerous reviews and reforms and increased investment, numbers doubled from 1997 to 2009 from approximately 75,000 to around 180,000 and at present more ambitious targets have been set to further increase participation in the programmes. Completion rates too have improved e.g. In 2001 only 24% finished the full programme whilst in 2009 63% completed – although questions still remain about the quality of the programmes.

If properly managed and supported by government and employers apprenticeships could provide a valuable set of opportunities during the current recession and produce a more qualified workforce for the future beginning to address the continuing low skill equilibrium in the country. It is essential that employers play the leading role in their development, implementation and monitoring and that the programmes are viewed and promoted as possessing an equal value to other education and training programmes e.g. GCSEs, GCE 'A 'Levels, other NVQS i.e. they are fully recognised as having parity of esteem with all other awards/qualifications.

Apprenticeships do have a major role to play in education and training because in spite of the catalogue of concerns cited above the apprenticeship model/framework has always possessed a number of positive and distinct characteristics that add value to the technical and vocational education and training experience.

Informal Apprenticeship System of Training EIWAs in Nigeria

In the Nigerian context, apprenticeship system of training artisans is common. The principal form of education for going into any occupation or profession, before the colonial administration, was through the apprenticeship system. According to Adekola (2013), the process of apprenticeship system in the traditional society started with the child choosing a career of his/her choice under the watch of the parent. When this is done, the child would then be bonded

with a master craftsman of the parent's choice. Such craftsman has the choice to accept or reject such potential apprentice. On the acceptance of the apprentice, the terms of agreement will be sealed by the parent and the master craftsman. This oral agreement usually cover issues like duration of apprenticeship, residence of the child during the period of apprenticeship (whether the parent's house or master's house), feeding and other welfare schemes.

In such apprenticeship system, there is usually no established curriculum or formal procedure for the acquisition of skill (Omole, 1999). The apprentice only learns through observation, imitation and trial and error method. The apprentice learns on the job by direct instruction and could be punished for making silly mistakes. It was the vehicle for instruction in healing, law, carving, rituals and so on. It was a loosely organized system where the master craftsman is at liberty to run his programme as he desires, even where such liberty is at a disadvantage to the learner. Fafunwa (2004) observed that this apprenticeship system does not encourage questioning or offer of suggestion by the apprentice. The master craftsman teaches and establishes his authority on learning and the learner in an autocratic manner. Also there are no standard regulations guiding the process, except what the master craftsman sets.

Tsoho (2013) noted that EIW trade is a skill-based trade that requires doing. Therefore, an apprentice is said to have learnt a skill only when the apprentice can actually perform the required tasks. This implies that merely completing the duration of training does not entail that the apprentice is proficient. For instance, an EIWA is said to have acquired the skill of installing a ceiling fan if he is able to do.

There is no measure in place to certify the proficiency of the apprentice order than the verbal attestation of the master craftsman. This implies that the competency of the apprentice is determined by the competency of the master craftsman, the depth of exposure of the apprentice to the rudiments of the craft and how much of the skills the apprentice was able to grasp within the period of training. Upon the completion of training, the apprentice is free to establish a workshop and accept other apprentice for training.

In spite of the shortfalls, this model of apprenticeship thrived and contributed immensely to the economic growth since apprentices were self-employed upon graduation. This was recognised by the Federal Government of Nigeria as means of curbing unemployment. This led to the establishment of National Directorate of Employment (NDE) in 1987 (Shita, 2000). The National Directorate of Employment was set up by the government with the aim of assisting youths to acquire marketable skills with a view to ensuring that they become self-employed. One of the basic schemes lunched by NDE is National Open Apprenticeship Scheme (NOAS) which was targeted to providing unemployed youths with basic skills that are needed in the economy. NDE, in a bid to achieve this aim attaches registered youths as apprentices to companies, ministries and professional craftsmen and women with adequate training facilities. The duration of training usually lasted from 3 months to 3 years depending on the trade area and educational level of the participant. Although NDE helped, to a great extent in sponsoring a great number of Nigerians to acquire skills through apprenticeship, the aim of the NOAS was not fully actualized (Usiwoma & Mgbor, 2005).

Subsequent government administrations intervened in one way or the other to maximize the potentials of informal sector apprenticeship system yet much has not been achieved. For instance, there was an attempt to conduct accreditation of the informal sector artisans by the National Board for Technical Education but it remained a mirage. In the same vein, President Muhammed Buhari, in a meeting with the Board of Directors of Julius Berger, inquired why foreign construction companies operating in Nigeria still source for artisans from abroad (Reviving Vocational Training Centres in Nigeria, 2017). The response of the directors of the company revealed that companies source for artisans from abroad because Nigeria lacked competent artisans. As a result, the current training of artisans in some trade areas such as building construction and automobile under the Federal Government Npower scheme was born. The question still unanswered is "how organised is the training in terms of instruction and facilities in view of the demand of the global trends?"

In developed countries such as USA, Japan, Germany, Austria where non-formal apprenticeship is employed in the training of artisans, such training is based on a standard programme and well-articulated policies. For instance, Udu (2015) observed that Austria has a strictly regulated and organised apprenticeship system. He equally noted that an individual becomes an apprentice in Austria only after completing a compulsory education perhaps at the age of 15 years. The apprenticeship training takes between 2-4 years to be completed. Upon successful completion an apprentice is issued with Apprenticeship Leave Certificate which qualifies him for two different vocational careers.

Also in Ghana, just as it is in Nigeria, apprenticeship in various trades such as electrical installation work is undertaken primarily by those with junior high school or lower levels of education (Monk et al in Udu, 2015). However, Palmer (2009) observed that Ghana has a highly developed apprenticeship system where young men and women undertake sector- specific private training in skills that are generally utilized in the informal sector. Presently, non-formal apprenticeships training accounts for 80-90% of all skills training in Ghana, compared with 5-10% from public training institutes, and 10-15% from NGOs.

The development of indigenous craft practice and apprenticeship in these countries is traceable to a robust training programme and valuable policies (Walther, 2007). Conversely, Adekola (2013) recognised that, among other factors militating against the informal sector apprenticeship, lack of standardized curriculum of instruction based on job types is key. He also stated that for the Nigerian apprenticeship system to be suitable for contemporary usage there is the need to strengthen the weak structural guidelines of the system. In this light, Udu (2015) lamented the unorganized and unregulated apprenticeship system practiced in Nigeria over the years. Hence the thrust of this study is to develop and validate a psychomotor competency-based training programme for electrical installation works artisans.

Psychomotor Competency-based Retraining Programme

Psychomotor domain is one of the three domains of educational objectives as classified by Bloom and his associates. According to Bloom et al (1956), psychomotor domain is the part of educational objectives that involves motor skill skills and manual dexterity. Ebenebe and Unachukwu (1995) while giving examples of objectives classified as psychomotor domain, noted that this domain of knowledge involve physical skills such as painting, typing, handwriting among others. This goes to say that psychomotor domain is concerned with practical skills.

Several authors have reviewed the psychomotor objectives and developed ways of classifying psychomotor objectives based on complexity or degree of difficulty. For instance, Dave in Huitt (2003), based on Bloom's classification of domains of educational objectives, developed five levels of psychomotor objectives. Dave's psychomotor domain is the simplest domain and easiest to apply. Dave's five levels of motor skills represent different degrees of competence in performing a skill. It captures the levels of competence in the stages of learning from initial exposure to final mastery. Imitation is the simplest level while naturalization is the most complex level. Dave's classification of the psychomotor domain has the following levels from the simplest to the most complex competence in performing a skill:

1. **Imitation:** At this level, one has the ability to observe and pattern one's behaviour after someone else. At this level, you simply copy someone else or replicate someone's actions following observations. For instance, observe a skill and attempt to repeat it, or observe a dancer and mimic the dancing steps so as to dance like him. In developing objectives at this levels, verbs such as attempt, copy, duplicate, imitate, mimic, align, place, balance, repeat, follow, grasp, are used.

2. **Manipulation**: At this level of competence, performance of an action with written or verbal directions but without a visual model or direct observation is achieved. The action may be performed crudely or without neuromuscular coordination at this stage. Verbs such as attempt, copy, duplicate, imitate, mimic, align, place, balance, repeat, follow,

grasp are used in developing objectives at this level. Note that the action verbs are the same as those for the imitation stage. The difference is that these actions are performed with the aid of written and verbal instruction, not visual demonstration.

3. **Precision**: The ability to perform certain actions with some level of expertise and without help or intervention from others. At this level, you are able to perform a skill with a high degree of precision and accuracy, and with few errors. Verbs that are used to describe learning outcomes at the precision level include perform proficiently, masterfully carry out, accurately measure, among others.

4. **Articulation**: The ability to adapt and integrate multiple actions to develop methods to meet varying and novel requirements. At this level, one's skills are so well developed that one can modify movement to fit special requirements or to meet a problem situation. For example, if a student driver who is taught with a car that has manual gear selection and afterward given a car with automatic gear selection to drive, this level of outcome is expected. Some verbs that are used to describe this level are adapt, alter, customize, originate.

5. **Naturalization**: The ability to perform actions in an automatic, intuitive, or unconscious way. At this level, performance of a skill is automatic with little physical or mental exertion. Performance of a given skill has become second-nature or natural, without needing to think much about it. An example is an expert driver who is driving a car. Naturally, perfectly, spontaneously, with ease, with poise are some verbs that describe the learning objectives at this level.

Elizabeth Simpson on her part described psychomotor objectives as one that progresses from preparedness, imitation, proficiency, automaticity, adaptation. According to Simpson (1972), the psychomotor domain includes physical movement, coordination, and use of the motor skill areas. Development of these skills requires practice and is measured in terms of speed, precision, distance, procedures or techniques in execution. Thus, psychomotor skills range from

manual tasks such as washing a car to more complex tasks such as operating complex machinery or wiring a duplex. Simpson classified the psychomotor objectives into seven major categories, namely; perception, set, guided response, mechanism, complex overt response, adaptation and origination. The categories are elucidated in Table 1.

Table 1: Simpson's Taxonomy of Psychomotor Objectives

Category and Definition	Illustrative verbs	Examples
Perception (awareness): The ability to use sensory cues to guide motor activity. This ranges from sensory stimulation, through cue selection, to translation.	chooses, describes, detects, differentiates, distinguishes, identifies, isolates, relates, selects, separates	Listening to the sounds made by guitar strings before tuning them. Recognizing sounds that indicate malfunctioning equipment. Estimates where a ball will land after it is thrown and then moving to the correct location. Adjusts heat of stove to correct temperature by smell and taste of food.
Set: Readiness to act. It includes mental, physical, and emotional sets. These three sets are dispositions that predetermine a person's response to different situations (sometimes called mindsets).	begins, displays, explains, moves, proceeds, reacts, responds, snows, starts, volunteers	Knowing how to use a computer mouse. Having instrument ready to play and watching conductor at start of a musical performance. Showing eagerness to assemble electronic components to complete a task. Knows and acts upon a sequence of steps in a manufacturing process. Recognize one's abilities and limitations.
Guided response: The early stages in learning a complex skill that includes imitation and trial and error. Adequacy of performance is achieved by practicing.	assembles, builds, calibrates, constructs, dismantles, displays, dissects, fastens, fixes, grinds, heats, manipulates, measures, mends, mixes, organizes, sketches	Using a torque wrench just after observing an expert demonstrate its use. Experimenting with various ways to measure a given volume of a volatile chemical. Performs a mathematical equation as demonstrated. Follows instructions to build a model.
Mechanism (basic proficiency): This is the intermediate stage in learning a complex skill. Learned responses have become	assembles, builds, calibrates, constructs, dismantles, displays, dissects, fastens, fixes,	Demonstrating the ability to correctly execute a 60 degree banked turn in an aircraft 70 percent of the time. Use a personal computer.

habitual and the movements can be performed with some confidence and proficiency.	grinds, heats, manipulates, measures, mends, mixes, organizes, sketches	Repair a leaking faucet.
Complex or overt response (expert): The skillful performance of motor acts that involve complex movement patterns. Proficiency is indicated by a quick, accurate, and highly coordinated performance, requiring a minimum of energy. This category includes performing without hesitation, and automatic performance. For example, players often utter sounds of satisfaction or expletives as soon as they hit a tennis ball or throw a football, because they can tell by the feel of the act what the result will produce.	assembles, builds, calibrates, constructs, dismantles, displays, dissects, fastens, fixes, grinds, heats, manipulates, measures, mends, mixes, organizes, sketches	Dismantling and re-assembling various components of an automobile quickly with no errors. Maneuvers a car into a tight parallel parking spot. Operates a computer quickly and accurately. Displays competence while playing the piano.
Adaptation: Skills are well developed and the individual can modify movement patterns to fit special requirements.	adapts, alters, changes, rearranges, reorganizes, revises, varies	Using skills developed learning how to operate an electric typewriter to operate a word processor. Responds effectively to unexpected experiences. Modifies instruction to meet the needs of the learners. Perform a task with a machine that it was not originally intended to do.
Origination: Creating new movement patterns to fit a particular situation or specific problem. Learning outcomes emphasize creativity based upon highly developed skills	arranges, combines, composes, constructs, creates, designs, originates	Designing a more efficient way to perform an assembly line task. Constructs a new theory. Develops a new and comprehensive training program. Creates a new gymnastic routine.

The levels of psychomotor objectives as developed by Dave and Simpson are referred to as psychomotor competencies. This goes to say that the levels of psychomotor domain described represent levels of psychomotor competency. Hence psychomotor competency-based training such as training in electrical installation work artisanship emphasizes mastery of the competencies

– skills, abilities and knowledge of the trade. Simply put, psychomotor competency training is all about what you know and are able to do.

Competency-based vocational education requires the teaching of knowledge, skills and attitudes (competencies) in a vocational programme to enable trainees to perform successfully in the related job or occupation (Anthony, 1991). This usually involves a series of learning experiences that include background information, practice and performance of the required skills in an actual or simulated work setting. According to Home in Anthony (1991), the basic characteristics of competency-based vocational education are as follows:

i.   Role-relevant competencies that include standards are identified and stated.

ii. Competencies are specified to students prior to instruction.

iii. Criterion-referenced measures are used to measure the achievement of competencies.

iv. A system exists for documenting the competencies achieved by each student.

According to Ayonmike, Okwelle and Okeke (2014), competency-based training is an approach to teaching and learning more often used in learning concrete skills than abstract learning. Kaaya (2012) also defined competency-based training programme as a programme of study with clearly defined, concrete and measurable objectives of which every student participating in the program must have demonstrated mastery upon program completion. Most times, such programmes involves the learners working at their own pace to meet up with the objectives. On his part, Anane (2013) described competency training programme as an industry and demand driven (outcomes-based) training programme based on well-defined industry generated standards (occupational standards). Anane further posited that these industry standards are the basis upon which the programme (curriculum), assessment and learning materials are designed and developed. Similarly, according to Deißinger and Hellwig as cited by Ayonmike et al (2014), competency-based training programme involves the specification of knowledge and

skill and the application of that knowledge and skill to the standard of performance expected in the workplace.

From the foregoing, competency-based training is viewed as a training that is meant to equip individuals with specific skills (competencies) in a given trade. A competency-based programme has the following characteristics:

1. Well defined objectives.

2. Contents and learning experiences

3. Instructional strategies.

4. Facilities required for the programme

5. Evaluation strategies.

This is also in line with the Tyler, Wheeler, and Nicholls and Nicholls model of curriculum development. Thus, it's vital to discuss these characteristics of competency-based programme alongside the stages in curriculum development process in relation to psychomotor competency-based programme for retraining EIWAs which this study is meant to develop.

Objectives of the Psychomotor Competency-based Programme

Every instruction or teaching has expected outcomes. These expected outcomes are those things the instructor wants the learner to learn upon completion of the instruction. Each instructional unit usually have peculiar expected learning outcomes. Such expected learning outcomes are referred to as objectives of the instruction. Conventionally, objectives of instruction are pronounced in formal apprenticeship and school-based training of artisans while it is not in the informal setting. However, a master apprentice may have a mental picture of what he wants to achieve after staying with an apprentice for a given period of time.

Objectives in the school setting are stated in specific terms for each unit of instruction and in broad terms for a course or programme. They are usually stated in terms of the students and in the three domains of knowledge (affective, psychomotor and cognitive). The objectives in the psychomotor domain involve the skills expected of the learner to possess at the end of the instruction. This is stated in clear measurable terms. According to Abd-Eld-Aziz (2013), objectives provide directions in learning and give the specific aims of education. He further stated that the more sophisticated and complex the statements of objectives are, the harder the task of organizing the materials to be taught. If the outcomes or the behavioural changes that are expected from the learners are stated in a very specific manner then structuring the content in terms of the objectives will be easier.

From the foregoing, objectives of an instruction may be thought of as a guide to instructional content. This is in line with Tyler, Wheel and Nicholl and Nicholl's models of curriculum development. Instructional objectives also form the basis of evaluation. It can be stated in broad and specific terms. However, Hartel and Foegeding (2004) defined objectives as a very general statement about the larger goals of the course or program. They also defined competency as general statement detailing the desired knowledge and skills of student graduating from a course or program and outcome as specific statement that describes exactly what a student will be able to do in some measurable way.

According to National Board for Technical Education (NBTE) curriculum and course specification for National Technical Certificate (NTC) and Advanced National Technical Certificate (ANTC) Nigeria UNESCO project, behavioural objectives are educational objectives, which identify precisely the type of behaviour a student should exhibit at the end of a course/module or programme (Federal Republic of Nigeria, 2001). It observed two types of objectives of Electrical Installation and Maintenance Work (EIAMW), namely; general objectives and specific learning outcomes. General objectives are concise but general statements of the

behaviour of the students on completion of a unit of week such as understanding the principles and application in orthographic projection in engineering/technical drawing. Also, specific learning outcomes was used to mean concise statements of the specific behavior expressed in units of discrete practical tasks and related knowledge the students should demonstrate as a result of the educational process to ascertain that the general objectives of course/programme have been achieved. Specific learning outcomes are more discrete and quantitative expressions of the scope of the tasks contained in a teaching unit.

According to Bannister (2002), learning objectives help in selecting content, developing instructional strategies, developing and selecting instructional materials, creating assessment tests and evaluating students learning outcomes. Also, Tyler (1971) opined that curriculum objective is the basis for selecting instructional material, instructional content, developing instructional procedures, creating test items and final evaluation. The question that comes to mind is "what is involved in selection of objectives that achieve these goals?"

Tyler (1949) in developing his curriculum model proposed that educational objectives originate from three sources: studies of society, studies of learners, and subject-matter specialists. These data systematically collected and analysed form the basis of initial objectives to be tested for their attainability and their efforts in real curriculum situations. In agreement to this, Offorma (1994) opined that in selecting curriculum objectives, the learner, the society and the subject matter specialists should be considered. Offorma further stated that these three considerations should be scrutinized to ensure their alignment with the philosophy of the society and development needs of the learner.

These considerations guided the selection of the objectives of psychomotor competency-based retraining programme for EIWAs. Also, for the purpose of this study and in accordance with the curriculum models adopted for this study, objectives will be viewed in both general and specific terms. The general objectives refer to the statement of the psychomotor skills which an

apprentice is expected to possess upon completion of a module. In the same vein, specific objectives refer to the measurable psychomotor skills an apprentice is expected to possess upon completion of a unit of a module. The modules here are as defined in the scope of the study.

