EFFECTS OF KOLB'S EXPERIENTIAL LEARNING MODEL AND GARDNER'S MULTIPLE INTELLIGENCE LEARNING MODEL ON STUDENTS' PSYCHOMOTOR ACHIEVEMENT IN ELECTRICAL INSTALLATION AND MAINTENANCE WORK

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Abstract

This study investigated the effects of Kolb's experiential and Gardner's multiple intelligence learning model on students' psychomotor achievement in Electrical Installation and Maintenance work. Two research questions guided the study while three hypotheses formulated were tested at 0.05 level of significance. The study adopted a quasi-experimental treatment group design and it was carried out in North West Nigeria. The population for the study was 903 National Technical Certificate II (NTC II) students offering Electrical Installation and Maintenance work in technical colleges in North-West, Nigeria. The simple random sampling technique was used to select 127 students consisting of 109 male and 18 female students assigned to two treatment groups using intact class. The instrument used for data collection was Electrical Installation and Maintenance work psychomotor achievement Test (EPAT). The instrument was developed by the researcher. To ensure content validity, the instrument was subjected to face validation by five experts. The internal consistency of the instrument was determined by using Pearson moment correlation coefficient of reliability 0.84. The data collected was analyzed using Mean to answer the two research questions while ANCOVA was used to test the three null hypotheses. The study found out, among others, that Gardner's multiple intelligence learning model was more effective than Kolb's experiential learning model in improving student's psychomotor achievement of students in Electrical Installation and Maintenance Work. There was an influence of gender on students' psychomotor achievement favouring males. However, gender had significant influence on students' psychomotor achievement. The study found a significant interaction effect of methods and gender on students 'psychomotor achievement. The study recommended among others that NBTE should incorporate Gardner's multiple intelligence learning model in the teaching/learning of Electrical Installation and Maintenance Work in Technical Colleges. In addition, workshops, seminars and conferences should be organized by Federal Ministry of Education and States Science and Technical Schools Management Board for teachers to enable them update their knowledge and skills on the use of Gardner's multiple intelligence learning model for improving students' psychomotor achievement in Electrical Installation and Maintenance Work.

Keywords: Kolb's model; Gardner's model; Technical Colleges; Psychomotor Achievement; Electrical Installation and Maintenance Work.

1.0   Introduction

Technology education is critical to sustainable national development. It has been transforming human life in one way or another for many years. It is glaring that the pace of technological transformation has been very rapid in recent times precipitating numerous challenges on daily basis. Inherently, issues challenging the sustainable existence of humankind and general wellbeing such as automation, globalization, workplace change and policies increasing personal responsibility are growing. These have necessitated a need to equip current and future citizens in general and Electrical Installation and Maintenance Work students in particular, with skills to address the rapidly evolving technology needs and challenges of the 21st century (Sani, 2018). Electrical Installation and Maintenance Work has the technology potentials to provide the needed solutions to the challenges of the millennium. The potentials of Electrical Installation and Maintenance work in providing the desired national sustainability is mirrored in the intents of its inclusion in the curriculum of Technical Colleges. However, these skill objectives are yet to be achieved in technical colleges as a result, poor psychomotor achievement of students in Electrical Installation and Maintenance work. To acquire the relevant learning experiences and skills in electrical installation and maintenance work for example, requires the use of relevant instructional methods and techniques.

Instructional methods and techniques are ways by which teachers present their course materials to learners and engage them in the task of learning the curriculum contents. Instructional methods and techniques are the tools used by the teacher for actualizing the set aims and objectives (Bello and Aliyu 2013). If the tools are faulty or inappropriate, the aims and objectives of the teaching and learning will not be achieved. It is clear from the foregoing that the possibility of Electrical Installation and Maintenance work to provide the needed solutions to the challenges of the millennium depends on the ability of Electrical Installation and Maintenance work teachers to select and maximally utilize appropriate instructional techniques and methods for their lesson delivery. The teaching methods are expected to reflect a modern society mandating the need for functioning, thinking-oriented, decision-making students. To be successful, teachers are expected to select and use a wide variety of innovative instructional strategies, because excellent and effective teaching demands high quality

techniques and a host of other devices to achieve cross critical outcomes. Nevertheless, the need for exposing the prospective students of Electrical Installation and Maintenance work to quality knowledge and skills, both practical and cognitive, remains a necessity. Educators maintain that the task can only be accomplished with a radical change from the use of teacher-centered approach in technical college programmes to the use of student-centered approaches such as the Kolb's experiential learning model (Nwosu, 2015).

1.2   Statement of the Problem

Technology has been critical to sustainable national development and positive transformation of human life. Issues that challenge the sustainable existence of human kind such as globalization, automation and workplace change are developing. This necessitates the need to equip all students, including Electrical Installation and Maintenance Work students, with knowledge and skills especially those of creativity to thrive in a rapidly evolving technology-driven world.

However, Technical Colleges as one of the institutions for the production of craftsmen often fail to satisfactorily equip Electrical Installation and Maintenance work students for this 21st century environment. The major reason for this problem is that teaching and learning in Technical Colleges especially in North-west geo-political zone, are still based predominantly on conventional methods such as lecture and demonstration. These methods promote gender disparity in learning; impede students' acquisition of requisite knowledge and skills. This often times results in learning difficulties, and poor performance of students as shown by 2019/2020, 2020/2021 and 2021/2022 NABTEB examination results. These circumstances vis-à-vis the knowledge and skill requirement of the millennium underscore the need for the shift in emphasis to the use of more students' centered instructional techniques outside conventional teaching methods. There is therefore the need for a more reformed innovative model approaches such as Kolb's Experiential Learning Model (KELM) and Gardner's Multiple Intelligence Learning Model (GMIM) in the teaching of Electrical Installation and Maintenance work in Technical Colleges in northwest geo-political zone.

1.3   Purpose of the Study

The general purpose of this study is to determine the effect of Kolb's Experiential and Gardner's Multiple Intelligence Learning Model on student's Academic achievement, Critical thinking and interest in Electrical Installation and Maintenance Work. Specifically, the study is designed to determine the:

1.   Effect of Kolb's Experiential Learning Model (KELM) and Gardner's Multiple Intelligence Learning Model (GMIM) on students' Psychomotor Achievement in Electrical Installation and Maintenance Work.
2.   Influence of Gender on students' Psychomotor Achievement in Electrical Installation and Maintenance Work.
3.   Interaction effect of Learning Models and Gender on student's Psychomotor Achievement in Electrical Installation and Maintenance Work.

1.4   Research Questions

The following research questions were posed to guide the study:

1.   What is the Effect of Kolb's Experiential Learning Model (KELM) and Gardner's Multiple Intelligence Learning Model (GMIM) on students' psychomotor Achievement in Electrical Installation and Maintenance Work?
2.   What is the influence of Gender on students' Psychomotor Achievement in Electrical Installation and Maintenance Work?

1.5   Hypotheses

The following hypotheses were tested at 0.05 level of significance:

H_{O2}: There is no significant difference in the Effects of Kolb's Experiential Learning Model and Gardner's Multiple Intelligences Learning Model on students' Psychomotor Achievement in Electrical Installation and Maintenance Work

Ho$_2$: There is no significant difference in the influence of Gender on students' Psychomotor Achievement in Electrical Installation and Maintenance Work.

Ho$_3$: There is no significant Interaction effect of Learning Models and Gender on Students' Psychomotor Achievement in Electrical Installation and Maintenance Work.

1.6   Significance of the Study

The results of this study will be of immense benefit to Educational Administrators, Electrical Installation and maintenance work Teachers, Students, Parents, Curriculum Planners and developers, Electrical Industries, especially Power Holding Company of Nigeria (PHCN)

The findings of this study on effects of Kolb's Experiential Learning Model and Gardner's multiple Intelligence Learning Model will be useful to Educational Administrators in Vocational Technical and Education when published. The findings will give educational administrators a kind of direction on the areas to retrain or organize workshop for teachers in their various colleges. Based on the findings the administrators such as principals and state science and technical school management board will organize workshops and seminars for training Electrical Installation and Maintenance Work Teachers on the effective application of either Kolb's Experiential Learning Model (KELM) or Gardner's multiple Intelligence Learning Model (GMIM) or both in their classroom teaching.