Contents of the Psychomotor Competency-based Programme

Curriculum content simply means the totality of what is to be taught. The content component of teaching and learning situation refers to the important facts, principles and concepts to be taught (Val, 2016).On her own part, Alvior (2015) defined curriculum content as subject matter to be taught. These contents must be in line with the learning experiences and must have clearly stated objectives to be achieved at the end of each unit of instruction. It can be in form of knowledge, skills, attitude and values that learners are exposed to.This means that content has cognitive, psychomotor and affective component. The cognitive content deals with knowledge, the psychomotor content deals with skills while the affective content deals with the attitude. In agreement to this, Olaitan and Ali (1997) defined content in curriculum development process as the knowledge, skills, attitudes and values which the learner in a program is meant to learn.

Learning experience refers to any interaction course, programme or other experience in which learning takes place. Such interaction, programme or experience can occur in traditional academic setting such as schools classrooms or non-traditional academic setting such as workshops. According to Tyler (1949), learning experiences are the interactions between the learner and the external conditions in the environment to which he can react. It is an activity which may be planned by the class or teacher but performed by the learner for the purpose of achieving some important learning objectives. Tyler argues that the term "learning experience" is not the same as the content with a course which deals with activities performed by the teacher. Learning takes place through the active behaviour of the student; it is what he does that he learns not what the teacher does. So, the learning experience of students refers to activities in the learning process.

Lieberman and Darling-Hammond (2011) defined educational objectives as the road map, content as the 'what" and learning experiences as the "how" of a curriculum. Wheeler (1976) also opined learning experiences stemmed from content. This entails that content and learning experiences are interrelated. It can be deduced that while content is what the teacher or instructor want the learner to learn and teacher-centered, learning experiences is the means or how the learner will learn the content. Learning experience is learner-centered. The teacher or instructor must expose the learners to learning experiences that is within the content to be taught which will ensure the achievement of the objectives. Thus selection of content precede selection of the learning experiences.

How to Select Curriculum Content

The content of a curriculum is not selected haphazardly. According to Alvior (2015) and Val (2016), the following criteria should guide the selection of curriculum content or subject matter;

1. **Validity:** Validity refers to the authenticity of the subject matter or content you selected. The content must not be obsolete. For instance, including typewriting as a skill to be learned by college students is going backward. It should be about the computer or Information Technology (IT).Thus, there is a need to check regularly the subject matter or contents of the curriculum, and replace it if necessary. Do not wait for another 5 years to change it.

2. **Self-sufficiency:** This criterion means that students should be given a chance to experiment, observe, and do field study. This system allows them to learn independently. It helps learners attain maximum self-sufficiency at the most economical manner or content selection. This is done when the students or learners are given the chance to experiment, observe and carryout field study.

3. **Significance:** The subject matter or content is significant if it is selected and organized for the development of learning activities, skills, processes, and attitude. It also develops the three domains of learning namely the cognitive, affective and psychomotor skills and considers the cultural aspects of the learners. Particularly, if your students come from different cultural backgrounds and races, the subject matter must be culture-sensitive.

4. **Interest:** Students learn best if the subject matter is meaningful to them. It becomes meaningful if they are interested in it.

5. **Learnability:** The content should be what the students can learn and should be within their experience.

6. **Utility:** This is the usefulness of the content in solving problems now and in future. It is more important in skill or procedural knowledge, whereby learners can put what they have learnt into practice life activities

7. **Feasibility**: The subject matter to be selected is one that can be fully implemented considering the real situation of the school, the government, and the society as well as the economy. Students must learn within the allowable time and the use of resources available.

The content of a course or programme may be enumerated topics to be studied or competencies to be acquired upon completion of the course or programme. According to Okoro in Onwuchekwa (2016), development of content for training programme in a given trade area involves nine major steps. These steps are;

1. **Write course description:** this involves identifying the goals and purpose of the programme, which the programme is intended for and the skills to be possessed by the trainees upon completion of the programme.

2. **Literature review:** this requires consulting already existing materials such as journals, textbooks, training manuals among others to be abreast with the trends in that trade area.

3. **Carryout task analysis:** task analysis means breaking down skills in the trade area into smaller tasks. It may involve making initial task list of all tasks in the trade area, turn the initial task lists into a questionnaire instrument and validate it, and piloting the validated task list.

4. **Identify programme objectives:** This requires stating both general and specific objectives for each topic, task or competency.

5. **Allocate time:** This involves stating the duration it will take trainees to complete the training using the programme.

6. **Prepare list of references:** This implies referencing or listing materials which will be of help to the instructors and trainees in the training process. The materials may be textbooks, journals other manuals among others.

7. **Prepare tools, equipment and material list:** this entails listing all the tools, equipment and materials required for effective instruction using the programme.

8. **Submit the programme content to advisory committee:** at this stage, the assumption is that all the components of the programme have been prepared. Thus it is submitted for ratification by the advisory committee. This committee must involve experts in the trade area.

9. **Produce the final programme content:** this is done after taking into account the constructive criticism of the advisory committee.

Okoro noted that the programme content generated following the steps above is a clear description of a competency curriculum model and hence can be employed in the development of contents in vocational trade areas. Therefore, these guidelines developed by Okoro will be modified and employed in the development of psychomotor Competency-based programme for retraining EIWAs.

How to Select Learning Experiences

Val (2016) stated that the conditions for selecting learning experiences by the experts must be based on the modern principles of learning. Val listed the criteria to include:

1. **Validity:** Learning experience is valid when its related objectives are in any of the three domains; cognitive, affective and psychomotor. Learning experience should be holistic to involve all the domains.

2. **Variety:** Learners differ and so learn in different ways based on their interest and ability. Therefore varied learning experience must be provided to aid comprehension.

3. **Interest:** In order to achieve the desired objectives, learning experiences should be of great interest to the learner.

4. **Relevance to Life:** Learning experience must be relevant to real-life situations in school and in the society. This will help learners understand their society and proffer solutions to some problems of the society. Experience in real context and situation bring reality to teaching and learning.

5. **Suitability:** Learning experience must not be too simple nor complex but rather suitable for the age or level of the learners and the content for which it is meant.

6. **Comprehensiveness:** Learning experience must cover all the stated objectives in a lesson. It should progress from the simplest learning experiences to the most complex.

7. **Provision for multiple learning:** This means that learning experiences should provide learning opportunities that will enable a learner to learn one thing in different ways. It is also necessary to plan for learning experiences that will provide for the three domains as strategy for multiple learning.

Organisation of Content and Learning Experiences

Learning experiences as well as the content must be organized, sequenced and cumulative to provide the required effect on the learner. When selection of content and learning experiences is done, they must be organized. Organisation of content and learning experiences must take into consideration continuity, sequence and integration as contained in Tyler's model of curriculum development earlier discussed.

From the foregoing, it can be deduced that both content and learning experiences can be grouped in the three domains of educational objectives. However, this study is concerned with the psychomotor part of the content and learning experience. Also, learning experience and content were not differentiated in this study because learning experiences are provided based on the trainee, learning environment and the instructor.

Instructional Strategies for the Psychomotor Competency-based Programme

The Organisation for Economic Co-operation and Development (OECD, 2016) stated that instruction or teaching (whether formal or informal) is a complex activity that usually involves a wide variety of behaviors, attitudes and practices. Conventionally, teaching and learning involves the teacher, learner and what is to be learnt. There must be an interaction between the teacher, the learner and what is to be learnt or the learner and what is to be learnt, for learning to take place. This interaction is what is referred to as teaching and learning strategies. Learning can take place by the interaction of the learner and the content to be learnt as in the case of individualized instruction. Similarly, learning can be initiated and controlled by the teacher. In the case of the later, the teacher interacts with the learner for the purpose of inculcating into the learner certain values, attitudes, knowledge and/or skills. The teacher can achieve this via several means. The means are called teaching or instructional strategies.

Kassem in Shinn (1997) defined teaching strategies as teacher's activities in the class to involve students in the subject matter, and requires that students participate in learning activities, share equally with other learners, and react to the learning experience. Teaching strategies refer to the structure, system, methods, techniques, procedures and processes that a teacher uses during instruction or teaching to achieve set objectives. These are strategies the teacher employs to assist student learning. In the view of Dorgu (2015), teaching strategy is any teaching manoeuvre that can be used to facilitate students learning and satisfaction. Dorgu noted that teaching strategies are many and varied and could be used in different ways. According to Sally, Carole and Sarah (2011), teaching strategies are the tools that teachers have at their disposal to engage learners and enable learning objectives to be met via effective teaching and learning and teaching skills are how they select and use these strategies. Some scholars have classified the numerous teaching methods in many ways.

Garrett (2008) observed that teaching strategies fall into two broad categories, namely; teacher-centred and student-centred or learner-centred. In teacher-cantered teaching strategies, students put all of their focus on the teacher. The teacher talks and the students exclusively listen. During activities, students work alone and collaboration is discouraged. Examples of teacher-centred teaching strategies are lecture method and direct instruction. On the other hand, in student-centred instruction, students and instructors share the focus. Instead of listening to the teacher exclusively, students and teachers interact equally. Group work is encouraged, and students learn to collaborate and communicate with one another.

An analysis of teachers' classroom practices has highlighted the existence of three underlying teaching strategies: these are referred to as active learning, cognitive activation and teacher-directed instruction (OECD, 2016).These instructional strategies were explained by OECD as follows:

❖ Active learning: this consists of promoting the engagement of students in their own learning. Under this strategy, students' discussions, group work, co-operation, reflection and the necessary support to foster these activities play a central role. Furthermore, the inclusion and use of information and communication technologies (ICT) in the classroom can help to foster an interactive and individual learning environment.

❖ Cognitive activation: Refers to the use of practices capable of challenging students in order to motivate them and stimulate higher-order skills, such as critical thinking, problem solving and decision making. This strategy not only encourages students to find creative and alternative ways to solve problems, but enables them to communicate their thinking processes and results with their peers and teachers.

❖ Teacher-directed instruction: Refers to teaching practices that rely, to a great extent, on a teacher's ability to deliver orderly and clear lessons. Making explicit the learning goals, providing a summary of previous lessons or asking short, fact-based questions are examples of practices that help to structure lessons.

Tiian and Hants (2011) on their part classified teaching strategies used in teaching engineering and related discipline into two: direct and indirect instruction. Tiian and Hants' explanation of these instructional strategies classification are thus:

❖ Direct instructional strategies: Direct instructional strategies are academically focused with the teacher clearly stating the goals for the lesson. The teacher monitors student understanding and provides feedback to students on their performance. Direct instruction has four key components:

1. Clear determination and articulation of goals;

2. Teacher-directed instructions

3. Careful monitoring of students´ outcomes

4. Consistent use of effective classroom organization and management methods.

Eggen and Kauchak in Tiian & Hant (2011) opined that direct instruction is effective because it is based on behaviorist learning principles (obtaining students´ attention, reinforcing correct responses, providing corrective feedback, and practicing correct responses), increasing the academic learning time during which students are attending to the task at a high success rate. The following main strategies of direct instructions may be used in teaching engineering and related courses:

1. Presentations – should be used when objectives other than knowledge are sought; the information is detailed, abstract or complex; learner involvement is important; higher cognitive learning is sought, or students are below average ability; presentations are more effective when using interactive breaks.

2. Demonstrations – involves a visual presentation to examine processes, information and ideas allowing students to observe real things and how they work.

3. Recitations – determine if students remember or understand previously covered content with the teacher clearly in control of directing the learning'

4. Practice and drills – going over the material just learned to consolidate, clarify and emphasize what has already been learned and repeating information on the topic until it is firmly established in students´ minds.

5. Guided practice and homework – teacher-directed strategy for the use of techniques through which students use and practice the knowledge and skills being addressed in the class, including seatwork, teacher-led practice, student cooperative practice and homework.

6. Review – an opportunity to look at the topic another time, not requiring drill techniques, being intended to reinforce the material learned.

❖ Indirect instructional strategies: Indirect instruction is an approach to teaching and learning in which concepts, patterns and abstractions are taught in the context of strategies that emphasize

concept earning, inquiry learning and problem-centered learning. Examples of some indirect instructional strategies used in teaching engineering and related courses are:

1. Concept attainment strategies – concepts serve as the building blocks for student higher-level thinking, being the main ideas used to help to categorize and differentiate information: comparisons, classifications, metaphors and analogies, using questions, drawing examples and non-examples in order to define the essential and nonessential attributes needed for making accurate generalizations.

2. Inquiry lessons – inquiry, discovery and problem solving approaches, being open-ended and creative way of seeking knowledge, consisting of following steps identify and clarity the problem, for hypotheses, collect data, brainstorm solutions, formulate questions, investigate, analyze and interpret the data to test hypotheses, discuss, reflect, draw conclusions, present results

3. Projects, reports, problems – project-based lessons flow in problem-solving environment where students work independently or cooperatively solving problems.

4. Discussions – students learn when they participate, thinking out loud about concepts. The use of full group discussions and small-group discussions improves student interactions.

5. Student's self-evaluation – engaging students in critical evaluation of their own responses and thereby taking responsibility for their own learning.

6. Cooperative learning – involving students to work together addressing specific instructional tasks, aiding and supporting each other.

7. Simulations – student-directed activity placing students in situations that model a real-life environment requiring, assuming roles, making decisions, facing consequences.

In discussing types of teaching methods, Vikoo in Dorgu (2015) explained that teaching methods could be presented under three main categories: cognitive development methods, affective

development methods and psychomotor development methods. These categories are explained thus:

- ❖ **Cognitive Development Methods:** Here, if the focus of the instructional objectives is to develop intellectual skills in learners, then the cognitive development methods of teaching are recommended. This method helps learners to comprehend, analyze, synthesize and evaluate information. It helps learners develop good cognitive abilities though the cognitive development methods are essentially didactic. Some of the teaching methods in this category includes: Discussion Method, Questioning/Socratic Method, Team Teaching Method, Talk Chalk/Recitation Method, Field Trip Method and Team Teaching Method

- ❖ **Affective Development Method:** This domain includes objectives which describe changes in interest, attitudes and values. It further deals with the development of appreciation and adequate adjustment. Education and training has a lot to give the learner in order to assist him/her develop in these areas, hence teachers are encouraged to include learning experiences that are worthwhile, teach in ways that arouse interest and develop proper attitude in learners. This mode of teaching are basically arouses the students' feelings or opinion. Some teaching methods under this category includes: Modeling Method, Simulation Method, Dramatic Method, Simulation Games and Role-Playing Method

- ❖ **Psychomotor Development Methods:** These are activity based methods of teaching that aim at motor skills development in learners. This method requires that learners are able to illustrate, demonstrate, or perform certain skills using their manual dexterity. It is a heuristic method of teaching that involves inquiry and discovery methods of teaching. It is a more student activity based method. This method includes: Inquiry/Discovery Method, Demonstration Method, Laboratory/Experimentation Method, Programmed Learning Method, Dalton Plan/Assignment Method, Project Method and Mastery Learning.

Since this study is concerned with development of psychomotor retraining programme for EIWAs, some of the psychomotor teaching strategies according to Vikoo's categories are briefly explained thus.

1. Inquiry/Discovery Method**:** Inquiry learning is based on constructivist theories of learning, where knowledge is "constructed" from experience and process. It covers a range of approaches, including: field work, case studies, investigations, individual and group projects, and research projects. It is the hallmark strategy of science, and often social science, learning. Specific learning processes that students engage in during inquiry include: developing questions, seeking evidence to answer questions, explaining evidence, and justifying or laying out an argument for the evidence. Progress and outcomes are assessed through observing students' learning develop over time through conversations, notebook entries, student questions, procedural skills, use of evidence, and other techniques.

2. Demonstration Method: A demonstration involves showing, doing or telling the students the point of emphasis. It is mostly used as a technique within a method of teaching and times as a method of teaching itself. Here the role of the teacher is to illustrate how to do something or illustrate a principle first by explaining the nature of the act verbally, followed by demonstrating the act in a systematic manner and later the students repeats the act. Here students are involved in doing things that will influence their behaviour patterns. Through demonstrations, students are exposed to physical materials that will illustrate some meaning to their cognitive framework. Direct experiences like this go a long way to enrich learning. The merits of using demonstration method in teaching lies in the fact that it bridges the gap between theory and practice, enables learners to become good observers and generate their interest; students see immediate progress as a result of a correct effort and it enables the teacher to teach manipulative and operational skills. The

problems encountered in this method amongst others include the fact that students lose interest and confidence when they fail to repeat accurately; creativity and originality by students are hindered as students try to do it exactly the same way as their teacher did it and students have a limited opportunity to be familiar with learning materials.

3. Laboratory/Experimentation Method: This is the use of controlled observations and measurements to test hypotheses. An experiment is a procedure carried out to support, refute, or validate a hypothesis. Experiments provide insight into cause-and-effect by demonstrating what outcome occurs when a particular factor is manipulated. Experiments vary greatly in goal and scale, but always rely on repeatable procedure and logical analysis of the results.

4. Programmed Learning Method: A form of individualized instruction whereby information is learned in small, separate units either by way of reading programmed texts or using computer-based programs. Programmed learning is a self-paced, self-administered programme (computer based in this case) presented in a logical sequence and with much repetition of concepts or skills.

5. Dalton Plan/Assignment Method: Assignment and practice are ways of extending learning time for mastering a skill. Designing activity for classroom practice and homework should aim to help students refine and extend their learning.

6. Project Method: Students work through a series of activities and problems culminating in the completion of something tangible (example fire alarm, chair or a piece of home furniture). A form of individualization whereby learners choose and work on projects and activities that facilitate and support the development of skills and knowledge. Often, learners not only choose topics but also the means of their conduct and production.

7. Mastery Learning: Mastery learning applies the principles of individualized instruction and tutoring to whole class learning. In this teaching strategy, rather than waiting to the end of a unit to check on progress, teachers design ongoing checks to use during the

process to provide individual feedback, diagnose learning needs/difficulties, prescribe specific remediation or enrichment strategies, and re-assess with a parallel assessment. Mastery learning is basic to many textbook programs and has engendered formative assessments as a routine of classrooms. Mastery learning honors the idea that students learn at different levels or paces.

Although Vikoo's classification gives insight into the fact that certain methods are more helpful in achieving objectives in different domains, OECD (2016) argued that generally, teaching strategies are multidimensional – how well they work depends on the context in which they are applied. OECD further opined that there is no single strategy that can guarantee better student outcomes. This implies that teaching strategies are not mutually exclusive. However, Chege (2013) argued that certain teaching methods encourage high performance of students and trainees in Technical Vocational Education and Training (TVET) more than others.

The world is rapidly changing and so is the practice of TVET (Uwe, 2014). Uwe therefore stated that innovative teaching and training methods must be adopted to match the rapidly changing economic and technological situation. This entails that teachers and trainers need to ensure that students will be trained or educated in a comprehensive sense; they need to be trained in generic and job-specific technical skills to be able to cope with the demands in working life. In line with this, Finch and Crunkilton as cited by Ngubane-Mokiwa and Khoza, (2016)stated that TVET institutions must offer education and training that is meant to prepare students to provide practical services for a productive economy. TVET programmes are industry-based and industry-competencies-orientated, it is necessary therefore, for TVET teachers to have the right set of competencies and right work environment when delivering technical and vocationally-oriented programmes so that the students are provided with the right set of skills and knowledge required by the industries(Paryono, 2015).The most vital key to training in both competencies (technical and generic) is the application of appropriate teaching and training methods.

Recognizing the dynamism of technology and TVET practice in particular, Modungwa (2012) described teaching and learning strategies that should be utilized in order to deliver TVET instruction effectively. Modungwa's view is that teaching and learning strategies in the light of global technological development must;

❖ engage learners through:

1. Active learning process -– project, interactive methods

2. Enquiry learning – activities are linked to research – project, experimentation

3. Interesting and challenging activities – experimentations, simulations, role plays

4. Exploring their experiences, challenge current beliefs, and develop new practices and understandings- experiential, discovery methods

❖ contextualize learners' learning experiences through:

1. Recognizing prior experience and knowledge and building on it – experiential, experimentations

2. Learners seeing the relevance of their studies to professional, disciplinary and/or personal contexts – simulations, role plays, case studies, apprenticeship/on the job training.

3. Encouraged dialogue between learners and teachers/trainers and among learners –cooperative learning, debates, discussions, seminars

❖ be inclusive learning and teaching experience through:

1. Acknowledging, valuing, and drawing on diversity of their experiences – differentiated teaching, experiential, discovery

2. Using multiple teaching methods and modes of instruction viz. audio-visual and psychomotor – interactive teaching through use of ICT and other media

From the foregoing, it is deducible that no teaching strategy is useless yet some instructional strategies are more helpful in achieving the learning objectives in certain fields. Also, teaching strategies are not all inclusive hence skillful application of teaching strategies is

key to effective instruction delivery. The retraining competency-based programme for EIWAs developed is psychomotor based and should be used in the informal sector. Therefore, insight from the literatures reviewed, such as Vikoo in Dorgu (2015), Eggen and Kauchak as cited by Tiian and Hant, (2011), Modungwa (2012) were helpful in selecting appropriate instructional techniques for the retraining programme.

Facilities required for the Psychomotor Competency-based Programme

Electrical Installation Work Trade programme is a programme is one of the TVET programmes which is meant to equip individuals with relevant skills and competencies for self-reliance or gainful employment in the electrical industries. According to the curriculum of EIW programme for technical colleges, EIW programme provides training that leads to the production of skilled personnel like craftsmen and technicians who could either secure employment at the end of their training, set up their own businesses or further their studies in Polytechnics, Colleges of Education (Technical) and Universities (NBTE, 2003). This goes to say that acquisition of psychomotor skills is key to becoming proficient in the trade and employable as well. For trainees to acquire relevant practical skills in EIW, facilities are imperative.

Technical and vocational education facilities involve all the infrastructural and physical facilities in the workshops, laboratories, studios (Hassan & Babawuro, 2013). Hassan and Babawuro further stated that these facilities include all the tools, equipment, machines, and the consumable materials that are being used from time to time for teaching/learning the trade. Esomonu and Jen in Manabete and Makinde (2016) agreed that educational facilities in our institutions are equipment, tools, learning/instructional materials, consumable materials and infrastructure (classrooms, assembly halls, libraries, laboratories and workshops). Manabete and Makinde on their part stated that facilities for Electrical Installation and Maintenance Work include workshops, laboratories, tools and equipment, instruments and consumable materials.

Training of artisans in EIW cannot take place in a vacuum or in any classroom like the liberal arts. Facilities are imperative for achievement of practical proficiency in EIW. This is why Manabete and Makinde (2016) stated that availability of physical facilities for the implementation of Electrical Installation and Maintenance Work Programme is of crucial importance. In the same vein, Azonwu (2017) noted that in a Technical College where facilities such as workshop or laboratory, equipment, tools and instructional materials are lacking, no significant practical teaching can be passed on to the learners. Hassan and Babawuro (2013) emphasized that these facilities are required to be available, adequate and functional in order to satisfy the needs of the curriculum. Hassan and Babawuro further indicated that the availability and effective utilization of facilities for training in any technical college enhances the vital process of the skills to be acquired. This implies that when the required facilities are not available, effective training is grossly hampered.

There are varied views as to what constitute adequate facility required for effective training of artisans in EIW. According to Yakubu and Mumah in Azonwu (2017), facilities needed to mount an EIW programme include;

❖ tools, equipment and training materials
❖ Teaching and technical/administrative support
    ❖ Infrastructural facilities which include administrative blocks, health centre, conveniences, workshops, laboratories, libraries
    ❖ Utility services such as water, electricity and communication facilities

Hassan and Babawuro (2013), Manabete and Makinde (2016) and Azonwu (2017) also listed a number of facilities in terms of tools, equipment and consumables. Since this study is concerned with the informal sector training of artisans, facilities such as health centre, administrative buildings, libraries, some utility services such as communication were not included. However, all

facilities such as good workshop, tools, equipment and consumables for the implementation of the competency-based programme were included so that respondents can discriminate against relevant and irrelevant ones.

Evaluation Techniques for the Psychomotor Competency-based Programme

Evaluation is the process of finding out the extent of success or failure of a programme based on the objectives of the programme. Educational evaluation is the continuous inspection of all available information concerning the student, teacher, educational programme and the teaching-learning process to ascertain the degree of change in students and form valid judgment about the students and the effectiveness of the programme (Umar, 2014). Value judgment on an observation, performance test and/or data whether directly measured or inferred is called evaluation. For instance, if a teacher administers a test to a class and computes the percentage of correct responses, it is said that measurement and testing has taken place. The scores must be interpreted which may mean converting them to values like As, Bs, Cs, and so on, or judging them to be excellent, good, fair or poor. This process is called evaluation.

Educational evaluations look at the entire educational process from different points of view, including the educator and students. The evaluation can be quantitative, such as tests or quizzes, or qualitative, such as observation of group activities (Duzan, n.d). Evaluation is said to be quantitative when the data used for the evaluation is quantitative (of countable quantity). The results can be measured or counted, and any other person trying to quantitatively assess the same situation should end up with the same results. On the other hand, qualitative evaluation is an evaluation that is based on qualitative data (data that can't be counted). Qualitative evaluation is defined as any evaluation that is made using the five senses (Collins, n.d). Because people often reach different interpretations when using only their senses, qualitative evaluation becomes harder

to reproduce with accuracy; two individuals evaluating the same thing may end up with different or conflicting results.

Educators typically talk about two kinds or stages of evaluation—formative evaluation and summative evaluation (Ughamadu, 1992). Formative evaluation occurs during the course of curriculum development. Its purpose is to contribute to the improvement of the educational programme. The merits of a programme are evaluated during the process of its development. The evaluation results provide information to the programme developers and enable them to correct flaws detected in the programme. In summative evaluation, the final effects of a curriculum are evaluated on the basis of its stated objectives. It takes place after the curriculum has been fully developed and put into operations. The purpose of summative evaluation is to assess a programme's success in reaching its stated goals. Summative evaluation (sometimes referred to as impact or outcome evaluation) frequently addresses many of the same questions as a progress evaluation, but it takes place after the programme has been established and the timeframe posited for change has occurred. Another type of evaluation is diagnostic evaluation. Diagnostic evaluation is directed towards two purposes either for placement of students properly at the outset of an instructional level (such as secondary school),or to discover the underlying cause of deviancies in student learning in any field of study.

Educational evaluation is carried out for certain purposes. According to Council of Europe and the European Commission, CEEC, (2018), educational evaluation is carried out to aid better planning, stock taking, consolidating result, checking the realization of objectives and ensure the cooperation of partners. The importance of curriculum evaluation is to determine the value of the curriculum itself Umar, 2014). The question that reveals the importance of evaluation in curriculum development process are: is the curriculum appropriate for the particular group of students with whom it is being used? Are the instructional methods selected, the best choices in the light of the objectives sought? Is the content the best that could be selected? Are the materials

recommended for instructional purpose appropriate and the best available for the purpose envisaged? Umar (2014) noted that educational evaluation in curriculum development process is to:

- ❖ determine the outcomes of a programme
- ❖ help in deciding whether to accept or reject a programme
- ❖ ascertain the need for the revision of the course content
- ❖ help in future development of the curriculum material for continuous improvement
- ❖ improve methods of teaching and instructional techniques

CEEC (2018) also recognised that purpose of the objectives in a curriculum process is to guide the educational process and to give an orientation to its evaluation. Hence evaluation is meant to test the achievement of objectives. CEEC also noted that evaluation is done to find out the competencies (knowledge, skills, attitudes, abilities and values) gained, developed or achieved during the educational activity. It revealed that evaluation by competencies is usually carried out in the informal setting such as the informal training of EIWAs. Evaluation can be achieved through several means.

Evaluation techniques refer to strategies or methods of conducting evaluation. Kolawole in Ariba (2016) described evaluation techniques as tools and devices employed by the teacher to determine the success or failure of learning of their students. There are many techniques/strategies through which evaluation can be done. For instance, CEEC (2018) outlined several strategies such as observation of participants, structured interviews, surveys, observation with guidelines, questionnaires, focus groups, spot checks, checklist observations, diaries, film/video and in-depth interview. In the formal setting, tests and exams are common evaluation techniques.

According to Ogbuanya, Akintonde and Bakare (2017), evaluation methods that are suitable for practical lessons in electrical/electronic trade include performance testing, product

evaluation, process evaluations method, ranking method and rating scale. However, they discovered that most of these methods are not adequately used. Some of these evaluation techniques which are relevant to this study are explained thus:

Performance Testing

Performance testing involves practical activities designed to measure the amount of practical skills possessed by artisans (Ariba, 2016). Ariba noted that performance test is of great relevance when the interest of evaluation involves psychomotor achievement. Performance test requires artisans to perform a task instead of answering questions (Khan, 2007). Hence performance tests are used to test the achievement of psychomotor objectives; objectives concerned with practical or motor skills possessed by the artisans. Performance testing methods may be in the form of checklist, rating scale, project method, assignment process evaluation, product evaluation or combination of these (Okeke, 2004).

Process and product evaluation

Process evaluation entails observing artisans while carrying out practical tasks and rating the level of their performance. For instance, if an artisan is assigned the task of fixing socket outlets in a sitting room, process evaluation of the artisan involves rating the artisan based on step by step activity involved in completing the task. Process evaluation helps the trainer to assess the quality of performance and rate of work directly. The demerit of process evaluation is that it is time consuming because the trainer may have to observe the artisans one by one. On the other hand, product evaluation is an evaluation that is concerned with the complete product regardless of the procedures used. The product evaluation may not be time consuming because it is concerned with the final product. However, it is not suitable for activities requiring long time to be executed.

Checklists

A checklist is an assessment tool for identifying the presence or absence of knowledge, skills, or behaviours. Checklists are used for identifying whether key tasks in a procedure, process, or activity have been completed. The tasks may be a sequence of steps or include items to verify that the correct sequence was followed. Checklists usually offer a yes/no format in relation to student demonstration of specific criteria. They may be used to record observations of an individual, a group or a whole class in a practical skill assessment.

Tips for Developing a Checklist

Checklists should:

1. have criteria for success based on expected outcomes

2. be short enough to be practical (e.g., one sheet of paper)

3. have tasks logically arranged in sections

4. have sign-off points that prevent students from proceeding without approval, if needed

5. be written with clear, detailed wording to minimize the risk of misinterpretation

6. have space for other information such as the student's name, date, course,examiner, and overall result

7. be reviewed by other instructors

Rating Scale

A rating scale is a tool used for assessing the performance of tasks, skill levels, procedures, processes, qualities, quantities, or end products, such as reports, drawings, and computer programs. These are judged at a defined level within a stated range. Rating scales are similar to checklists except that they indicate the degree of accomplishment rather than just yes or no.

Nworgu (2003) recognised that rating scale enables the trainer to indicate the degree or extent to which the learner possesses particular attribute or dexterity. The rating scale has clearly defined, detailed statements, which enables reliable results to be achieved. Rating scale lists performance statement in one column and other columns form "the scale" and can indicate a range of achievement, such as from poor to excellent, never to always, beginning to exemplary, or strongly disagree to strongly agree among others.

Tips for Developing a Rating Scale

Tips for developing checklists apply to rating scale. In addition, rating scale should:

1. include clear wording with numbers when a number scale is used

2. have specific, clearly distinguishable terms

3. indicate levels of success required before proceeding further, if applicable

Review of Related Empirical Studies

Empirical studies found to be related to this study are reviewed and summarized below.

A study was conducted by Ariba (2016) to develop a retraining programme for artisans in blocklaying and concreting in Lagos State. Six research questions were answered while one null hypothesis was formulated and tested at 0.05 level of significance. The study adopted research and development design. The population of the study consisted of 4487 which consisted of 70 builders, 80 building supervisors, 80 craftsmen, 4200 artisans, 40 teachers from Technical Colleges and 17 Colleges of Education teachers that taught blocklaying and concreting. The sample for this study was 540, made up of 30 builders, 40 building supervisors, 48 craftsmen, 365 artisans, 40 Technical College teachers and 17 Colleges of Education teachers that taught blocklaying and concreting. Purposive sampling techniques was used to select builders, craftsmen and building supervisors that worked directly with the artisans on the building construction sites.

There was no sampling for teachers who taught blocklaying and concreting in Technical Colleges and Colleges of Education in view of the manageable size of the population. Taro Yamene formula was used to determine the sample size for the artisans which was 365. Two sets of instruments were used for data collection for this study: the questionnaire for retraining programme for artisans in blocklaying and concreting and the rating scale for assessing the skills possessed by the artisans after retraining. The questionnaire for retraining programme for blocklaying and concreting artisans were content and face validated by three experts. The internal consistency of the questionnaire items was determined using Cronbach alpha reliability method and the overall reliability coefficient of 0.89 was obtained. The rating scale was validated by five raters, inter – rater reliability was calculated using Kendall's coefficient of concordance. A reliability coefficient of 0.87 was obtained. Five hundred and forty copies of questionnaire were administered on the respondents with the help of research assistants and four hundred and eighty-three copies of the questionnaire were collected back which represented a 90% return rate. The mean statistic was used to answer the research questions while the analysis of covariance was employed for testing the null hypothesis at 0.05 level of significance. The findings revealed 35 objectives, 76 contents, 15 training strategies, 29 training facilities and 14 evaluation techniques were agreed upon by the respondents for the retraining programme. The result of hypothesis tested revealed that there was a significant mean difference in the skill performance of artisans retrained and not retrained with the developed programme, this implied that the developed programme was effective on the artisans it was retrained with. To improve the skills, knowledge and attitudes of artisans in blocklaying and concreting, therefore, the study recommended that: the building construction firms should be encouraged to retrain artisans in blocklaying and concreting in their establishment with the developed programme; also the Nigerian Institute of Builders, should enforce the need to retrain artisans with the developed programme to enhance delivery of quality construction jobs. Master craftsmen should use the developed programme to enhance their competencies in the impartation of skills to apprentices in blocklaying and concreting. The

similarities between this study and the current study are; both are concerned with development and validation of retraining programme for artisans and also adopted same research and development design.

Ogbuanya and Fakorede (2008) carried out a study to determine the effect of learning mode on the psychomotor achievement of Automobile technology students in Technical Colleges. To achieve this, two objectives of the study were formulated as follows:

i. Compare students' score on automobile technology psychomotor achievement test when taught with cooperative learning mode and when taught with competitive learning mode.

ii. Compare the retention ability of boys and girls in automobile technology psychomotor achievement test score under cooperative learning mode and conventional learning mode.

Using a two stage random sampling technique to determine a sample of 96 automobile technology students from four Technical Colleges for the study, the researchers made use of quasi experimental factorial design; specifically, the pre-test and the post-test design with experimental and non-equivalent control group. This is because the intact classes (non-randomized) groups were used for the study. The instruments used for the data collection were: Cooperative learning-mode lesson plan, conventional lesson plan and the Learning-mode Psychomotor Achievement Test (LPAT). The instrument was validated by three experts and trial-tested using the test re-test reliability technique on a sample of 30 automobile students divided into three groups. The data analyzed yielded a reliability index of 0.78. The research questions were answered using the mean and standard deviation of the test scores while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. The findings of the study showed that students taught with cooperative learning mode performed better and females performed better in automobile technology test than the males. It was concluded from the findings of the study that the cooperative learning mode has positive effects on the psychomotor achievement and retention.

Technical teachers should adopt this approach by incorporating this instructional technique in the art of teaching automobile technology in the technical colleges. The present study is concerned also with psychomotor competency and determination of appropriate instructional techniques for developed competency programme.

A study by Shailong (2014) was to develop a self-instructional manual for teaching tailoring techniques to home economics students in universities. The study was aimed at enhancing students' acquisitions of some skills in tailoring techniques. The students were found to be facing some technical challenges in acquiring these skills largely because of the following reasons: too few teachers that had the competence in impacting tailoring skills into the students; technical instructor who were unwilling to devote enough time to instruct the students; competing demands on the time of the students which resulted in not allotting enough time to the course; Clothing construction and tailoring textbooks which could have been of help were scarce to come by and were too costly for the students to afford. The purpose of this study therefore was to develop self-instructional manual in tailoring techniques for Home Economics students in universities. Eight specific purposes guided the study. The study answered eight research questions and tested only one hypothesis at 0.05 level of significance. The area of the study was north central geo-political zone of Nigeria. The study adopted Research and Development (R&D) design. It was carried out in five phases as follows; Phase 1- Development of Tailoring Technique Need Assessment Questionnaire, Phase II- Development of the self-instructional manual on tailoring techniques, Phase III – validation of the self-instructional manual, Phase 1V- teaching students tailoring techniques with the draft self-instructional Manual and Phase V- Testing the effectiveness of the self-instructional manual. The study was conducted in three universities out of seven universities that offered clothing construction courses. The population was 4052, comprising all the Home Economics lecturers, all the technical instructors, all registered tailors in the area, and all final year Home Economics students offering clothing and textile in the

universities in the area of study. Purposive sampling technique was used to sample three universities as well as tailors. All the Home Economics lecturers in the three sampled universities totaling 14 and the 3 technical instructors- one from each university and all the final year students in the sampled universities totaling 139 students were entirely studied including 116 sampled tailors. Four sets of instruments were used for data collection. They are as follows-Tailoring Technique Need Assessment Questionnaire (TTNAQ), Self-instructional Manual in Tailoring Techniques (SIMITT), Validates Assessment Questionnaire (VAQ), Practical Skill Test Items in Tailoring Techniques (PSTIITT). Mean, ANCOVA and t-test were used to analyze the data collected. Major findings of the study include: self-instructional manual with pictorial views that developed in students saleable skills suitable for successful careers in tailoring and proper working habits for sustainable employment among others. A total of 97 tasks for achieving the specific objectives of tailoring techniques were determined, A total of 21 consumable materials and 35 instructional tools and equipment were required for the study, A total of 80 step by step procedure and 33 self- evaluation guidelines were developed for the study. The study found out that effective skill acquisition was possible with repeated exercises. The null hypothesis was rejected because those students that used the SIM performed better than those that used conventional method. Based on the findings, it was recommended that students and teachers should adopt the use of self-instructional manuals among others in order to stimulate meaningful understanding and skill acquisition. University council should organize workshops, seminars and conferences for the teachers to enlighten them on the importance and use of instructional manuals. The Nigerian government was encouraged to make good use of the information generated in this study either in print or in electronics in facilitating skill acquisition in Nigeria. The commonality between this study and the present study is that they are both concerned with development of a skill training programme.