The findings of this study on effects of Kolb's Experiential Learning Model and Gardner's multiple Intelligence Learning Model will benefit the Electrical Installation and Maintenance Work Teachers in Technical Colleges if implemented or adopted. It will provide information that will serve as a guide to teachers on how to assess and identify the unique intelligence profile possessed by each student. It will help the Teachers to adopt appropriate instructional techniques, design suitable lesson plans and activities that will provide some greater ways of acquiring psychomotor academic achievement in Electrical Installation and Maintenance Work. The findings of this study on effects of Kolb's Experiential Learning Model and Gardner's multiple Intelligence Learning Model if found to have positive effect and implemented will also be of benefit to students, they will become creative, social, self-confident and self-mediating. It will also enable students acquire technical skills, problem solving skills among others required for success on, on the job in the 21st century. The findings if implemented and KELM and GMIM are allowed for teaching electrical installation and maintenance work will help to improve student's psychomotor Academic Achievements, in Electrical Installation and Maintenance Work which will also enhance their performance in National Business and Technical Examinations Board (NABTEB) Examinations. Students will also develop workplace skills such as problem solving skills and collaborative competencies that will help them adapt apply and transfer their knowledge and skills to new situations in Electrical Installation and Maintenance Work such as gaining employment in industry/ self-employment or employing others.

Electrical related industries will benefit from the findings of the study if implemented. If KELM and GMIM are applied for teaching the students of EIMW, the industries will have well trained technical college graduates who possessed technical skills, problem solving skills that will enable them to face challenges in their workplace. KELM and GMIM will enhance the students' performance in the applications of new knowledge and skills and there will be sufficient low level manpower to feed the industries.

The findings of the study on effects of Kolb's Experiential Learning Model and Gardner's multiple Intelligence Learning Model will be highly beneficial to Curriculum Planners as it will afford them the opportunity to know those pedagogical practices that are in tone with contemporary technological changes in teaching to acquire knowledge and the basic work place skills that are consistent with the need of the industries. The information that will be provided is also expected to help Curriculum Planners to develop curriculum that will incorporate Kolb's Experiential Learning Model and Gardner's Multiple Intelligence Learning Model that will facilitate training students to acquire the skills required to work and cope in the Electrical Installation and maintenance work. It will be of benefit in planning a better curriculum that will

meet the objective of the programme, this could be achieved through curriculum innovation as curriculum could be restructured to meet Kolb's Experiential Learning Model and Gardner's Multiple Intelligence Learning Model that will enable students acquired the necessary psychomotor academic achievement, in Electrical Installation and Maintenance Work.

1.7 Scope of the Study

The study covered North West Geo-Political Zone of Nigeria and investigated the Effects of Kolb's Experiential Learning Model and Gardner's Multiple Intelligences Learning Model on students' Psychomotor Achievement in Electrical Installation and Maintenance Work. The study covered domestic installation and battery charging and repair aspects of electrical installation and maintenance work. Electrical installation and maintenance work students in Second year in all the technical colleges that offered EIMW in North West, Nigeria were involved in the study.

2.0 Literature Review

Kolb's experiential learning model is one of the widely used models. University of phoenix (2017) popularized experiential learning model as the most efficient method for mastering new concepts. This model takes its root from Kolb's learning cycle. Kolb's Learning Cycle is a well-known theory which argues human beings learn from their experiences of life, even on an everyday basis. This also treats reflection as an integral part of such learning. University of Leicester (2017) reported that experiential learning theory provides a holistic model of the learning process and is a multi-linear model of adult development, both of which are consistent with what people know about how they naturally learn, grow, and develop. According to Kolb (1984), the process of learning follows a pattern or cycle consisting of four stages, one of which involves what Kolb refers to as 'reflective observation'. According to Kolb in the report of University of Phoenix (2017) knowledge results from the combination of grasping experience and transforming it. In Kolb's experiential learning model, there are four distinct segments to learning: description of concrete experience, reflections, generalizations/principles/theories and testing and application. Kolb's experiential learning model according to Kolb and Kolb (2005), sets out four distinct learning styles (or preferences), which are based on a four-stage learning cycle (Which might also be interpreted as a 'training cycle') in which 'immediate or concrete experiences' provide a basis for 'observations and reflections'. The observations and reflections are assimilated and distilled into 'abstract concepts' producing new implications for action which can be 'actively tested' in turn creating new experiences. Kolb and Kolb (2005), further explained that ideally (and by inference not always) this process represents a learning cycle or spiral where the learner 'touches all the bases', i.e., a cycle of experiencing, reflecting, thinking, and acting. Immediate or concrete experiences lead to observations and reflections. These reflections are then assimilated (absorbed and translated) into abstract concepts with implications for action, which the person can actively test and experiment with, which in turn enable the creation of new experiences. Kolb (1984) model therefore works on two levels - a four-stage cycle: Concrete Experience - (CE), Reflective Observation - (RO), Abstract Conceptualization - (AC) and Active Experimentation - (AE), and a four-type definition of learning styles, (each representing the combination of two preferred styles, rather than a two by-two matrix of the four-stage cycle styles), for which Kolb used the terms: Diverging (CE/RO), Assimilating (AC/RO), Converging (AC/AE) and Accommodating (CE/AE).