Esiowu (2015) carried out a study to develop hairdressing curriculum for integration into Home Economics Education programme of universities in the South-East, Nigeria. Specifically, the study determined the: instructional objectives to be integrated; content (knowledge, skills and attitudes) in hairdressing; instructional methods that could be adopted in teaching; instructional materials/media to be utilized in teaching hairdressing; evaluation activities that could be employed in teaching hairdressing. The development procedures involved developing a draft hairdressing curriculum (HDC), validating the draft HDC, revising the hairdressing curriculum based on the inputs from the validates and determining the effectiveness of the developed hairdressing curriculum. The study adopted the research and development design (R & D). It was carried out in five major phases: phase I – collection of data using hairdressing questionnaire (HDQ), phase II – development of hairdressing curriculum based on the objectives, content, delivery systems and evaluation activities, phase III – validation of the draft of hairdressing curriculum by experts, phase IV – assessment of the draft hairdressing curriculum using hairdressing test (HDT) and phase V: revision of HDC based on information from phases III and IV. The population was made up of 5057 hairdressing respondents comprising 32 Home Economics lecturers, 4900 hairdressers and 125 final year Home Economics students. 400 hairdressers were purposively selected. No sample for final year Home Economics students and Home Economics lecturers. Four sets of instruments were utilized for data collection. Face and content validation of HDQ was done by three experts from University of Nigeria, Nsukka. HDQ was tried out and the result obtained was used for the computation of reliability coefficient using Cronbach alpha. The following coefficients were obtained for each of the clusters: cluster B = 0.95, cluster C = 0.97, cluster D =0.93, cluster D (m/m) = 0.88 and cluster E = 0.94. The draft of HDC developed was validated by experts namely: three hairdressers, three Home Economics lecturers and three curriculum experts. Mean was used to answer the research questions 1 to 5, ANOVA was used to test hypotheses 1 to 5 while ANCOVA was used to test hypothesis 6. The findings included 34 objectives, 68 item content (knowledge, skills and attitudes), 45 delivery

systems (23 instructional methods and 22 instructional materials/media) and 29 evaluation activities for assessing the attainment of HDC. There were no significant differences in the mean responses of hairdressers, final year Home Economics students and Home Economics lecturers to what should constitute the objectives, content, instructional techniques, instructional materials and evaluation techniques of HDC. Based on the findings, it was recommended among others that (1) Home Economics students should be adequately exposed to learning experiences identified in this study to enable them to be self-employed; (2) Curriculum planners should utilize the objectives, content, instructional methods, instructional materials/media and evaluation activities identified in this study for reviewing and re-planning the curriculum. This study is similar to the current since both are concerned with development of a training programme.

Ishaya and Halliru (2016) conducted a study to identify strategies for improving students' acquisition of practical skills in Electrical Installation and Maintenance Work Trade in technical colleges of Kano State with a view to finding out ways of optimizing practical skills acquisition among students. The study was guided by three research questions and three null hypotheses. A descriptive survey was used as the design of the study. The population of the study comprised 24 school administrators, 22 trade teachers, and 208 final year students making a total of 254. The entire population of 254 was used as the sample for the study. A structured questionnaire named "Strategies for Improving Students' Acquisition of Practical Skills in Electrical Installation and Maintenance Work Trade in Technical Colleges in Kano State Questionnaire (SISAPSETCKSQ)" was used for data collection. The questionnaire has 28 items with four sections. The instrument was subjected to content and face validation and afterward tested on 15 respondents for internal consistency reliability using Kurder Richardson (RK-21) method. The reliability coefficient for the four sections of the instrument ranges between 0.76 and 0.82. The reliability coefficient of the entire instrument was 0.79. The researchers with the help of two research assistants administered the instrument. The data for the study were analyzed using Mean, Grand Mean, Standard

Deviation, and t-test statistical methods. The findings of the study include among others; Demonstration, assignment, drill and practice, and apprenticeship strategies as appropriate for enhancing practical skills acquisition by students. It was found out in the study that there was no significant difference between the mean responses of trade teachers and students on supervisory strategies for students' practical skills acquisition in Electrical Installation and Maintenance Work Trade in technical colleges of Kano State. It was also discovered that there was no significant difference between the mean responses of trade teachers and school administrators on assessment strategies for students' practical skills acquisition in Electrical Installation and Maintenance Work Trade in technical colleges of Kano State. It was concluded among others, that teachers in Electrical Installation and Maintenance Work Trade used seven (7) out of eight (8) categories of practical teaching strategies; and ten (10) strategies for supervising students' practical activities in Electrical Installation and Maintenance Work Trade were much appropriate and enhanced acquisition of practical skills by students in the technical colleges. Based on the findings of the study the following recommendations were made; Teachers of Electrical Installation and Maintenance Work Trade should continue to adopt appropriate teaching strategies identified in the study for improving acquisition of practical skills by the students in technical colleges; and identified strategies for assessing practical skills of students in Electrical Installation and Maintenance Work Trade should be continuously used by teachers in technical colleges.The relationship between this study and the current study is that both involves teaching strategies and assessment techniques suitable for electrical installation works.

Another study by Nwokike (2014) sought to determine the skills required by graduates of technical colleges for self-employment in electrical installation and maintenance works in Enugu State. Survey research design was adopted for the study. The population for the study was 35 respondents which consist of teachers of electrical installation and maintenance work and workshop attendants. There was no sampling because of manageable size of the population. A

Structured questionnaire was used as instrument for data collection. The instrument was validated by three experts. Cronbach alpha reliability method was used to determine the internal consistency of the instrument and 0.82 reliability coefficient value was obtained. Four research questions and four null hypotheses were formulated for the study. Mean was used to analyze 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 25 skills in domestic installation, 32 skills in industrial installation, 23 skills in cable jointing and 25 skills in winding of electrical machines required by graduates of technical colleges for self-employment in Enugu State. There was no significant difference between the mean responses of electrical installation teachers and workshop assistants on the skills required by graduates of technical colleges for self-employment in domestic installation, industrial installation, cable jointing and winding of electrical machines. The study recommended that the skills identified in this study should be packaged and used to retrain the graduates of electrical installation and maintenance work at skills acquisition centres. It was also recommended that teachers of electrical installation and maintenance work in technical colleges should be retrained by government on the implementation of the skills identified for self-employment in domestic, industrial, cable joint and winding of electrical machines. The relationship between this study and the current study is that both involve identification of skills in electrical installation work.

Ogbuanya, Ogundola and Ogunmilade (2010) carried out a study on the level of availability of recommended tools and equipment for teaching motor vehicle mechanic works in technical colleges in South Western States, Nigeria. The purpose of the study is to assess the level of availability and utilization of facilities for effective teaching and learning of motor vehicle mechanic works in technical colleges. The survey research design was employed for the study, which was carried out in technical colleges in south western States, with a total population of 216; made up of 170 students and 46 teachers of motor vehicle mechanic work in technical collages.

The sample of the study is 92, made up of 78 students and 14 teachers. A structured questionnaire developed by the researchers titled Motor Mechanics Facility Assessment Questionnaire (MMFAQ) was used as instrument for data collection. The MMFAQ was divided into four sections with 27 items. The data collected were analysed using mean rating and t – test statistics tested at 0.05 level of significance. The instrument was validated by three experts. The Cronbach alpha was used to determine the internal consistency of the instrument which yielded a reliability coefficient of 0.79. Findings of the study revealed that available tools and equipment in technical colleges were used for teaching and learning, the study recommended that more tools and equipment be provided for teaching and learning. This study is related to the present study in the area of training facilities.

A study was carried out by Uwamieye and Iyamu (2002) on training methodology used by the Nigerian Indigenous apprenticeship system. The purpose of the study was to investigate the training orientation given to apprentices by the master – craftsmen. The area of study is in Edo and Delta States. The population for the study comprised all master – craftsmen, journeyman and apprentices in the study area, 16 trades and crafts that were registered with the Ministry of Trade and Labour was used. The population was stratified to unique trades and randomly sampled through the use of a random number system in which the sample of the study was 960: 320 masters – craftsmen, 320 journeymen and 320 apprentices. The instrument used in the study was the modified Ugonabo and Ogwo (1991) questionnaire. The method of data analysis was by mean and Analysis of Variance (ANOVA). The findings showed that the apprentices were not trained with any formal curriculum, learning is through observation, and evaluation is based on consistency in successful diagnosis of faults demonstration of skills shows mastery. Uwamieye and Iyamu's study which investigated the training orientation given to apprentices by the master – craftsmen. The purpose of the study, content, training method and evaluation techniques relates to the components of the present study.

Oluka (2016) also carried out a study to determine the entrepreneurial competencies required by electrical/electronic technology education graduates for self-employment in Enugu State. The study was necessitated because of the prevailing issue of unemployment among graduates of higher institutions which has become a thing of worry for all and sundry. Three purposes of the study with corresponding three research questions and a null hypothesis guided the study. A survey research design was used for the study. Population was 185 graduates of electrical/electronics (tech) education which comprises 118 governments employed and 67 self-employed graduates of the same programme in Enugu State. The instrument for data collection was questionnaire meticulously structured by the researcher which was made up of three sections according to the three research questions of the study. The instrument was face validated by three experts. The questionnaire has a total number of 41 item statements structured in four point response categories of very highly needed, highly needed, slightly needed, and not needed with weighting values of 4, 3, 2 and 1 respectively. 185 copies of the questionnaire were administered to the respondents and collected back by the researcher. Mean with standard deviation was used to answer the three research questions of the study while t-test was used to test the null hypothesis at 0.05 level of significance. The findings of the study showed that ability to accommodate and plan for changes in technology among others are the managerial competencies needed for self-employment while skills to rectify faults among other findings are the technical/ICT competencies needed by graduates of electrical/electronics (tech) education for self-employment. Also, it was found that ability to take wise decisions based on the available facts and being honest to customers and employers among others are interpersonal competencies needed by the graduates for self-employment. Based on the findings of the study, recommendations were made which include, that education authorities and the government at all levels should create enough awareness about entrepreneurship education for onward eradication of the ailing problems of unemployment and abject poverty that abound in the country. This study and the current study involve identification competencies in electrical installation trade.

A study by Ogbuanya, Akintonde and Bakare (2017) was to assess the practical skill training of Technical College students in Electrical and Electronics trades in Osun State of Nigeria. A survey research design was adopted for the study. The population consisted of 15 principals (Vice principals inclusive), 16 heads of electrical and electronics Department and 43 teachers, Technical Colleges of Osun State. The entire population was used. Six research questions and three null hypotheses were formulated based on the specific purpose of the study. The data for the study were collected by means of structured questionnaire developed by the researchers. Face and content validation of the instrument was done by three lecturers from the Department of Vocational Teachers Education, University of Nigeria, Nsukka. The reliability of the instrument was established by the use of Cronbach Alpha reliability index. The data collected were analyzed using mean scores to answer the research questions while the three null hypotheses were tested using t-test at 0.05 level of significance. It was found that teachers were not adequate in terms of practical experience and numerical strength. Most of equipment/facilities were not put to effective use to train the students. Most of appropriate teaching methods for teaching Vocational Technical Education subjects were not used to teach the students in the Technical Colleges. The hours allocated for practical were inadequate. The method of evaluation of practical in Electrical and Electronics were very poor. On the bases of the findings, it was recommended among others, that equipment/facilities should be supplied to the electrical and electronics section of the technical colleges and adequate number of qualified teachers should be recruited to handle all the courses offered in electrical and electronic in the technical colleges. The relationship existing between this study and the present study is that evaluation of practical skills in Electrical Trade is involved.

Egbita and Kanu (2015) carried out a study to measure the effect of a training module in improving knowledge competencies for Technical and vocational Education teachers in Nigeria. The training module consisted of 10 training sessions, covered three domains, namely, planning,

instruction and classroom management, and evaluation competencies. The sample of the study consisted of 50 teachers. The participants of the sample were distributed into two equal groups, with 25 teachers in each group. The teachers in the experimental group were attached with the training module for five weeks; whereas the teachers in the control group were exposed for the same period. The results of (ANCOVA) revealed that there were statistically significant differences between the means of the two groups' means on the post-achievement test, favoring to the experimental group. Furthermore, results of the experimental group on the achievement test revealed no statistically significant differences across the demographic variables, namely, gender, specialization, qualification, and experience. This study dwelt on competency-based education and its effect on teachers. In the same vein, the current study deals with competency-based programme and will equally test its effectiveness on artisans.

Dauda, Daniel, Paul, and Danlami (2017) conducted a study to determine level of skills acquired and job performance of graduates of electrical installation and maintenance work (EIM) trade of technical colleges in industrial installation in north eastern Nigeria with a view of finding information that will help solve low level of skill acquisition and job performance of the graduates in order to sustain the graduates' human and job security for national development. The study was guided by two research questions and one hypothesis. Descriptive survey research design based on core self-evaluation was used for the study. The population for the study consisted of 313 graduate of electrical installation and maintenance work trade and 82 work place supervisors in 33 public establishment in north eastern Nigeria. The entire population was used for the study. Two sets of structured questionnaires were used for data collection. Each of the questionnaires had 32 items in four task cluster within two major sections. The content and face validation of the instrument was done by three electrical technology lecturers form Modibbo Adama University of Technology, Yola and three EIM teachers and workshop based supervisor each from government science and technical college and federal ministry of works and Jos

respectively. The entire validated instrument was tested for internal consistence using the Cronbach Alpha method which yielded reliability coefficient of 0.85. The data for the study were analyzed using the mean, mean of means and z-test statistical methods using the SPSS 17.0 for windows. Findings of the study include among others that the graduate of electrical installation and maintenance works trade of technical colleges in north eastern Nigeria moderately acquired skills in installation of MICC cables and slightly acquired skills in installation of ducts and trunking task clusters respectively of the industrial installation module. While the graduate exhibited moderate level of job performance in installation of MICC cables and low job performance in installation of ducks and trunking tasks clusters, there was no significance difference in the mean response of graduate and supervisor on level of job performance of graduate in industrial installation module as a whole. It was recommended among others that government should provide adequate training facilities at the technical colleges especially on the task clusters that the graduates were deficient in. On the job remedial training should be provided by employers to remedy the very low skills acquired by graduates of EIM in some task clusters in industrial installation. The study dwelt on determining level of skills acquired and job performance in electrical installation and maintenance work which an aspect of the current study dwells on.

Onah (2012) undertook a study to develop an e-learning programme for digital empowerment of university students in South-East, Nigeria. Specifically, the study sought to identify: the objectives of e-learning programme, the content of e-learning training programme, the instructional methods to be used in e-learning programme, learning experience required to enhance learning in e-learning programme, activities to be used for evaluating the students in e-learning programme. A draft e-learning programme was developed and face validated by five experts. Five research questions and five hypotheses tested at 0.05 level of significance, guided the study. The study adopted the Research and Development (R and D) design. The study was

carried out in five phases as follows: Phase 1: Determination of the needed e-learning skills, knowledge and attitude by students. Phase II: Determination of the components of e-learning programme to be developed. Phase III: Development of the draft e-learning programme. Phase IV: Validation of the draft e-learning programme. Phase V: Revision of the draft e-learning programme. The study was conducted in the South-East of Nigeria. The population was made up of 251 respondents as follows: 187 Lecturers and 64 instructors. The entire population was surveyed for the study because of its manageable size. Three instruments were developed and used for data collection, namely, the needs assessment questionnaire (NAQ), the e-learning Programme Questionnaire (EPQ) and the focus group discussion guide (FGDG). The EPQ was face validated by five experts from the University of Nigeria, Nsukka. Cronbach alpha reliability coefficient index was used to determine the internal consistency of the instrument and it yielded an overall coefficient of $0.919 = \aleph$. The draft of the developed e-learning programme was validated by a focus group made up of thirteen experts, namely two Computer education lecturers, five Computer science lecturers, three instructors and three curriculum experts. Mean and Standard deviation were used to analyze the data collected on the research questions. For null hypothesis, the t-test was used to determine significant differences. The findings include: ten items on objectives of e-learning programme, fifty seven items on content of e-learning programme, twenty items on methods on instruction, fifteen items on learning experience and seven items on evaluation activities of e-learning. Based on the findings, it was recommended among others that (1) the Federal, state governments and individuals should help package the identified e-learning programme for students for the training of graduates for employment in computer trades. (2) There should be provision by the government and relevant agencies to provide a framework for regular up-skilling of computer lecturers in order to keep updating the required skills and competencies for instructional delivery in the e-learning programme (3) adequate human and instructional materials should be made available by the government and other stakeholders for effective integration of the e-learning programme into the curriculum of

computer studies in Nigerian universities. This study and the present is concerned amount development and validation of a training programme.

Summary of Review of Related Literature

The review of related literature for this study was organized under conceptual framework, theoretical framework, theoretical studies and empirical studies.

Under the conceptual framework, concepts such as psychomotor competency, development and validation of a training programme, Electrical Installation Works and Electrical Installation Works Artisans. Psychomotor competency was defined as abilities that border on motor skills and manual dexterity. Development and validation of a training programme entails setting out the objectives, the learning experiences, content, content delivery strategies, facilities and evaluation component of a programme and ascertaining its consistency in measuring what it is supposed to measure. Electrical installation works is seen as an electrical trade area consisting of domestic installation, industrial installation, cable jointing, battery charging and repairs, and winding of electrical machines. Electrical installation Work artisans are artisans trained in any of these areas of electrical installation works.

Under the theoretical framework, Cognitive apprenticeship theory by Collins, A., Brown, J. S., and Newman, S. E., Curriculum Development Theories such as Ralph Tyler's Model, Wheeler's Model and Nicholl and Nicholl model were reported to give the study a theoretical base.

Several sub-topics discussed under the theoretical studies include: components of Electrical Installation Works, training of EIWAs, psychomotor competency-based programme. In practice, Electrical Installation Works consist of specialization such as Domestic Installation, Industrial Installation, Cable Jointing, Winding of Electrical Machines and Battery Charging. Apprenticeship was discussed a means of training EIWAs in the informal sector. Psychomotor

competency-based programme was discussed in terms of objectives, content, instructional strategies, facility requirements and evaluation techniques.

Several empirical literatures related to this study were reviewed. Some of the empirical literatures were on development and validation of retraining and training programme or manual whereas others were on competency needs as well as assessment of electrical installation work skills needed for self-reliance and employment.

It is important to note at this point that the researcher could not find any available literature on development and validation of competency-based programme for retraining EIWAs. This is the gap the current study seeks to fill. The psychomotor competency-based programme when developed and validated, will be used in training and retraining EIWAs to enable them acquire psychomotor competencies needed for self-reliance and employment in the industries.

CHAPTER THREE

METHOD

In this chapter, method that was used in carrying out the study is presented and discussed under the following sub-headings: research design, development and validation procedures, area of the study, population of the study, sample and sampling technique, instrument for data collection, validation of the instrument, reliability of the instrument, method of data collection and method of data analysis.

Research Design

Research and development (R&D) research design was used for the study. Research and development is a process whereby educational products such as textbooks, equipment or curricular are developed and trial-tested in the field to ensure their effectiveness (Nworgu, 2006). Akuezuilo and Agu (2003) stated that R & D is a research method adopted when the aim of a research is to produce school materials like textbooks, equipment, teaching aids and curricula. Research and development is also viewed as an industry-based development model in which the findings of research are used to design new products and procedures, which are systematically tested in the field, evaluated and refined until they meet specified criteria of effectiveness, quality or similar standards (Gall, Gall & Borg, 2007). Thus, R & D design was adopted for this study since its thrust was to develop and validate a retraining programme as well as trial-test it to ascertain its effectiveness.