Explaining the four-stage cycle styles, Kolb and Kolb (2005), explained that diverging (feeling and watching - CE/RO) people are able to look at things from different perspectives. They are sensitive. They prefer to watch rather than do, tending to gather information and use imagination to solve problems. They are best at viewing concrete situations from different viewpoints. Assimilating (watching and thinking - AC/RO) - The Assimilating learning preference is for a concise, logical approach. Ideas and concepts are more important than people. These learners require good clear explanation than practical opportunity. They excel at understanding wide-ranging information and organising it a clear logical format. Converging (doing and thinking - AC/AE) Learners with a Converging learning style can solve problems

and will use their learning to find solutions to practical issues. They prefer technical tasks, and are less concerned with people and interpersonal aspects. Accommodating (doing and feeling - CE/AE) - The Accommodating learning style is 'hands-on', and relies on intuition rather than logic. The learners use other learner's analysis, and prefer to take a practical, experiential approach. They are attracted to new challenges and experiences, and to carrying out plans. They commonly act on 'gut' instinct rather than logical analysis.

The experiential learning model is acknowledged by academics, teachers, managers and trainers as fundamental concepts towards understanding and explaining human learning behaviour, and towards helping others to learn (Zagorac, Ivanis, Nuhbegovic, & Steiner, 2008). According to Greenway (2004), experiential learning model finds its application in a wide range of disciplines, especially in education and computer science to improve students' learning abilities. Kolb's experiential learning model, just like Gardner's multiple intelligence model, aimed at improving learning. Experiential styles refer to the preferred way individual processes information. Unlike individual differences in abilities such as Gardner, which describe peak performance, styles describe a person's typical mode of thinking, remembering or problem solving. Styles are usually considered to be bipolar dimensions whereas abilities are unipolar (ranging from zero to a maximum value). Having more of an ability is usually considered beneficial while having a particular cognitive style simply denotes a tendency to behave in a certain manner. The style is usually described as a personality dimension which influences attitudes, values, and social interaction.

Gardner's Multiple Intelligence Learning Model is a modern model that takes its root from the theory of multiple intelligences who suggests that the traditional notion of intelligence, based on intelligent quotient (IQ) testing, is far too limited. Gardner's Multiple Intelligence Learning Model according to Armstrong (2009) has eight different intelligences to account for a broader range of human potential in children and adults. Gardner also emphasizes the cultural context of multiple intelligences. Each culture tends to emphasize particular intelligence, suggests that there are a number of distinct forms of intelligence that each individual possesses in varying degrees. According to Gardner, the implication of the model is that learning/teaching should focus on the particular intelligences of each person. For example, if an individual has strong spatial or musical intelligences, they should be encouraged to develop these abilities. Gardner points out that the different intelligences represent not only different content domains but also learning modalities.

In explaining multiple intelligences model, Gardner claims that all humans have eight intelligences, to a lesser or greater extent, and that each human have a different intelligence profile. This profile is based on genetics and experiences, and makes it unique from others. The intelligences are as follows: Linguistic intelligence is the ability to use spoken and written language effectively to express oneself; Logical-mathematical intelligence is the ability to analyze problems logically, work effectively with mathematical operations, and investigate issues using the scientific method. Finding patterns and deductive reasoning are other capabilities associated with this intelligence; Musical intelligence is the ability to perform, compose, and appreciate musical patterns, including changes in pitch, tone, and rhythm; Bodily-kinesthetic intelligence is the ability to use the body for expression. People high in this intelligence use their physical coordination to master problems; spatial intelligence is the ability to recognize, use, and interpret images and patterns and to reproduce objects in three dimensions; Interpersonal intelligence is the ability to understand people's intentions, motivations, and desires. The intelligence allows individuals to work well with others; Intrapersonal intelligence is the ability to understand one, and to interpret and appreciate ones' own feelings and motivations; Naturalist intelligence is the ability to recognize and appreciate relationship with the natural world. Kolb's experiential learning model and Gardner's Multiple Intelligence Learning Model have been found to be an effective technique for increasing academic achievement of students in concepts in computer science among others in non-technical institutions unlike technical colleges.

Technical college is a type of secondary school established either by government or individual to offer technical and vocational trades leading to acquisition of knowledge and skills required for further studies or employment. Bakare (2009) defined technical college as a post primary institution equivalent to secondary school charged with the production of craftsmen and technicians. Technical colleges offer various technical and vocational trades and some of the trades include motor vehicle and mechanic work, radio and television, refrigeration and air conditioning, furniture and cabinet making, welding and fabrication, block laying and concrete work and electrical installation and maintenance work. Federal Republic of Nigeria (FRN,2004), stated that the length of trades in a technical college, like other senior secondary schools shall be three years for the craft level and four years for the advanced craft level and National Business and Technical Examinations Board (NABTEB) shall award National Technical Certificate (NTC), National Business Certificate (NBC), Advanced National Technical Certificate (ANTC), and Advanced National Business Certificate (ANBC) to the successful graduates of technical colleges. Electrical installation and maintenance work offer in technical colleges is geared towards the graduation of technicians, and craftsmen who have skills and knowledge to meet the demand of electrical/electronic industries.

Electrical installation and maintenance work (EIMW) is one of the trades offered in Technical Colleges in Nigeria. According to National Board for Technical Education (2007), EIMW was incorporated into the curriculum of technical colleges to facilitate the attainment of the objective on maintenance, service, and installation of electrical equipment and machines. National Board for Technical Education (NBTE, 2007), further explained that industrial installation is intended to provide the trainee with the knowledge and skill to carry out all types of industrial/factory electrical installations and maintenance, cable jointing is designed to provide the trainee with the knowledge and skill to enable the trainee to undertake with proficiency various methods of cable jointing and terminations, battery charging and repairs is to provide trainee with the knowledge and skill to maintain, repair and charge batteries efficiently, winding of electrical machines is designed to provide trainee with the knowledge and skill to enable him wind or rewind AC and DC rotating/static machines up to 10KVA. Solid state devices is aimed at making the circuits and domestic installation is to provide the trainee with the knowledge and skill to enable him/her carry out complete electrical installations in a building and its associated equipment (Gupta, 2013). Both battery charging and maintenance and domestic installation components of EIMW are considered in this study simply because all students offer them as fundamental aspect of EIMW.

Achievement connotes academic performance in school subject as symbolized by a score or mark on achievement test. According to Anene (2005), students' academic Achievement is quantified by a measure of the students' academic standard in relation to those of other students of his age tested with the same instrument. Bakare, (2009) also described achievement as the outcome of level of accomplishment in a specific programme of instruction in a subject area or occupation which a student had undertaken in the recent past. Academic achievement of students is the translation of the students' performance in achievement test into scores obtained in a psychomotor test. It is also the level of knowledge, skills or accomplishment in area of endeavours. However, achievement in this study relates to accomplishment of learning by a student in cognitive domain of learning. Unfortunately, Low academic achievement has been observed in electrical installation and maintenance work. It has been observed from the record of (NABTEB, 2019) that the students of electrical installation who sat for National Technical Certificate Examinations perform very low This record indicated 66.4 percent failed rate in electrical installation and maintenance work. Also, National Business and Technical Education Board (NABTEB) May/June chief examiners' report of 2020 indicated that shortcomings of using inappropriate teaching strategy partly accounted for the low academic achievement of students in electrical installation and maintenance work.

However, literature abound with statistics that gender parity could be established in science and technology classes that emphasize hands-on/activity based instructional strategies. In view

of the fact that model methods such as the inductive and deductive inquiry have been used as well as other activity-based strategies such as cooperative learning on gender issues in electrical installation and maintenance work, the result is still inconclusive. Hence, there is the need to try the Kolb's Experiential Learning Model (KELM) and Gardner's Multiple Intelligence Learning Model (GMIM) and ascertains its impact on achievement of both male and female electrical installation and maintenance work students.