Area of the Study

The area of the study was the South East geo-political zone of Nigeria. The South East of Nigeria consists of five states. They are: Enugu, Abia, Imo, Ebonyi, and Anambra.

The people of the South East of Nigeria are widely noted for industry, entrepreneurship, resourcefulness, travelling and most importantly hospitality. The region has large deposits of natural resources such as coal in Enugu State, Oil in Anambra and Imo States.

The choice of the area for the study was anchored on the fact that the people are hardworking and have a good number of EIWAs. Again, in view of economic crunch and consequent high level of unemployment, the potency of Electrical Installation Works as a viable trade area capable of curbing unemployment has not been explored fully. Even in the technical colleges, EIW has suffered negligence over the years in some states in the region (Agbo, 2016). Lastly, there are a lot of industries in the region such as Enugu Electricity Distribution Company (EEDC) which need the services of EIWAs. Therefore, this retraining programme will serve as training and retraining programme for EIWAs thereby equipping the artisans with basic skills needed for self-reliance and employment in the industry.

Population of the Study

The population for this study was 397. This consisted of 69 technical college teachers of electrical installation works, 282 electrical installations works master craftsmen and 46 lecturers of electrical technology in the tertiary institutions in the South East of Nigeria (see Appendix E, page 145).

Sample and Sampling Technique

There were two different samples used for this study. They were: sample for phase IV (administration and collection of PCRPEIWAQ) and the sample used for trial-testing of the developed programme (phase viii).

The sample from whom data was collected using PCRPEIWAQ was 132. This was made up of 23 technical college teachers of electrical installation works, 94 electrical installation works master craftsmen and 15 lecturers in electrical technology drawn using proportionate stratified random sampling. The states formed the strata. That is to say that there were five strata made up of the five south eastern states. The sample was drawn from each stratum in a number that is proportional to the stratum's size compared to the population. According to Olatunji (2007), 15 – 30 percent of a small population is a good proportion of the population which can be sampled.

Hence this principle guided the researcher in determining the sample size. Specifically, one-third (approximately 33 percent) of the population were sampled (Appendix F, page 146).

The sample used for trial testing of the developed psychomotor competency-based retraining programme consisted of eleven EIWAs and their master craftsmen purposively selected. Two groups were formed from the eleven EIWAs used for the trial-testing of the developed programme. The members of one group were selected independent of the other group. The group retrained with the developed programme had seven EIWAs and a craftsman while the group retrained without it had four EIWAs and a craftsman. These groups were retrained in Awka, Anambra state. However, the location of each group were far apart to avoid any form of bias.

Instrument for Data Collection

Two sets of instruments were used for data collection for this study. They are Psychomotor Competency-based Retraining Programme for Electrical Installation Work Artisans Questionnaire (PCRPEIWAQ) and Psychomotor Competency-based Retraining Rating Instrument (PCRRI). PCRPEIWAQ and PCRRI instruments were developed by the researcher.

PCRPEIWAQ was used to collect data from the respondents on the contents of each component of the programme to be developed (Appendix B, page 130). The data collected using PCRPEIWAQ were presented, analysed and used to answer the research questions in chapter four. The questionnaire was developed by the researcher based on the interaction with some electrical installation works master craftsmen, electrical installation works teachers in Technical Colleges and EIWAs, and related literature reviewed.

The questionnaire was divided into two parts; I and II. Part II was subdivided into sections A, B, C, D and E. Part I of the questionnaire was designed to elicit information on personal data of the respondents. The information required here were to indicate whether the respondent was a technical college teacher, master craftsman or a lecturer and number of years of experience.

Part II: Section A of the questionnaire consists of 56 items on objectives of the programme for retraining EIWAs. Section B of the questionnaire consists of 38 items for eliciting responses on the contents of the retraining programme for retraining of EIWAs. Section C of the questionnaire consists of 58 items to help determine the instructional strategies for the retraining programme. Section D of the questionnaire consists of 86 items on facilities needed for the EIWAs retraining programme. Section E of the questionnaire consists of 51 items on evaluation techniques for the retraining programme.

Sections A, B, C, D, and E of the questionnaire are structured on 5 point Likert scale with the following options and corresponding nominal values:

Strongly Agree (SA) = 5 points

Agree (A) = 4 points

Undecided (U) = 3 points

Disagree (D) = 2 points

Strongly disagree (SD) = 1 point

The items in sections A, B, C and E of part II were grouped into clusters. The clusters are thus: Clusters 1, 2, 3, 4, 5, 6 and 7 which are domestic installation safety, working drawing, preparation for surface and conduit Installations, surface wiring, installation of conduit, installation of final sub-circuits and protective devices and inspection, and testing of domestic installations respectively. Section D was grouped into tools (hand and power), materials, equipment and other facilities. The respondents were requested to check (√) in the appropriate column reflecting the extent to which the respondent agreed with each item for the development of the retraining programme for EIWAs.

PCRRI was used to collect data during the trial-testing (final validation) of the developed psychomotor competency-based programme. This rating instrument was used to rate the artisans in the two groups before and after retraining (Appendix C, page 140). The instrument was designed to be used in determining the effectiveness of the developed retraining programme.

PCBRRI comprised observable psychomotor competencies organized in accordance with the objectives of the retraining programme. The level of possession of psychomotor skills was rated using a four-point rating scale of: Excellent – 4 points, good – 3 points, fair – 2 points and poor – 1 point.

Programme Development Procedure

The procedure involved collection of data from the respondents using a questionnaire and development of the retraining programme based on the data collected. The development of the retraining programme for EIWAs was based on the following R & D cycle by Gall, Gall and Borg (2007). They include:

1. Definition of goals which include need assessment.

2. Review of relevant literature pertinent to the product to be developed.

3. Statement of specific objectives and criteria for product development.

4. Development of prototype based on scientific evidence available or pertinent to research findings.

5. Field-test of prototype in the setting, where it will be used eventually.

6. Revision of the prototype to correct deficiencies found in the field testing state.

7. Conducting a main field test of the revised product

These steps were modified into eight phases for this study. They are:

Phase I: Need analysis

Phase II: Identification of the components of the psychomotor competency-based retraining programme

Phase III: Generation of items on each component of the psychomotor competency-based retraining programme and organizing them into a questionnaire

Phase IV: Administration and collection of the questionnaire

Phase V: Analysis of data collected using the questionnaire

Phase VI: Development of the programme

Phase VII: Face and content validation of the developed programme by experts

Phase VIII: Trial-testing of the developed programme (final validation).

Phase I: Need Analysis

This phase involved literature review on electrical installation work skill needs and visit to several sites where electrical installation were ongoing and EIW workshops, interacted and observed methods, procedures, techniques and application of tools for work and training purposes. The information gathered from the activities carried out in these areas was incorporated in the literature review.

Phase II: Identification of the components of the psychomotor competency-based retraining programme

In this phase, all the information collected as well as literature reviewed in phase I (Need Analysis) helped to identify the components of the programme. The components identified were objectives, contents, instructional strategies, facilities and evaluation techniques.

Phase III: Generation of items on each component of the psychomotor competency-based retraining programme and organizing them into a questionnaire

Items were generated on each of the components of the programme to be developed based on phase 1 (need analysis). The items thus generated were used to develop the psychomotor competency-based retraining programme for electrical installation works artisans questionnaire (PCRPEIWAQ) which was used in the next phase (administration and collection of the questionnaire). The PCRPEIWAQ was used to collect data from the respondents on the contents of each component of the programme to be developed. The respondents to this questionnaire were

electrical installation works teachers in technical colleges, lecturers in electrical technology and electrical installation works master craftsmen.

Phase IV: Administration and collection of the questionnaire

In this phase, PCRPEIWAQ was administered to and collected from the respondents by the researcher and five research assistants in the area of study. A total of 132 copies of PCRPEIWAQ were administered and 118 copies of same were collected.

Phase V: Analysis of data collected using the questionnaire

The data collected using PCRPEIWAQ were analysed in this phase. Items of the questionnaire which used for the development of the programme were selected or not selected using the real limits of number. Any item with a mean value of 3.5 and above was selected while items with mean value of less than 3.5 were not selected. The selected items were used for the development of the programme in phase VI

Phase VI: Development of the Programme

This phase involved development of the retraining programme by the researcher based on the result of phases I to V. The programme was packaged in terms of objectives, contents, retraining strategies, retraining facilities and evaluation techniques.

Phase VII: Face and content validation of the developed programme by experts

In this phase, the draft of the retraining programme was face and content validated by three experts in electrical installation works. These experts were; a lecturer of electrical technology from Nnamdi Azikiwe University, Awka, a master craftsman and a technical college teacher of electrical installation works from St. John Science and Technical College, Alor. After the face and content validation of the retraining programme by the three experts, the researcher packaged the retraining programme for trial-testing (final validation) in phase VIII.

Phase VIII: Trial-Testing of the Developed Programme (final validation)

This phase involved the trial-testing of the programme on EIWAs and final packaging of the retraining programme. Two groups of artisans were used in this phase. The two groups were rated independently before retraining using the rating scale (PCRRI) by their master craftsmen. Afterwards, one of the groups was retrained with the developed programme while the other group was retrained conventionally. The retraining lasted for a period of three months. PCRRI was used to rate the performance of EIWAs after retraining. The data collected from the groups before and after retraining using PCRRI were used to ascertain the effectiveness of the developed programme.

Validation of the Instrument

Two sets of instruments were validated. They are: Psychomotor Competency-based Retraining Programme for Electrical Installation Work Artisans Questionnaire (PCRPEIWAQ) and Psychomotor Competency-based Retraining Rating Instrument (PCRRI).

The face and content validation of PCRPEIWAQ was done by three experts. Two experts from the Department of Technology and Vocational Education of Nnamdi Azikiwe University, Awka and one Measurement and Evaluation expert from the Department of Educational Foundations of Adeniran Ogunsanya College of Education, Lagos State. A copy of PCRPEIWAQ was given to each of the experts to identify any ambiguity, ensure coherence of items and appropriateness for the study. The validates who are experts in Electrical Installation Trade were asked to suggest additional items deemed necessary for the study. In this regard, some items were restructured for coherence while some were removed. Specifically, a total of ten items were voided during validation.

The PCRRI was face and content validated by three experts. These experts were; a lecturer of electrical technology from Nnamdi Azikiwe University, Awka, a master craftsman from Godun

Electrical and Plumbing Tech, Awka and a technical college teacher of electrical installation works from St. John Science and Technical College, Alor in Anambra State. The validates modified some parts of the rating instrument.

Validation of the Developed Programme

The draft of the psychomotor competency-based retraining programme for EIWAs was face and content validated by three experts in electrical installation works. These experts were: a lecturer of electrical technology from Nnamdi Azikiwe University, Awka; a master craftsman from Godun Electrical and Plumbing Tech, Awka; and a technical college teacher of electrical installation works from St. John Science and Technical College, Alor in Anambra State. The validates modified some parts of the programme as well as suggested inclusion of duration for training and retraining using the programme.

Reliability of the Instrument

The instruments used for data collection were PCRPEIWAQ and PCRRI. The reliabilities of these instruments were determined thus:

In order to ensure the reliability of the PCRPEIWAQ, 15 copies of PCRPEIWAQ were administered to 15 respondents. The respondents were made up of 5 technical college teachers of electrical installation, 5 master craftsmen in EIW and 5 lecturers in electrical technology in Ogun and Lagos States. Data obtained from administration of the questionnaire were analysed using Cronbach alpha to determine the internal consistency of the instrument. SPSS version 20 was used for the calculation of alpha co-efficient. The alpha co-efficient obtained are 0.94 for the objectives, 0.88 for the contents, 0.94 for training strategies, 0.96 for training facilities and 0.92 for evaluation techniques respectively for the retraining programme. The overall reliability coefficient of 0.99 was obtained (Appendix D, page 142). The alpha co-efficient of 0.99 showed that the instrument is reliable.

To establish the reliability of the Psychomotor Competency-based Retraining Rating Instrument (PCRRI), three raters in Ogun State (which is outside the area of the study) used the instrument to rate five EIWAs. The raters were exposed to how the instrument should be used. Afterwards, Kendall's coefficient of concordance (ω) was calculated using SPSS version 20 to establish inter-rater reliability of PCRRI. A coefficient of 0.82 was obtained which was considered appropriate for the study (Appendix G, page 147).

Method of Data Collection

The PCRPEIWAQ was administered to the respondents by the researcher and five research assistants. Research assistants were used in Imo, Anambra and Abia States while the researcher was in charge of Enugu and Ebonyi States. The research assistants were given orientation on the administration and retrieval of the copies of questionnaire. A total of 132 copies of the questionnaire were distributed and 118 copies were retrieved from the respondents. This represented 89.4 percent return rate.

Master craftsmen used the PCRRI to rate the competency of artisans who were used for trial-testing of the developed psychomotor Competency-based retraining programme for EIWAs. Eleven EIWAs were retrained. These EIWAs were rated before retraining. Afterwards, one group made up of seven artisans were retrained using the developed programme for a period of three months while another group made up of four artisans were retrained on same concepts and in three months without the developed programme. The group retrained without the developed programme were retrained using the conventional methods the master craftsman uses to train his apprentices. The data collected before and after retraining by the master craftsmen from the two groups (Appendix H, page 149) using PCRRI were used to ascertain the effectiveness of the developed programme.

Method of Data Analysis

The research questions were answered using mean statistic and standard deviation. In selecting items for the programme development, the real limits of number were used for decision making. Five point Likert scale was used.

Any item with mean value of 3.50 and above was regarded as agreed upon. On the other hand, items with mean value less than 3.50 were regarded as not agreed upon. The standard deviation was used to determine the closeness or otherwise of the opinions of the respondents from the group mean.

The hypothesis was tested at 0.05 level of significance using Analysis of Covariance (ANCOVA). If the probability value (P-value) for the groups obtained after data analysis was less than or equal to 0.05 alpha value, it means that there was a significant difference while P-value greater than 0.05 implies no significant difference.

CHAPTER FOUR

PRESENTATION AND ANALYSIS OF DATA

This chapter deals with the presentation and analysis of data generated in this study. The data presentation and analysis were based on the research questions and hypothesis formulated for the study.

Research Question 1

What are the objectives of the psychomotor competency-based retraining programme?

The data for answering research question 1 are presented in Table 2.

Table 2

Mean Responses of Respondents on the Objectives of the Psychomotor Competency-based Retraining Programme for Electrical Installation Works Artisans
Number of respondents (N) = 118

S/N	Objectives of the Retraining Programme	Mean	S.D	Remark
1	prepare a clean work environment	4.49	0.725	Agreed
2	protect oneself and equipment	4.58	0.513	Agreed
3	keep tools at the designated place after use	4.33	0.887	Agreed
4	carry out interactive workplace communication	4.22	0.615	Agreed
5	Observe domestic installation safety regulations	4.45	0.648	Agreed
6	Identify hazards and risks	4.52	0.610	Agreed
7	Evaluate hazards and risks	3.99	0.929	Agreed
8	Control hazards and risks	3.98	0.906	Agreed
9	Operate safety gadgets e.g fire extinguishers	4.23	0.928	Agreed
10	Identify electrical symbols/signs	4.45	0.948	Agreed
11	Locate positions of various accessories on a drawing	4.42	0.821	Agreed
12	Identify electrical accessories needed for implementation of a given drawing	3.79	1.239	Agreed
13	Interpret the distribution system from a drawing	4.27	0.781	Agreed
14	Interpret electrical symbols/signs in a given electrical drawing	4.31	1.090	Agreed
15	Identify fittings and fixtures	4.34	0.798	Agreed

16	Relate drawings to fittings and fixtures	4.44	0.863	Agreed
17	Identify wiring systems	4.47	0.803	Agreed
18	Select an appropriate location for the point of service entrance of electrical wires and main panel	4.22	0.980	Agreed
19	Select an appropriate location for the main panel from a sketch of an electrical plan	4.08	0.883	Agreed
20	Identify cable types and sizes used for heating, cooker, sockets, lighting points, service cable	4.38	0.612	Agreed
21	Select cables based on rating, maximum load and ambient temperature	4.30	0.799	Agreed
22	Make material estimates for a given drawing	3.88	0.989	Agreed
23	State statutory regulations regarding surface and conduit wiring	4.08	0.681	Agreed
24	Fix cable to a surface	4.77	0.442	Agreed
25	Use plumb line, chalk line and spirit level	4.41	0.731	Agreed
26	Carry out simple surface wiring of residential building using appropriate tools	4.47	0.864	Agreed
27	Apply IEE and EEDC regulations regarding surface wiring	4.29	0.764	Agreed
28	Identify types of conduits such as steel conduit, flexible conduit and PVC conduit	4.56	0.607	Agreed
29	Identify tools used in conduit wiring installation	4.56	0.563	Agreed
30	Demonstrate appropriate use of tools	4.33	0.752	Agreed
31	Verbally discuss relevant conduit statutory regulations	4.19	0.657	Agreed
32	Apply relevant conduit statutory regulations	4.14	0.653	Agreed
33	Select materials and accessories	4.40	0.601	Agreed
34	Prepare conduit for Installation	4.29	0.717	Agreed
35	Use running coupler, conduit boxes, bend, elbows, tees and accessories for conduit work	4.11	0.771	Agreed
36	Draw in cables using fish wire	4.40	0.557	Agreed
37	Carry out conduit wiring installation of a residential building	4.28	0.805	Agreed
38	Apply statutory regulations guiding installation of sub-circuit	4.36	0.673	Agreed
39	Connect one-way switch circuits	4.72	0.451	Agreed
40	Connect two-way switch circuits	4.72	0.639	Agreed
41	Install isolators	4.56	0.674	Agreed
42	Install cooker outlets	4.63	0.638	Agreed

43	Install socket outlets	4.56	0.790	Agreed
44	Install circuit breakers	4.36	0.781	Agreed
45	Connect main earth	4.75	0.432	Agreed
46	Install fuses	4.73	0.636	Agreed
47	Install meters	4.30	0.870	Agreed
48	Install control panel	4.58	0.810	Agreed
49	Install distribution boxes	4.76	0.427	Agreed
50	Install lamp holders	4.84	0.369	Agreed
51	Install fluorescents	4.81	0.398	Agreed
52	Install other lighting points	4.66	0.657	Agreed
53	Install ceiling fans	4.63	0.664	Agreed
54	Inspect various parts of the installation	4.42	0.789	Agreed
55	Carry out tests (insulation, continuity, earth leakage & polarity)	4.57	0.673	Agreed
56	Connect residential installation to supply	4.71	0.455	Agreed

The data presented in Table 2 show that all the objectives formulated for psychomotor competency-based retraining programme for electrical installation artisans had their mean values ranging from 3.79 to 4.84. This implies that the mean value of each objective was above the cutoff point of 3.50 indicating that all the 56 objectives were required for psychomotor competency-based retraining programme for electrical installation artisans. Table 2 also reveals that the standard deviations (SD) of the items are within the range of 0.369 – 1.239. This indicates that the respondents were not far from one another in their responses.

Research Question 2

What are the contents of the psychomotor competency-based retraining programme?

The data for answering research question 2 are presented in Table 3.