3.0 Methodology

The study used quasi experimental treatment group design aimed at investigating the effects of Kolb's experiential and Gardner's multiple intelligence learning models on students' psychomotor achievement in Electrical Installation and Maintenance work in. Two research questions guided the study while three hypotheses formulated were tested at 0.05 level of significance. The population for the study was 903 National Technical Certificate II (NTC II) students offering Electrical Installation and Maintenance work in technical colleges in North-West, Nigeria. The simple random sampling technique was used to select 127 students consisting of 109 male and 18 female students assigned to two treatment groups using intact class. The instrument used for data collection is Electrical Installation Psychomotor Achievement Test (EIPAT). The instrument was developed by the researcher. To ensure content validity of the instrument, the instrument was validation by five experts. One in Measurement and Evaluation, one in Education Psychology, drawn from both Departments of Science and Adult Education and two in Electrical Technology Department of Industrial Technical Education all from University of Nigeria, Nsukka, and one in Electrical Installation and Maintenance Work from Government Technical College Malali, Kaduna. To establish the reliability of the instrument, the instrument was carried out on 30 sampled NTCII students at Government Technical College Soba, Kaduna State in North-west geo-political zone of Nigeria. The Pearson moment correlation coefficient was used to determine the internal consistency of the instrument. The reliability coefficient of the instrument was found to be 0.84. The data collected were analyzed using Mean to answer the two research questions while ANCOVA was used to test the three null hypotheses.

4.0 Results/Findings

Table 1: Mean and Standard Deviation of Pretest and Posttest Scores of Kolb's Experiential Learning Model Group and Gardner's Multiple Intelligence Learning Model Group in the Psychomotor Achievement Test.

Group	N	Pre-test		Post-test		Mean Gain	
		$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	
KELM	82	30.12	5.61	67.92	4.38	37.34	
GMILM	45	30.60	2.63	69.11	3.78	39.53	

The results presented in Table 3 show that Kolb's experiential learning model group had a Mean score of 30.12 and Standard Deviation of 5.61 in the pre-test and a Mean score of 67.92 and Standard Deviation of 4.38 in the post-test making a pre-test, post-test Mean gain of 37.34. Gardner's multiple intelligence learning model group had a Mean score 30.60 and Standard Deviation of 2.63 in the pre-test and a post-test Mean of 69.11 and Standard Deviation of 3.78, with a pre-test, post-test Mean gain of 39.53. With these results, the Gardner's multiple intelligence learning model improved students' psychomotor achievement in Electrical Installation and Maintenance Work than the of Kolb's experiential learning model.

Table 2: Mean and Standard Deviation of Pre-test and Post-test on the Influence of Gender on Psychomotor Achievement Scores of Students Taught using Kolb's Experiential Learning Model (KELM) and Gardner's Multiple Intelligences Learning Model (GMIM)

Group	Gender	N	Pre-test scores		Post-test scores		Mean Gain
			$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$
KELM							
	M	74	29.45	5.48	68.79	3.54	39.34
	F	8	36.25	1.83	59.75	2.54	23.50
GMIM	M	35	31.05	2.43	68.82	3.53	37.77
	F	10	29.00	2.78	69.9	4.55	40.90

The data presented in Table 11 show the influence of gender on Electrical Installation and Maintenance Work students' cognitive achievement when exposed to Kolb's experiential learning model. Result showed that the male students taught with Kolb's experiential learning model had a pre-test mean of 29.45 with a standard deviation of 5.48 and post-test mean of 68.79 with a standard deviation of 3.54. The difference between the pre-test and post-test mean for the male students is 39.34. The female students taught using Kolb's experiential learning model had a pre-test mean of 36.25 with a standard deviation of 1.83 and a post-test mean of 59.75 with a standard deviation of 2.54. The difference between the pre-test and post-test mean for the female students is 23.50 Hence, the males taught with Kolb's experiential learning model achieved higher (39.34 > 23.50) than their female counterparts. Also, the data presented in Table 10 show the influence of gender on student's psychomotor achievement when exposed to Gardner's Multiple Intelligence Learning Model. Result showed that the male students taught with Gardner's Multiple Intelligence Learning Model had a pre-test mean of 31.05 with a standard deviation of 2.43 and a post-test mean of 68.82 with a standard deviation of 3.53. The difference between the pre-test and post-test mean for the male students is 37.77. The female students taught using Gardner's Multiple Intelligence Learning Model had a pre-test mean of 29.00 with a standard deviation of 2.78 and a post-test mean of 69.9 with a standard deviation of 4.55. The difference between the pre-test and post-test mean for the female students is 40.90. Hence, the females taught with Gardner's Multiple Intelligence Learning Model achieved higher (40.90 > 37.77) than their male counterparts. Therefore, there is no gender influence on students' psychomotor achievement in Electrical Installation and Maintenance Work.

Hypothesis 1, 2 and 3

There is significant difference in the effect of Kolb's Experiential Learning Model and Gardner's Multiple Intelligences Learning Model on methods, gender and interaction effect of methods and gender of students' psychomotor achievement in Electrical Installation and Maintenance Work.

Table 3: Analysis of Covariance (ANCOVA) of the Difference in the Influence of Gender on Mean Psychomotor Achievement Scores of Electrical Installation and Maintenance Work Students Taught with KELM and those Taught with GMIM.

Tests of Between-Subjects Effects

Dependent Variable: post-test.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	849.702[a]	4	212.425	18.999	0 .000
Intercept	13952.015	1	13952.015	1.248E3	0.000
Psychomotor pre-test	211.269	1	211.269	18.8696	0.000
Method	260.228	1	260.228	23.274	0.000
Gender	157.636	1	157.636	14.099	0.000
method * gender	190.512	1	190.512	17.039	0.000
Error	1364.062	122	11.181		
Total	595051.000	127			
Corrected Total	2213.64	126			

a. R Squared = .384 (Adjusted R Squared = .364)

*Significant at sig of F< 0.05.

The results in Table 3 show that an F-ratio of 14.099 with associated probability value of 0.000 was obtained with regard to the difference in the influence of gender on mean psychomotor achievement scores of male and female students taught with Kolb's experiential learning model and those taught with Gardner's multiple intelligence learning model. Since the associated probability (0.000) is less than 0.05, the null hypothesis of no significant mean difference between the influence of gender (male and female) on students' psychomotor achievement in Electrical Installation and Maintenance Work was rejected. Hence, there is significant difference in the mean achievement scores of male and female students when exposed to Kolb's Experiential Learning Model and Gardner's Multiple Intelligence Learning Model. This implies that the use of Kolb's Experiential Learning Model and Gardner's Multiple Intelligence Learning Model result in significant difference in the mean psychomotor achievement scores of male and female Electrical Installation and Maintenance Work students.

5.0 Discussion of Results

The data presented in Table 1 provided answer to research question 1. It was revealed that Kolb's experiential learning model and Gardner's multiple intelligence learning model are effective in improving students' psychomotor achievement in Electrical Installation and Maintenance Work, but the effect of Gardner's multiple intelligence learning model in improving students' psychomotor achievement in Electrical Installation and Maintenance Work is higher than Kolb's experiential learning model. The result indicates that Gardner's multiple intelligence learning model is more effective in improving students' psychomotor achievement in Electrical Installation and Maintenance Work. However, analysis of covariance was used to test the second hypothesis (Table 2) at an F-ratio of 23.39 with associated probability value of 0. 000 was obtained with regards to the difference in the mean scores of Electrical Installation and Maintenance Work students taught with Kolb's experiential learning model and those taught with Gardner's multiple intelligence learning model. Since the associated probability (0.000) was less than 0.05, the null hypothesis (HO_1 was rejected. The result means that there was significant mean difference between the effect of Kolb's experiential learning model and Gardner's multiple intelligence learning model on students' psychomotor achievement in Electrical Installation and Maintenance Work.