Table 3

Mean Responses of Respondents on the Contents of the Psychomotor Competency-based Retraining Programme for Electrical Installation Works Artisans

Number of respondents (N) = 118

S/N	Contents of the Retraining Programme	Mean	S.D	Remark
57	How to keep a clean work environment	4.42	0.544	Agreed
58	Personal and equipment safety	4.28	0.504	Agreed
59	Safety regarding use and storage of tools	4.32	0.521	Agreed
60	Workplace communication/interaction and safety	4.32	0.521	Agreed
61	Domestic installation safety regulations	4.47	0.550	Agreed
62	Identification, evaluation and control of hazards and risks	4.47	0.550	Agreed
63	Domestic Safety gadgets	4.39	0.680	Agreed
64	Electrical symbols/signs	4.83	0.377	Agreed
65	Identification of electrical symbols in a drawing	4.81	0.458	Agreed
66	Interpretation of electrical drawing	4.72	0.504	Agreed
67	Identification/listing of accessories needed to implement a given drawing	4.68	0.612	Agreed
68	Fittings and fixtures	4.59	0.630	Agreed
69	Types of wiring systems	4.68	0.612	Agreed
70	Location for the point of service entrance of electrical wires and main panels	4.73	0.501	Agreed
71	Cable types, sizes and uses	4.75	0.432	Agreed
72	Cable rating, maximum load and ambient temperature.	4.58	0.841	Agreed
73	Material estimation	4.59	0.630	Agreed
74	Selection of materials and accessories	4.57	0.497	Agreed
75	Surface Wiring tools	4.47	0.550	Agreed
76	Statutory regulations regarding surface wiring	4.47	0.550	Agreed
77	Surface wiring of residential buildings	4.47	0.550	Agreed
78	Types of conduits	4.63	0.536	Agreed
79	Selection of materials and accessories	4.59	0.543	Agreed
80	Conduit Wiring tools	4.59	0.543	Agreed
81	Statutory regulations regarding conduit wiring	4.57	0.634	Agreed
82	Conduit wiring of residential buildings	4.52	0.814	Agreed
83	Statutory regulation guiding installation of final sub-circuits	4.11	0.689	Agreed

84	Connection of one-way and two-way switch circuits	4.47	0.650	Agreed
85	Installation of protective devices	4.52	0.689	Agreed
86	Earth connection	4.74	0.497	Agreed
87	Installation of socket outlets	4.42	0.619	Agreed
88	Installation of meters	4.34	0.742	Agreed
89	Installation of control panel	4.44	0.853	Agreed
90	Installation of distribution boxes	4.51	0.551	Agreed
91	Installation of lighting sub-circuits	4.61	0.490	Agreed
92	Installation of ceiling fans	3.98	0.906	Agreed
93	Inspection of installation	4.56	0.843	Agreed
94	Testing of installations	4.50	0.814	Agreed

The data presented in Table 3 show that all the contents listed for psychomotor competency-based retraining programme for electrical installation artisans had their mean values ranging from 3.98 to 4.83. This implies that the mean value of each item on the content is above the cutoff point of 3.50 indicating that all the 38 contents are required for psychomotor competency-based retraining programme for electrical installation artisans. Table 3 also reveals that the standard deviations (SD) of the items are within the range of 0.377 – 0.906. This indicates that the respondents were not far from one another in their responses.

Research Question 3

What are the appropriate instructional strategies for the psychomotor competency-based retraining programme?

The data for answering research question 3 are presented in Table 4.

Table 4

Mean Responses of Respondents on Instructional Strategies for the Psychomotor Competency-based Retraining Programme for Electrical Installation Works Artisans
Number of respondents (N) = 118

S/N	Instructional Strategies of the Retraining Programme	Mean	S.D	Remark
95	Use demonstration to show how to keep a clean work environment	4.43	0.811	Agreed
96	Discussion of personal and equipment safety	4.34	0.527	Agreed
97	Demonstration of personal and equipment safety	4.38	0.538	Agreed
98	Demonstration of safety regarding use and storage of tools	4.40	0.541	Agreed
99	Role-play the importance of communication/interaction as a means of ensuring safety in the work environment	4.22	0.474	Agreed
100	Discuss installation safety regulations using IEE and EEDC regulations.	4.24	0.565	Agreed
101	Use demonstration to show how to identify, evaluate and control hazards and risks	4.36	0.481	Agreed
102	Demonstrate how to use domestic safety gadgets	4.37	0.536	Agreed
103	visit industries/domestic construction sites to observe safety attire, tools and equipment used in different contexts	4.39	0.704	Agreed
104	Field trip to fire service station to learn how fire safety gadgets are operated in emergency situations	4.26	0.842	Agreed
105	Show samples of an electrical working drawing	4.58	0.631	Agreed
106	Use a sample drawing to show electrical symbols and also draw them	4.64	0.483	Agreed
107	Present a list of accessories and locate them on a sample drawing	4.42	0.709	Agreed
108	Using discussion method, explain each of the accessories and their uses	4.42	0.709	Agreed
109	Demonstrate the application of scale-rule on a sample drawing	4.47	0.636	Agreed
110	Demonstrate how to interpret an electrical drawing using a sample drawing	4.54	0.500	Agreed
111	Use samples of fittings and fixtures to explain what they mean	4.55	0.500	Agreed
112	Go on field trip to a house in which the electrical installation is newly completed so that trainee can see the fittings and fixtures	4.51	0.637	Agreed
113	Using samples on boards, show types of wiring systems	4.47	0.566	Agreed

114	Visits to housing sites to observe and take pictures of what is taking place with respect to location of service of entrance and main panel	4.51	0.551	Agreed
115	Use cable samples to explain types, sizes and uses of cables	4.45	0.635	Agreed
116	Field trip to show application of types, sizes and uses of cables in domestic installation	4.62	0.538	Agreed
117	Use IEE chart to explain cable rating, maximum load and ambient temperature.	4.55	0.711	Agreed
118	Field trip to show application of cable rating, maximum load and ambient temperature	4.56	0.634	Agreed
119	Demonstrate material estimation with examples of a given working drawing	4.43	0.745	Agreed
120	Present other samples of materials and accessories and discuss their uses in surface wiring	4.35	0.732	Agreed
121	Discuss principles of materials and accessories selection	4.46	0.549	Agreed
122	Demonstrate the application of the principles of materials and accessories selection	4.30	0.604	Agreed
123	Discuss uses and selection of tools	4.21	0.702	Agreed
124	Demonstrate selection and appropriate use of tools	4.40	0.629	Agreed
125	Discuss IEE and EEDC regulations regarding surface wiring	4.46	0.549	Agreed
126	Demonstrate application of IEE and EEDC regulations	4.30	0.604	Agreed
127	Demonstrate surface wiring installation using a bungalow	4.21	0.804	Agreed
128	Field trip to show on-going surface wiring of a residential building	4.27	0.501	Agreed
129	Use practical method to allow the trainee carry out surface wiring of residential building	4.42	0.544	Agreed
130	Use project method to carry out surface wiring of rooms	4.31	0.636	Agreed
131	Use assorted conduit pipes to discuss types of conduits	4.26	0.697	Agreed
132	Use discussion method to itemize and explain tools used for preparing conduit pipes	4.27	0.712	Agreed
133	Demonstrate the appropriate use of tools	4.24	0.700	Agreed
134	Use IEE regulation to discuss regulations guiding conduit installation	4.32	0.612	Agreed
135	Use demonstration to show right application of tools for preparation of conduits for installation	4.29	0.601	Agreed
136	Use group work to prepare conduits for installation	4.48	0.637	Agreed

137	Demonstrate how cables are drawn into conduits using fish wire	4.44	0.634	Agreed
138	Demonstrate how to carry out continuity test, insulation test and polarity test	4.47	0.550	Agreed
139	Field trip to see on-going conduit installations	4.45	0.500	Agreed
140	Use group work to carry out conduit installation of a building	4.41	0.630	Agreed
141	Use demonstration to show how to connect one-way and two-way switch circuits	4.31	0.606	Agreed
142	Role play to show how to connect one-way and two-way switch circuits	4.40	0.492	Agreed
143	Demonstrate installation of protective devices	4.43	0.497	Agreed
144	Demonstrate connection of main earth	4.47	0.550	Agreed
145	Demonstrate installation of socket outlets	4.39	0.540	Agreed
146	Demonstrate installation of meters	4.33	0.524	Agreed
147	Demonstrate installation of control panel	4.31	0.724	Agreed
148	Demonstrate installation of distribution boxes	4.31	0.736	Agreed
149	Demonstrate installation of lighting sub-circuits	4.34	0.669	Agreed
150	Demonstrate installation of ceiling fans	4.38	0.678	Agreed
151	Demonstrate how to conduct inspection of installations	4.45	0.548	Agreed
152	Demonstrate various tests usually carried out on installations	4.42	0.631	Agreed

The data presented in Table 4 show that all the instructional strategies formulated for psychomotor competency-based retraining programme for electrical installation artisans have their mean values ranging from 4.21 to 4.64. This implies that the mean value of each instructional strategy was above the cutoff point of 3.50 indicating that all the 58 objectives are required for psychomotor competency-based retraining programme for electrical installation artisans. Table 4 also reveals that the standard deviations (SD) of the items is within the range of 0.474 – 0.842. This indicates that the respondents were not far from one another in their responses.

Research Question 4

What are the facilities needed for effective psychomotor competency-based retraining in EIW?

The data for answering research question 4 are presented in Table 5.

Table 5

Mean Responses of Respondents on the Facilities Needed for the Psychomotor Competency-based Retraining Programme for Electrical Installation Works Artisans
Number of respondents (N) = 118

S/N	Facilities for the Programme	Mean	S.D	Remark
153	Pliers	4.84	0.369	Agreed
154	Screw drivers	4.81	0.391	Agreed
155	Wire strippers	4.81	0.391	Agreed
156	Hammers/mallets	4.75	0.492	Agreed
157	Electrician's knife	4.81	0.391	Agreed
158	Hacksaws	4.75	0.437	Agreed
159	Files	4.75	0.437	Agreed
160	Spirit level	4.79	0.469	Agreed
161	Plumb line	4.70	0.512	Agreed
162	Callipers	4.69	0.466	Agreed
163	Wire gauges	4.79	0.469	Agreed
164	Push-pull tape	4.70	0.512	Agreed
165	Meter rule/foot rule/steel rule	4.66	0.527	Agreed
166	Zigzag rule	4.49	0.748	Agreed
167	Test light	4.60	0.741	Agreed
168	Wrenches	4.66	0.527	Agreed
169	Pullers	4.75	0.492	Agreed
170	Grinding tool	4.49	0.676	Agreed
171	Portable electric drill	4.56	0.746	Agreed
172	Vacuum cleaner	4.45	0.735	Agreed
173	Pneumatic tools	4.47	0.747	Agreed
174	Air chisel/hand chisels	4.69	0.606	Agreed
175	Taps and dies	4.67	0.729	Agreed
176	Reamers	4.63	0.737	Agreed
177	Saddles	4.68	0.521	Agreed
178	Fish wire/line	4.71	0.508	Agreed
179	Micrometer gauges	4.38	0.666	Agreed

180	Utility box	4.75	0.437	Agreed
181	Connectors	4.67	0.614	Agreed
182	Plugs	4.69	0.515	Agreed
183	Junction box	4.67	0.614	Agreed
184	Circuit breakers	4.68	0.469	Agreed
185	Fuses	4.72	0.451	Agreed
186	Fuse panels/distribution panel	4.68	0.469	Agreed
187	Conduits (PVC, Metallic and Flexible types)	4.72	0.451	Agreed
188	Conduit accessories	4.47	0.550	Agreed
189	Electrical wires	4.45	0.635	Agreed
190	Cables	4.55	0.635	Agreed
191	Receptacles	4.34	0.682	Agreed
192	Switches	4.62	0.538	Agreed
193	Socket outlets	4.62	0.538	Agreed
194	Square boxes	4.43	0.547	Agreed
195	Cut out box	4.43	0.547	Agreed
196	Lamp holders	4.58	0.545	Agreed
197	Clamps	4.53	0.550	Agreed
198	Cable terminators	4.47	0.550	Agreed
199	Insulators	4.58	0.545	Agreed
200	Control panel	4.42	0.732	Agreed
201	Adapters	4.36	0.662	Agreed
202	Pencil/pen	4.40	0.541	Agreed
203	Paper	4.40	0.541	Agreed
204	Electrical symbols	4.40	0.541	Agreed
205	Electrical signs	4.36	0.534	Agreed
206	Electrical drawing/plan	4.47	0.637	Agreed
207	Cleaning agents	4.31	0.713	Agreed
208	Bulbs/fluorescents	4.36	0.661	Agreed
209	Boards	4.39	0.667	Agreed
210	Earthing accessories	4.55	0.635	Agreed
211	Megger	4.46	0.636	Agreed
212	Multimeter/multi-tester	4.56	0.548	Agreed
213	Ohmmeter	4.67	0.472	Agreed

214	Voltmeter	4.53	0.637	Agreed
215	Ammeter	4.46	0.636	Agreed
216	Calculator	4.27	0.893	Agreed
217	Vices e.g bench vice	4.47	0.623	Agreed
218	G-clamp	4.42	0.658	Agreed
219	IEE and EEDC regulation	4.26	0.973	Agreed
220	Utility meter	4.35	0.732	Agreed
221	Ladder	4.43	0.745	Agreed
222	Respirators	4.51	0.701	Agreed
223	First aid facility	4.41	0.695	Agreed
224	Hard hat/helmet	4.34	0.765	Agreed
225	Overall	4.51	0.637	Agreed
226	Safety belt	4.44	0.634	Agreed
227	Gloves	4.41	0.630	Agreed
228	Masks	4.19	0.960	Agreed
229	Safety boot	4.48	0.637	Agreed
230	Standard workshop	4.58	0.631	Agreed
231	Material store	4.47	0.748	Agreed
232	Buildings for practice	4.35	0.890	Agreed
233	Computer and accessories	4.54	0.747	Agreed
234	Projector	4.47	0.748	Agreed
235	Internet facilities	4.47	0.844	Agreed
236	Work benches	4.54	0.747	Agreed
237	Workshop chairs	4.54	0.791	Agreed
238	Ceiling fan and accessories	4.65	0.529	Agreed

The data presented in Table 5 show that all the facilities listed for psychomotor competency-based retraining programme for electrical installation artisans have their mean values ranging from 4.19 to 4.81. This implies that the mean value of each facility is above the cutoff point of 3.50 indicating that all the 86 facilities was required for psychomotor competency-based retraining programme for electrical installation artisans. Table 5 also reveals that the standard deviations (SD) of the items is within the range of 0.369 – 0.973. This means that the respondents

were not far from one another in their responses.

Research Question 5

What are the appropriate evaluation techniques for the psychomotor competency-based retraining programme?

The data for answering research question 5 are presented in Table 6.

Table 6
Mean Responses of Respondents on Evaluation Techniques for the Psychomotor Competency-based Retraining Programme for Electrical Installation Works Artisans
Number of respondents (N) = 118

S/N	Evaluation Techniques for the Retraining Programme	Mean	S.D	Remark
239	Use observation technique to assess the extent trainees maintain a clean work environment using rating scale	4.49	0.748	Agreed
240	Rating scale to rate trainees' application of personal and equipment safety during work	4.46	0.747	Agreed
241	Observe whether tools are kept at the designated place after use	4.56	0.746	Agreed
242	Design an activity to carry out interactive workplace communication and observe individual trainee participation	4.51	0.748	Agreed
243	Design an activity that will require the trainees to apply domestic installation safety regulations and rate them using rating scale	4.51	0.748	Agreed
244	Use rating scale to assess identification, evaluation and control of hazards and risks	4.57	0.745	Agreed
245	Using a rating scale, rate trainee's ability to identify electrical symbols	4.36	0.622	Agreed
246	Use checklists to assess trainee's ability to locate positions of various accessories on a drawing	4.36	0.622	Agreed
247	Rate trainee's ability to identify all electrical accessories needed for implementation of a given drawing	4.36	0.622	Agreed
248	Use Competency-based evaluation to assess trainee's skills in interpreting the distribution system from a drawing	4.43	0.634	Agreed
249	Rate trainee's skill in showing how the drawing is actually represented in a building	4.34	0.616	Agreed
250	Use rating scale to determine trainee's ability to identify fittings and fixtures	4.42	0.744	Agreed
251	Use observation technique to ascertain the extent trainee can relate drawings to fittings and fixtures	4.46	0.844	Agreed
252	Use checklists to assess trainee's ability to identify wiring systems	4.37	0.737	Agreed
253	Use interview technique to assess selection of an appropriate location for the point of service entrance of electrical wires and main panel	4.49	0.637	Agreed

254	Use questioning to assess ability to identify an appropriate location for the main panel from a sketch of an electrical installation plan	4.45	0.635	Agreed
255	Use rating scale to measure ability to identify cable types and sizes used for heating, cooker, sockets, lighting points, service cable	4.48	0.637	Agreed
256	Give assignment to trainee to measure competence in material estimation	4.42	0.743	Agreed
257	Project method to asses ability to fix cable to a surface	4.54	0.636	Agreed
258	Checklist to assess selection of cables based on rating, maximum load and ambient temperature.	4.57	0.634	Agreed
259	Rating scale to measure selection of tools	4.63	0.624	Agreed
260	Rating scale to measure appropriate use of tools	4.53	0.637	Agreed
261	Use practical project to measure competence in carrying out simple surface wiring of residential building	4.51	0.713	Agreed
262	Rating scale to measure competence in carrying out simple surface wiring of residential building using appropriate tools	4.57	0.547	Agreed
263	Process evaluation to measure competence in carrying out simple surface wiring of residential building using appropriate tools	4.51	0.637	Agreed
264	Use interview to find out knowledge of statutory regulations regarding surface wiring	4.31	0.636	Agreed
265	Use practical project to assess competence in applying IEE and EEDC regulations regarding surface wiring	4.56	0.746	Agreed
266	Use checklist to assess identification of types of conduits such as steel conduit, flexible conduit and PVC conduit	4.47	0.844	Agreed
267	Use checklist to assess identification of tools used in conduit wiring installation	4.55	0.746	Agreed
268	Use observation technique to measure trainee's skills in appropriate use of tools	4.58	0.545	Agreed
269	Questioning to ascertain knowledge of relevant conduit statutory regulations	4.36	0.622	Agreed
270	Use rating scale to determine trainee's ability to apply relevant conduit statutory regulations	4.28	0.715	Agreed
271	Use rating scale to measure competence in selection of materials and accessories	4.34	0.731	Agreed
272	Use project method to assess skills in preparing conduit for Installation	4.35	0.861	Agreed
273	Use product evaluation method to assess skills in preparing conduit for Installation	4.37	0.624	Agreed
274	Use project method to assess skills in using running coupler, conduit boxes, bend, elbows, tees and accessories for conduit work	4.31	0.882	Agreed
275	Use rating scale to assess ability to draw in cables using fish wire	4.47	0.781	Agreed
276	Group work method to assess competence in carrying out conduit wiring installation of a residential building	4.43	0.745	Agreed

277	Process evaluation method to assess trainee's competence in carrying out conduit wiring installation of a residential building	4.23	0.733	Agreed
278	Use observation method to assess skills in testing the installation as stipulated in the statutory regulations	4.31	0.722	Agreed
279	Use process evaluation method to assess skills in testing the installation as stipulated in the statutory regulations	4.31	0.852	Agreed
280	Use observation method to assess competence in installation of various sub-circuits	4.30	0.604	Agreed
281	Use product evaluation to assess competence in installation of various sub-circuits	4.38	0.773	Agreed
282	Use process evaluation to assess competence in installation of various sub-circuits	4.45	0.635	Agreed
283	Use rating scale to assess trainee's competence in installation of various sub-circuits	4.31	0.757	Agreed
284	Use questioning to assess competence in applying statutory regulation regarding installation of various sub-circuits	4.31	0.606	Agreed
285	Use interview to assess competence in applying statutory regulation regarding installation of various sub-circuits	4.41	0.630	Agreed
286	Use rating scale to assess competence in earthing	4.40	0.629	Agreed
287	Use rating scale to assess inspection skills	4.45	0.579	Agreed
288	Use checklist to assess testing processes	4.37	0.771	Agreed
289	Observation to assess ability to connect the building to supply	4.57	0.497	Agreed

The data presented in Table 6 show that all evaluation techniques identified for the psychomotor Competency-based retraining programme for electrical installation artisans have their mean values ranging from 4.23 to 4.63. This implies that the mean value of each evaluation technique is above the cutoff point of 3.50 indicating that all the 51 evaluation techniques were required for psychomotor competency-based retraining programme for electrical installation artisans. Table 6 also reveals that the standard deviations (SD) of the items is within the range of 0.497 – 0.884. This indicates that the respondents were not far from one another in their responses.

Research Question 6

What is the difference between the mean ratings of artisans retrained using the psychomotor Competency-based programme and those retrained conventionally before and after retraining?

The data for answering research question 6 are presented in Table 7.

Table 7

Means and Standard Deviations of Performance Rating of Artisans Retrained with the Developed Programme and those Trained without the Developed Programme

Source of Variance	N	Mean before training	SD	Mean after training	SD	Gain in mean	Remark
Group trained with Developed Programme	7	39.61	2.34	87.69	2.06	48.08	Positive effect
Group trained with conventional method	4	60.16	3.50	67.97	4.06	7.81	Positive effect
Difference in gain in mean						40.27	

The result shown in Table 7 reveals that the mean of the rating of the artisans before retraining is 39.61 while the mean of the rating after retraining using psychomotor competency-based retraining programme for electrical installation artisans is 87.69. This amounts to a difference of 48.08 between the rating after and before retraining. Also, the mean ratings of the artisans retrained without the developed programme before and after retraining are 60.16 and 67.97 respectively. This amounts to difference in mean of 7.81. This implies that the artisans retrained using the developed psychomotor competency-based retraining programme performed better than those retrained without it.

Test of Statistical Significance of Hypothesis

Hypothesis

There is no significant difference in the psychomotor competency mean ratings of EIWA retrained using the psychomotor competency-based programme and those retrained conventionally.

Table 8

Analysis of Covariance (ANCOVA) on the Psychomotor Competency Mean Ratings of Artisans in Electrical Installation Works Retrained with the Developed Programme and those Retrained Conventionally

Source	Type III Sum of Squares	df	Mean Square	F	P-value	Alpha level of sig.
Corrected Model	998.732[a]	2	499.366	59.976	0.000	
Intercept	102.674	1	102.674	12.332	0.008	
Pre-test	8.322	1	8.322	.999	0.347	
Groups	111.600	1	111.600	13.404	0.006	0.05
Error	66.609	8	8.326			
Total	72383.515	11				
Corrected Total	1065.340	10				

The analysis of covariance (ANCOVA) in Table 8 shows that p-value of 0.006 is less than 0.05 level of significance. This indicates that there is significant difference in the psychomotor competency mean ratings of EIWA retrained using the psychomotor competency-based programme and those retrained conventionally. The significance difference is in favour of the group retrained using the developed programme. Hence the null hypothesis was rejected. This implies that the developed programme is valid.

Summary of Findings

The following findings emerged from the study based on the research questions and hypothesis:

1. The respondents agreed that 56 objectives were suitable for the development of retraining programme for EIWAs.

2. The respondents agreed that 38 contents were suitable for the development of retraining programme for EIWAs.

3. The respondents agreed that 58 instructional strategies were suitable for the development of retraining programme for EIWAs.

4. The respondents agreed that 86 facilities were suitable for the development of retraining programme for EIWAs.

5. The respondents agreed that 51 evaluation techniques were suitable for the development of retraining programme for EIWAs.

6. There was significant difference in the psychomotor competency mean ratings of EIWA retrained using the psychomotor competency-based programme and those retrained conventionally. The difference was in favour of the group that was retrained using the developed programme.

Psychomotor Competency-based Programme Developed

From the findings of the study, the psychomotor competency-based programme was developed. The developed programme is presented as Appendix I (see page 150).

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

The discussion of findings, conclusion and implication of the study as well as recommendations are presented in this chapter.

Discussion of Findings

The discussions of the findings of this study were done in line with the purpose of the study under the following headings:

1. Objectives of the psychomotor competency-based retraining programme.

2. Content of the psychomotor competency-based retraining programme.

3. Instructional strategies for the psychomotor competency-based retraining programme.

4. Facilities needed for effective psychomotor competency-based training in EIW.

5. Evaluation techniques for the psychomotor competency-based retraining programme.

6. Effectiveness of the psychomotor competency-based retraining programme in achieving the objectives of EIW.

Objectives of the Psychomotor Competency-based Retraining Programme

Table 2 revealed that respondents agreed that 56 objectives formulated were suitable for the development of retraining programme for EIWAs. The objectives were stated in specific and measurable terms using action words such as prepare, identify, select, fix among others.

Abd-Eld-Aziz (2013) is of the view that objectives provide directions in learning and give specific aims of education. In the same vein, Bannister (2002) noted that objectives help to select content, develop instructional strategies, develop instructional materials, create assessment tests and evaluate learning outcome. These objectives serve as bench mark for assessing apprentices during and after exposing them to the training content. Objectives describe the skills artisans are

expected to possess or demonstrate after completing the retraining programme. Hence the performance of a trainee on completion of the training and retraining programme is determined in terms of achievement of the objectives. In other words, a trainee is evaluated based on these objectives. One who possesses skills as specified in the objectives is considered to be successful and vice versa.

The findings of this study on objectives of psychomotor competency-based retraining supports a study by Nwokike (2014) on skills needed for self-employment in electrical installation. Some skills found by Nwokike in domestic installation include; identify the electrical symbols in working drawing, know various items and accessories on the list, know the appropriate distribution units for single and poly phase, identify wiring materials, select types of cables (PVC, MICC, armoured), apply IEE charts on cable ratings, identify tools used for preparing conduit pipes and apply regulations guiding conduit installation. These skills and many others are contained in the 56 objectives found by the current study. This goes to say that when these objectives are achieved, the trainee can be self-reliant as these objectives were required for self-employment.

Content of the Psychomotor Competency-based Retraining Programme

The findings in Table 3 of the study revealed that all the 38 items on contents were agreed upon for the development of a retraining programme for EIWAs. The findings of this study on content confirmed what to be taught to the artisans in the programme. This means that trainees in electrical installation works should be exposed progressively to these contents in order to acquire the psychomotor skill required for competency in the trade.

The findings of this study are in line with Nwokike (2014) who determined the skills needed for self-employment in electrical installation. Nwokike specifically found that, in domestic installations, skills such as identification of symbols in working drawing, cable selection,

application of regulation among others, are required for self-employment. This study equally found these concepts among others, as part of the content of the psychomotor competency-based retraining programme.

Programme or curriculum content refers to the subject matter or what is to be taught to the learners (Val, 2016; Alvior, 2015). They further posited that contents of a programme must not be selected haphazardly. The contents that emerged as a result of this study were carefully selected in line with the objectives and so conform to this assertion.

Instructional Strategies for the Psychomotor Competency-based Retraining Programme

The findings of this study as shown in Table 4 revealed that all the 58 items on appropriate instructional strategies for the psychomotor competency retraining programme were agreed upon by the respondents. These instructional strategies include demonstration, field trip, simulation, project method among others.

These findings agreed with the findings of Ishaya and Halliru (2016) on instructional strategies in a study that was conducted to identify strategies for improving students' acquisition of practical skills in Electrical Installation and Maintenance Work Trade. Ishaya and Halliru found that demonstration, assignment, drill and practice, and apprenticeship instructional strategies significantly improved practical skills acquisition by the student. In this regard, it is vital to reiterate that the current study dwelt on psychomotor competencies which are practical based just like the study by Ishaya and Halliru (2016). Hence the findings of this study on instructional strategies strongly support the study of Ishaya and Halliru.

These instructional strategies should be used as specified in the retraining programme when delivering the training content to the trainees. This will ensure that the trainees attain the required psychomotor competency.

Facilities Needed for Effective Psychomotor Competency-based Training in EIW

The findings of this study as shown Table 5 revealed that all the 86 items on facilities for the psychomotor competency retraining programme were agreed upon by the respondents. The facilities include 27 hand and power tools, 31 materials and accessories, 19 equipment and 9 other facilities such as workshop, material store, and building for practice among others.

The findings of the study on facilities required for the psychomotor competency retraining programme is in line with the assertions of Hassan and Babawuro (2013), and Esomonu and Jen in Manabete and Makinde (2016) that educational facilities include tools, consumable materials, equipment, and infrastructure (laboratories and workshops). Manabete and Makinde specifically pointed out that facilities for Electrical Installation and Maintenance Work include workshops, laboratories, tools, equipment, instruments and consumable materials.

These facilities are required for effective training of apprentices in electrical installation works. As noted by Azonwu (2017), no significant practical training can be carried out when adequate facilities such as workshop, equipment, tools and instructional materials are lacking. Hence, there should be adequate provision of facilities such as revealed in the findings of this study for effective apprenticeship in electrical installation works to be carried out.

Evaluation Techniques for the Psychomotor Competency-based Retraining Programme

Table 6 revealed that all the 51 items on evaluation techniques for the psychomotor competency retraining programme were agreed upon by the respondents. Evaluation techniques are tools and devices employed by an instructor to determine the success or otherwise of instruction (Kolawale as cited in Ariba, 2016). The evaluation techniques found suitable for the retraining programme include observation, rating scale, checklist, competency-based evaluation, project method among others.

The findings of this study on evaluation techniques is in agreement with the findings of Ogbuanya, Akintonde and Bakare (2017) that evaluation methods such as process evaluation, product evaluation, rating scale, performance testing among others are suitable for practical lesson evaluation in electrical/electronic trade. Ogbuanya, Akintonde and Bakare further discovered that these evaluation methods were not adequately utilized.

Based on the findings of this study on evaluation techniques for the psychomotor competency retraining programme, the instructors or trainers of EIWAs are expected to employ these techniques to ascertain the extent their trainees has acquired the desired skills. This will also reveal to the trainer the extent objectives have been achieved.

Effectiveness of the Psychomotor Competency-based Retraining Programme in Achieving the Objectives of EIW

The study also sought to find the effectiveness of the psychomotor competency-based retraining programme in achieving the objectives of EIW. The result shown in Table 7 indicated difference in mean gain of 40.27 in favour of the group retrained with the developed programme. This implies that artisans retrained using the developed programme performed better than those retrained without it. Furthermore, Table 8 reveals that the mean difference is statistically significant. This finding indicates that the developed psychomotor competency-based programme is valid and effective when used for training and retraining purposes.

The findings of some related empirical literatures reviewed support the findings of this study on effectiveness of retraining programme in improving skill performance of artisans. For instance, Ariba (2016) found a significant mean difference between artisans' skill performance before and after retraining using a developed programme. Similarly, Egbita and Kanu (2015), in a study conducted to measure the effect of a training module in improving knowledge competencies for Technical and Vocational Teachers found that those trained using training module significantly improved more than those that were trained without it.

Implication of the Study

The findings of this study has a far reaching implication for electrical installation works artisans, master craftsmen, non-formal electrical installation works apprenticeship and National Board for Technical Education.

One of the findings of this study revealed that using the developed programme for retraining of artisans significantly improved their performance. The implication of this for electrical installation works artisans, master craftsmen and non-formal electrical installation works apprenticeship is that the developed programme is a training/retraining manual that should be employed for the training and retraining of artisans by the master craftsmen. This will ensure that electrical installation works apprenticeship becomes impactful.

Specifically, the findings of this study revealed the objectives, contents, instructional strategies, facilities and evaluation techniques for electrical installation works apprenticeship. These findings imply that artisans who are undergoing training have a privilege of knowing the content and components of the apprenticeship programme. The master craftsmen through the findings of this study are brought in the know of content and components of electrical installation works apprenticeship. Hence, the master craftsmen will be able to ensure that the minimum facilities are available before carrying out training/retraining. The developed programme provides a guide for electrical installation works apprenticeship in terms of objectives, contents, instructional strategies, facilities and evaluation techniques.

More so, the product of this study based on findings is the Psychomotor competency-based Retraining Programme for Electrical Installation Works Artisans. National Board for Technical Education (NBTE) need to take this programme as a guide for accreditation of the non-formal electrical installation craft practice. This will ensure that only licensed craftsmen who meet the

requirements for training/retraining as specified in the developed programme are allowed to conduct training. This will serve as a check against quacks.

Conclusion

Based on the findings of this study, it was concluded that the Psychomotor competency-based Retraining Programme for Electrical Installation Works Artisans has five major components which are; objectives, contents, instructional strategies, facilities and evaluation techniques. Also, artisans retrained using the psychomotor competency-based programme significantly achieved more than those retrained using the conventional method. This indicates that the developed programme is effective when used to retrain and train electrical installation works artisans.

Recommendations

The following recommendations were made based on the findings of this study:

1. The Licensed Electrical Contractors Association of Nigeria should henceforth enforce the use of the developed programme for training of EIWAs and also make it a requirement for securing licence to practise in Nigeria.

2. State government in the various states should enact laws that will make it compulsory for EIWAs to go through retraining to update their skills.

3. Seminar and workshops should be organised for EIWAs to drive home the need and explicate the benefits of using the developed programme for retraining and training of artisans.

4. The Government should set up an incentive scheme to reward the artisans after undergoing retraining/training.

Suggestion for Further Study

Due to the limitations of this study, the following suggestions for further study have been made:

1. The study should be replicated in other geopolitical zones of Nigeria.

2. The study should also be replicated in other areas of electrical installation craft such as industrial installation, windings of electrical machines, and battery charging and repairs.

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Appendix A

Transmittal Letter

Department of Technology and Vocational Education

Faculty of Education,

Nnamdi Azikiwe University,

Awka.

June 20, 2018

Dear Respondent,

REQUEST TO RESPOND TO A QUESTIONNAIRE

The researcher is a postgraduate student in the above named Department and University, currently carrying out a research study aimed at developing and validating a psychomotor competency-based programme for retraining electrical installation works artisans in the south east of Nigeria.

The attached questionnaire is to collect the necessary information needed for the study. Kindly respond to the items as objectively as possible. The information provided will be treated with strict confidence and will be used only for this research study.

Thank you for your cooperation.

Yours faithfully,

Agbo, Nnaemeka Martin

 (Researcher)

Appendix B

Psychomotor Competency-based Retraining Programme for Electrical Installation Work Artisans Questionnaire (PCRPEIWAQ)

Part I: Personal Information

Please, check (√) in the information box below as appropriate.

Technical College Teacher ☐ Master Craftsman ☐ Lecturer ☐ No of years of practice ☐

Part II

Please tick (√) in the appropriate column the extent to which you agree with each statement in sections A, B, C, D and E below in relation to development of a psychomotor competency-based programme for retraining Electrical Installation Works Artisans in South East of Nigeria.

Key: SA = Strongly Agree, A = Agree, U = Undecided, D = Disagree, SD = Strongly Disagree

Section A: Objectives of the Retraining Programme for Artisans in Electrical Installation Works

Item No	At the end of the Retraining Programme, Artisans in Electrical Installation Works should be able to:	SA	A	U	D	SD
	Cluster 1: Domestic Installation Safety					
1	prepare a clean work environment					
2	protect oneself and equipment					
3	keep tools at the designated place after use					
4	carry out interactive workplace communication					
5	Observe domestic installation safety regulations					
6	Identify hazards and risks					
7	Evaluate hazards and risks					
8	Control hazards and risks					
9	Operate safety gadgets e.g fire extinguishers					
	Cluster 2: Working Drawing					
10	Identify electrical symbols/signs					
11	Locate positions of various accessories on a drawing					
12	Identify electrical accessories needed for implementation of a given drawing					
13	Interpret the distribution system from a drawing					
14	Interpret electrical symbols/signs in a given electrical drawing					
	Cluster 3: Preparation for Surface and Conduit Installations					
15	Identify fittings and fixtures					
16	Relate drawings to fittings and fixtures					
17	Identify wiring systems					
18	Select an appropriate location for the point of service entrance of electrical wires and main panel					
19	Select an appropriate location for the main panel from a sketch of an electrical plan					

20	Identify cable types and sizes used for heating, cooker, sockets, lighting points, service cable					
21	Select cables based on rating, maximum load and ambient temperature.					
22	Make material estimates for a given drawing					
23	State statutory regulations regarding surface and conduit wiring					
	Cluster 4: Surface Wiring					
24	Fix cable to a surface					
25	Use plumb line, chalk line and spirit level					
26	Carry out simple surface wiring of residential building using appropriate tools					
27	Apply IEE and EEDC regulations regarding surface wiring					
	Cluster 5:Installation of Conduit					
28	Identify types of conduits such as steel conduit, flexible conduit and PVC conduit					
29	Identify tools used in conduit wiring installation					
30	Demonstrate appropriate use of tools					
31	Verbally discuss relevant conduit statutory regulations					
32	Apply relevant conduit statutory regulations					
33	Select materials and accessories					
34	Prepare conduit for Installation					
35	Use running coupler, conduit boxes, bend, elbows, tees and accessories for conduit work					
36	Draw in cables using fish wire					
37	Carry out conduit wiring installation of a residential building					
	Cluster 6: Installation of Final Sub-circuits and Protective Devices					
38	Apply statutory regulations guiding installation of sub-circuit					
39	Connect one-way switch circuits					
40	Connect two-way switch circuits					
41	Install isolators					
42	Install cooker outlets					
43	Install socket outlets					
44	Install circuit breakers					
45	Connect main earth					
46	Install fuses					
47	Install meters					
48	Install control panel					
49	Install distribution boxes					
50	Install lamp holders					
51	Install fluorescents					
52	Install other lighting points					
53	Install ceiling fans					
	Cluster 7: Inspection and Testing of Domestic Installations					
54	Inspect various parts of the installation					
55	Carry out tests (insulation, continuity, earth leakage & polarity)					
56	Connect residential installation to supply					

Section B: Contents of the Retraining Programme for Artisans in Electrical Installation Works