The above findings are consistent with the findings of (Meller and Kauffman, (2003), who on their study explained that student's activities in this group include: Active imagination, cartooning, drawing, modelling, building, and painting, sculpturing and set designing. Teachers of Electrical Installation and Maintenance Work can use and also involve students in drawing different electrical systems and symbols in the classroom and using same to trace components and faults in Domestic Installation. Students who are dominant in this intelligence have strong body awareness and a sharp sense of physical movement. They communicate best through body language, physical gestures, hands-on activities, active demonstrations and performance tasks (Scott, 2002). Teachers of Electrical Installation and Maintenance Work can involve students in active hands-on activities such as tracing and rectification of electrical problems, disassembly and assembly of different parts to tap into this intelligence consequently, improved students' technological understanding by applying theoretical principles to real life situations. This, therefore, also enhanced their manipulative skills and mastery of problem-solving strategies which led to their considerable psychomotor achievement.

The data presented in Table 2 provided answer to research question two. Findings revealed that gender has no influence on students' psychomotor achievement in Electrical Installation and Maintenance Work when exposed to Kolb's experiential learning model and Gardner's multiple intelligence learning model. However, analysis of covariance was used to test the second hypothesis (Table 3) at an F-ratio of 14.09 with associated probability value of (0.000) was obtained. Since the associated probability (0.000 was less than 0.05, the null hypothesis (HO_2) was rejected. The results showed that male students did not perform significantly better than their female counterparts in psychomotor achievement test when taught using Kolb's experiential and Gardner's multiple intelligence learning models. This means that the

difference between the mean scores of male and female subjects of this study in Electrical Installation and Maintenance Work psychomotor achievement test was statistically significant. However, the finding of this study agreed with that of Abayomi (2015) who discovered that female students showed a higher improvement in creativity than their male counterparts when exposed to learning by doing. Despite the fact that male Electrical Installation and Maintenance Work significantly outperformed their female counterparts in achievement for probable reasons aligned to students' socio-cognitive and stereotypical perspectives, the unique activities/conversations in Kolb's experiential learning model and Gardner's multiple intelligence learning model offered opportunity for both genders to operate equally to such an extent, though significant for females to acquire creative skill slightly higher than their male counterparts agree with the findings of Ayang, Edu and Idaka (2012) who found male students portray higher psychomotor abilities in basic electricity than their female counterparts. Ayang, Edu & Idaka attributed their findings to the fact that male students possessed superior positive self-concept and attitude than their female counterparts towards technical subjects than any other factor.

Analysis of covariance was used to test the third hypotheses (Table 3) at an F-ratio of 17.03 with associated probability value of (0.000) was obtained. Since the associated probability (0.000 was less than 0.05, the null hypothesis (HO$_3$) was rejected. The result indicated that the null hypothesis of significant interaction effect of methods and gender on students taught with Kolb's experiential learning model and Gardner's multiple intelligence learning model gender with respect to their mean scores in Electrical Installation and Maintenance Work psychomotor achievement test was rejected at the confidence interval of 0.05. This result implies that the effectiveness of Kolb's experiential learning model and Gardner's multiple intelligence learning model on students' psychomotor achievement in Electrical Installation and Maintenance Work has no influence on gender.

6.0 Recommendations

Based on the findings, the following recommendations are hereby made:

1. The National Board for Technical Education (NBTE) curricular content packages in the minimum standard should be restructured to aid Electrical Installation and Maintenance Work students' training through Gardner's multiple intelligences learning model.
2. Technical College Teachers should use Gardner's multiple intelligences learning model in teaching Electrical Installation and Maintenance Work.
3. The state and local government in conjunction with the Federal Ministry of Education should endeavor to organize in-service training in form of workshops, seminars, conferences and symposia regularly for Electrical Installation and Maintenance Work Teachers to enable them update their knowledge, attitudes and skills on the use of innovative teaching strategies such as Gardner's multiple intelligences learning model.

7.0 Conclusion

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

Kolb's experiential learning model and Gardner's multiple intelligences learning model are effective in enhancing students' psychomotor achievement in Electrical Installation and Maintenance Work. However, Gardner's multiple intelligences learning model is more effective than Kolb's experiential learning model. It was also concluded that there was significant difference in the performance of students taught with Gardner's multiple intelligence learning model when compared with those taught with Kolb's experiential learning model. The study also concluded that there was significant difference in the interaction effects of methods and gender on students' psychomotor achievement when taught Electrical Installation and Maintenance Work with Gardner's multiple intelligences and Kolb's experiential learning models in the Technical Colleges of North-Western States of Nigeria.

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