Item No	The following should be included in the Content of the Psychomotor Competency-based Retraining Programme for Artisans in Electrical Installation Works	SA	A	U	D	SD
	Cluster 1: Domestic Installation Safety					
57	How to keep a clean work environment					
58	Personal and equipment safety					
59	Safety regarding use and storage of tools					
60	Workplace communication/interaction and safety					
61	Domestic installation safety regulations					
62	Identification, evaluation and control of hazards and risks					
63	Domestic Safety gadgets					
	Cluster 2: Working Drawing					
64	Electrical symbols/signs					
65	Identification of electrical symbols in a drawing					
66	Interpretation of electrical drawing					
67	Identification/listing of accessories needed to implement a given drawing					
	Cluster 3: Preparation for Surface and Conduit Installations					
68	Fittings and fixtures					
69	Types of wiring systems					
70	Location for the point of service entrance of electrical wires and main panels					
71	Cable types, sizes and uses					
72	Cable rating, maximum load and ambient temperature.					
73	Material estimation					
	Cluster 4: Surface Wiring					
74	Selection of materials and accessories					
75	Surface Wiring tools					
76	Statutory regulations regarding surface wiring					
77	Surface wiring of residential buildings					
	Cluster 5: Installation of Conduit					
78	Types of conduits					
79	Selection of materials and accessories					
80	Conduit Wiring tools					
81	Statutory regulations regarding conduit wiring					
82	Conduit wiring of residential buildings					
	Cluster 6: Installation of Final Sub-circuits and Protective Devices					
83	Statutory regulation guiding installation of final sub-circuits					
84	Connection of one-way and two-way switch circuits					
85	Installation of protective devices					
86	Earth connection					
87	Installation of socket outlets					

88	Installation of meters					
89	Installation of control panel					
90	Installation of distribution boxes					
91	Installation of lighting sub-circuits					
92	Installation of ceiling fans					
	Cluster 7: Inspection and Testing of Domestic Installations					
93	Inspection of installation					
94	Testing of installations					

Section C: Instructional Strategies of the Retraining Programme for Artisans in Electrical Installation Works

Item No	The following instructional strategies should be used for the Psychomotor Competency-based Retraining Programme for Artisans in Electrical Installation Works	SA	A	U	D	SD
	Cluster 1: Domestic Installation Safety					
95	Use demonstration to show how to keep a clean work environment					
96	Discussion of personal and equipment safety					
97	Demonstration of personal and equipment safety					
98	Demonstration of safety regarding use and storage of tools					
99	Role-play the importance of communication/interaction as a means of ensuring safety in the work environment					
100	Discuss installation safety regulations using IEE and EEDC regulations.					
101	Use demonstration to show how to identify, evaluate and control hazards and risks					
102	Demonstrate how to use domestic safety gadgets					
103	visit industries/domestic construction sites to observe safety attire, tools and equipment used in different contexts					
104	Field trip to fire service station to learn how fire safety gadgets are operated in emergency situations					
	Cluster 2: Working Drawing					
105	Show samples of an electrical working drawing					
106	Use a sample drawing to show electrical symbols and also draw them					
107	Present a list of accessories and locate them on a sample drawing					
108	Using discussion method, explain each of the accessories and their uses					
109	Demonstrate the application of scale-rule on a sample drawing					
110	Demonstrate how to interpret an electrical drawing using a sample drawing					
	Cluster 3: Preparation for Surface and Conduit Installations					
111	Use samples of fittings and fixtures to explain what they mean					
112	Go on field trip to a house in which the electrical installation is newly completed so that trainee can see the fittings and fixtures					

113	Using samples on boards, show types of wiring systems					
114	Visits to housing sites to observe and take pictures of what is taking place with respect to location of service of entrance and main panel					
115	Use cable samples to explain types, sizes and uses of cables					
116	Field trip to show application of types, sizes and uses of cables in domestic installation					
117	Use IEE chart to explain cable rating, maximum load and ambient temperature.					
118	Field trip to show application of cable rating, maximum load and ambient temperature.					
119	Demonstrate material estimation with examples of a given working drawing					
	Cluster 4: Surface Wiring					
120	Present other samples of materials and accessories and discuss their uses in surface wiring					
121	Discuss principles of materials and accessories selection					
122	Demonstrate the application of the principles of materials and accessories selection					
123	Discuss uses and selection of tools					
124	Demonstrate selection and appropriate use of tools					
125	Discuss IEE and EEDC regulations regarding surface wiring					
126	Demonstrate application of IEE and EEDC regulations					
127	Demonstrate surface wiring installation using a bungalow					
128	Field trip to show on-going surface wiring of a residential building					
129	Use practical method to allow the trainee carry out surface wiring of residential building					
130	Use project method to carry out surface wiring of rooms					
	Cluster 5: Installation of Conduit					
131	Use assorted conduit pipes to discuss types of conduits					
132	Use discussion method to itemize and explain tools used for preparing conduit pipes					
133	Demonstrate the appropriate use of tools					
134	Use IEE regulation to discuss regulations guiding conduit installation					
135	Use demonstration to show right application of tools for preparation of conduits for installation					
136	Use group work to prepare conduits for installation					
137	Demonstrate how cables are drawn into conduits using fish wire					
138	Demonstrate how to carry out continuity test, insulation test and polarity test					
139	Field trip to see on-going conduit installations					
140	Use group work to carry out conduit installation of a building					
	Cluster 6: Installation of Final Sub-circuits and Protective Devices					
141	Use demonstration to show how to connect one-way and two-way switch circuits					
142	Role play to show how to connect one-way and two-way					

	switch circuits					
143	Demonstrate installation of protective devices					
144	Demonstrate connection of main earth					
145	Demonstrate installation of socket outlets					
146	Demonstrate installation of meters					
147	Demonstrate installation of control panel					
148	Demonstrate installation of distribution boxes					
149	Demonstrate installation of lighting sub-circuits					
150	Demonstrate installation of ceiling fans					
	Cluster 7: Inspection and Testing of Domestic Installations					
151	Demonstrate how to conduct inspection of installations					
152	Demonstrate various tests usually carried out on installations					

Section D: Facilities Needed for the Retraining Programme for Artisans in Electrical Installation Works

Item No	The following facilities are needed for the Psychomotor Competency-based Retraining Programme for Artisans in Electrical Installation Works	SA	A	U	D	SD
	Hand and Power Tools					
153	Pliers					
154	Screw drivers					
155	Wire strippers					
156	Hammers/mallets					
157	Electrician's knife					
158	Hacksaws					
159	Files					
160	Spirit level					
161	Plumb line					
162	Callipers					
163	Wire gauges					
164	Push-pull tape					
165	Meter rule/foot rule/steel rule					
166	Zigzag rule					
167	Test light					
168	Wrenches					
169	Pullers					
170	Grinding tool					
171	Portable electric drill					
172	Vacuum cleaner					
173	Pneumatic tools					
174	Air chisel/hand chisels					
175	Taps and dies					
176	Reamers					
177	Saddles					
178	Fish wire/line					
179	Micrometer gauges					
	Materials and Accessories					

180	Utility box					
181	Connectors					
182	Plugs					
183	Junction box					
184	Circuit breakers					
185	Fuses					
186	Fuse panels/distribution panel					
187	Conduits (PVC, Metallic and Flexible types)					
188	Conduit accessories					
189	Electrical wires					
190	Cables					
191	Receptacles					
192	Switches					
193	Socket outlets					
194	Square boxes					
195	Cut out box					
196	Lamp holders					
197	Clamps					
198	Cable terminators					
199	Insulators					
200	Control panel					
201	Adapters					
202	Pencil/pen					
203	Paper					
204	Electrical symbols					
205	Electrical signs					
206	Electrical drawing/plan					
207	Cleaning agents					
208	Bulbs/fluorescents					
209	Boards					
210	Earthing accessories					
	Equipment					
211	Megger					
212	Multimeter/multi-tester					
213	Ohmmeter					
214	Voltmeter					
215	Ammeter					
216	Calculator					
217	Vices e.g bench vice					
218	G-clamp					
219	IEE and EEDC regulation					
220	Utility meter					
221	Ladder					
222	Respirators					
223	First aid facility					
224	Hard hat/helmet					
225	Overall					
226	Safety belt					
227	Gloves					

228	Masks					
229	Safety boot					
	Other Facilities					
230	Standard workshop					
231	Material store					
232	Buildings for practice					
233	Computer and accessories					
234	Projector					
235	Internet facilities					
236	Work benches					
237	Workshop chairs					
238	Ceiling fan and accessories					

Section E: Evaluation Techniques for the Retraining Programme for Artisans in Electrical Installation Works

Item No	The following evaluation techniques should be used for the Psychomotor Competency-based Retraining Programme for Artisans in Electrical Installation Works	SA	A	U	D	SD
	Cluster 1: Domestic Installation Safety					
239	Use observation technique to assess the extent trainees maintain a clean work environment using rating scale					
240	Rating scale to rate trainees' application of personal and equipment safety during work					
241	Observe whether tools are kept at the designated place after use					
242	Design an activity to carry out interactive workplace communication and observe individual trainee participation					
243	Design an activity that will require the trainees to apply domestic installation safety regulations and rate them using rating scale					
244	Use rating scale to assess identification, evaluation and control of hazards and risks					
	Cluster 2: Working Drawing					
245	Using a rating scale, rate trainee's ability to identify electrical symbols					
246	Use checklists to assess trainee's ability to locate positions of various accessories on a drawing					
247	Rate trainee's ability to identify all electrical accessories needed for implementation of a given drawing					
248	Use competency-based evaluation to assess trainee's skills in interpreting the distribution system from a drawing					
249	Rate trainee's skill in showing how the drawing is actually represented in a building					
	Cluster 3: Preparation for Surface and Conduit Installations					
250	Use rating scale to determine trainee's ability to identify fittings and fixtures					
251	Use observation technique to ascertain the extent trainee can relate drawings to fittings and fixtures					

252	Use checklists to assess trainee's ability to identify wiring systems					
253	Use interview technique to assess selection of an appropriate location for the point of service entrance of electrical wires and main panel					
254	Use questioning to assess ability to identify an appropriate location for the main panel from a sketch of an electrical installation plan					
255	Use rating scale to measure ability to identify cable types and sizes used for heating, cooker, sockets, lighting points, service cable					
256	Give assignment to trainee to measure competence in material estimation					
	Cluster 4: Surface Wiring					
257	Project method to asses ability to fix cable to a surface					
258	Checklist to assess selection of cables based on rating, maximum load and ambient temperature.					
259	Rating scale to measure selection of tools					
260	Rating scale to measure appropriate use of tools					
261	Use practical project to measure competence in carrying out simple surface wiring of residential building					
262	Rating scale to measure competence in carrying out simple surface wiring of residential building using appropriate tools					
263	Process evaluation to measure competence in carrying out simple surface wiring of residential building using appropriate tools					
264	Use interview to find out knowledge of statutory regulations regarding surface wiring					
265	Use practical project to assess competence in applying IEE and EEDC regulations regarding surface wiring					
	Cluster 5: Installation of Conduit					
266	Use checklist to assess identification of types of conduits such as steel conduit, flexible conduit and PVC conduit					
267	Use checklist to assess identification of tools used in conduit wiring installation					
268	Use observation technique to measure trainee's skills in appropriate use of tools					
269	Questioning to ascertain knowledge of relevant conduit statutory regulations					
270	Use rating scale to determine trainee's ability to apply relevant conduit statutory regulations					
271	Use rating scale to measure competence in selection of materials and accessories					
272	Use project method to assess skills in preparing conduit for Installation					
273	Use product evaluation method to assess skills in preparing conduit for Installation					
274	Use project method to assess skills in using running coupler, conduit boxes, bend, elbows, tees and accessories for conduit work					

275	Use rating scale to assess ability to draw in cables using fish wire					
276	Group work method to assess competence in carrying out conduit wiring installation of a residential building					
277	Process evaluation method to assess trainee's competence in carrying out conduit wiring installation of a residential building					
278	Use observation method to assess skills in testing the installation as stipulated in the statutory regulations					
279	Use process evaluation method to assess skills in testing the installation as stipulated in the statutory regulations					
	Cluster 6: Installation of Final Sub-circuits and Protective Devices					
280	Use observation method to assess competence in installation of various sub-circuits					
281	Use product evaluation to assess competence in installation of various sub-circuits					
282	Use process evaluation to assess competence in installation of various sub-circuits					
283	Use rating scale to assess trainee's competence in installation of various sub-circuits					
284	Use questioning to assess competence in applying statutory regulation regarding installation of various sub-circuits					
285	Use interview to assess competence in applying statutory regulation regarding installation of various sub-circuits					
286	Use rating scale to assess competence in earthing					
	Cluster 7: Inspection and Testing of Domestic Installations					
287	Use rating scale to assess inspection skills					
288	Use checklist to assess testing processes					
289	Observation to assess ability to connect the building to supply					

Appendix C

Psychomotor Competency-based Retraining Rating Instrument (PCRRI)

Name of Artisan _____

Please tick (√) in one of the columns in each case to represent your rating of artisan on the level of skill acquired on the under-listed competencies

Name of Rater _____

Key: Excellent = 4 marks, Good = 3 marks, Fair = 2 marks, Poor = 1 mark

S/N	Psychomotor competencies to be rated	4	3	2	1
	Cluster 1: Domestic Installation Safety				
1	prepare a clean work environment				
2	protect oneself and equipment				
3	keep tools at the designated place after use				
4	carry out interactive workplace communication				
5	Observe domestic installation safety regulations				
6	Identify hazards and risks				
7	Evaluate hazards and risks				
8	Control hazards and risks				
9	Operate safety gadgets e.g fire extinguishers				
	Cluster 2: Working Drawing				
10	Identify electrical symbols/signs				
11	Locate positions of various accessories on a drawing				
12	Identify all electrical accessories needed for implementation of a given drawing				
13	Interpret the distribution system from a drawing				
14	Interpret electrical symbols/signs in a given electrical drawing				
	Cluster 3: Preparation for Surface and Conduit Wiring Installations				
15	Identify fittings and fixtures				
16	Relate drawings to fittings and fixtures				
17	Identify wiring systems				
18	Select an appropriate location for the point of service entrance of electrical wires and main panel				
19	Select an appropriate location for the main panel from a sketch of an electrical plan				
20	Identify cable types and sizes used for heating, cooker, sockets, lighting points, service cable				
21	Select cables based on rating, maximum load and ambient temperature				
22	Make material estimates for a given drawing				
23	State statutory regulations regarding surface and conduit wiring				
	Cluster 4: Surface Wiring Installation				
24	Fix cable to a surface				
25	Use plumb line, chalk line and spirit level				
26	Carry out simple surface wiring of residential building using appropriate tools				
27	Apply IEE and EEDC regulations regarding surface wiring				
	Cluster 5: Installation of Conduit Wiring				

28	Identify types of conduits such as steel conduit, flexible conduit and PVC conduit				
29	Identify tools used in conduit wiring installation				
30	Demonstrate appropriate use of tools				
31	Verbally discuss relevant conduit statutory regulations				
32	Apply relevant conduit statutory regulations				
33	Select materials and accessories				
34	Prepare conduit for Installation				
35	Use running coupler, conduit boxes, bend, elbows, tees and accessories for conduit work				
36	Draw in cables using fish wire				
37	Carry out conduit wiring installation of a residential building				
	Cluster 6: Installation of Final Sub-circuits and Protective Devices				
38	Apply statutory regulations guiding installation of sub-circuit				
39	Connect one-way switch circuits				
40	Connect two-way switch circuits				
41	Install isolators				
42	Install cooker outlets				
43	Install socket outlets				
44	Install circuit breakers				
45	Connect main earth				
46	Install fuses				
47	Install meters				
48	Install control panel				
49	Install distribution boxes				
50	Install lamp holders				
51	Install fluorescents				
52	Install other lighting points				
53	Install ceiling fans				
	Cluster 7: Inspection and Testing of Domestic Installations				
54	Inspect various parts of the installation				
55	Carry out tests (insulation, continuity, earth leakage & polarity)				
56	Connect residential installation to supply				

Appendix D

Reliability of Psychomotor Competency-based Retraining Programme for Electrical Installation Work Artisans Questionnaire (PCRPEIWAQ)

Notes

Output Created		08-JUL-2018 08:42:14
Comments		
Input	Active Dataset	DataSet2
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	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	14
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.

Notes

	RELIABILITY
	/VARIABLES=ITEM1 ITEM2 ITEM3 ITEM4 ITEM5 ITEM6 ITEM7 ITEM8 ITEM9 ITEM10 ITEM11 ITEM12 ITEM13 ITEM14 ITEM15 ITEM16 ITEM17 ITEM18 ITEM19 ITEM20 ITEM21 ITEM22 ITEM23 ITEM24 ITEM25 ITEM26 ITEM27 ITEM28 ITEM29 ITEM30 ITEM31 ITEM32 ITEM33 ITEM34 ITEM35 ITEM36
	ITEM37 ITEM38 ITEM39 ITEM40 ITEM41 ITEM42 ITEM43 ITEM44 ITEM45 ITEM46 ITEM47 ITEM48 ITEM49 ITEM50 ITEM51 ITEM52 ITEM53 ITEM54 ITEM55 ITEM56 ITEM57 ITEM58 ITEM59 ITEM60 ITEM61 ITEM62 ITEM63 ITEM64 ITEM65 ITEM66 ITEM67 ITEM68 ITEM69 ITEM70 ITEM71 ITEM72
	ITEM73 ITEM74 ITEM75 ITEM76 ITEM77 ITEM78 ITEM79 ITEM80 ITEM81 ITEM82 ITEM83 ITEM84 ITEM85 ITEM86 ITEM87 ITEM88 ITEM89 ITEM90

Notes

Resources	Processor Time	00:00:00.05
	Elapsed Time	00:00:00.06

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	14	100.0
	Excluded[a]	0	.0
	Total	14	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.987	289

Appendix E

Population Distribution for the Study

S/N	States	No. of Electrical Technology Lecturers	No. of EIW Teachers in Technical Colleges	No. of EIW Master Craftsmen
1	Abia	7	20	45
2	Anambra	20	11	75
3	Ebonyi	4	8	50
4	Enugu	11	22	62
5	Imo	4	8	50
	Total	**46**	**69**	**282**

Sources: Tertiary institutions, school boards and unions of Licensed Electricians in South East states

Appendix F

Sample Distribution for the Study

S/N	States	No. of Electrical Technology Lecturers	No. of EIW Teachers in Technical Colleges	No. of EIW Master Craftsmen
1	Abia	2	7	15
2	Anambra	7	4	25
3	Ebonyi	1	2	17
4	Enugu	4	8	20
5	Imo	1	2	17
	Total	**15**	**23**	**94**

Appendix G

Kendall's Coefficient of Concordance

NPar Tests

Notes

Output Created		13-OCT-2018 08:58:18
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	Cases Used	Statistics for all tests are based on cases with no missing data for any variables used.
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	Elapsed Time	00:00:00.03
	Number of Cases Allowed[a]	78643

a. Based on availability of workspace memory.

[DataSet2]

Kendall's ω Test

Ranks

	Mean Rank
A	5.00
B	3.00
C	3.17
D	1.00
E	2.83

Test Statistics

N	3
Kendall's ω[a]	.819
Chi-Square	9.831
Df	4
Asymp. Sig.	.043

a. Kendall's Coefficient of Concordance

Appendix H

**Raw Scores of the Groups (group retrained with Developed Psychomotor Competency
Programme for EIWAs and the group retrained conventionally)**

S/N	Group Retrained with Developed Programme	
	Pretest	**Post-test**
1	37.95	86.61
2	37.95	84.38
3	41.52	86.16
4	38.84	89.29
5	36.61	89.73
6	42.86	87.95
7	41.52	89.73

Group Retrained with Conventional Method

1	59.38	72.30
2	56.25	64.29
3	60.27	64.73
4	64.73	70.53