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Construction Of 5KVA Inverter And Charge Controller: Implications On Electrical Technology Students Practical Skills Acquisition In Federal College Of Education (Technical) Ekiadolor

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ABSTRACT

The study focuses on Construction of 5kva inverter and charge controller: implications on electrical technology student's practical skills acquisition in federal college of education (technical). The aim of this study is to assess how hands-on experience in designing and building inverter and charge controller enhances students' understanding and competency in electrical technology. The study had three objectives, three research question and one hypothesis which guided the study. The study was conducted in federal college of education technical Ekiadolor**.** The study employed Research and Development (R & D) incorporating a quasi-experimental research design. The population for this study comprised all the NCE II students studying electrical/electronic technology in Federal college of education (technical) Ekiadolor. The study was a census as the entire population was studied. The instrument for data collection was titled: Construction of Inverter and Charge Controller Performance Rating Scale Test (CICCPRST), which was develop and validated by two experts. The reliability co-efficient of CICCPRST was determined using Analysis of Co-variance and .75 was obtained as the reliability coefficient. The test results was gathered by the research assistants and submitted to the researcher for analysis. The findings of the study revealed that the Students taught identification of electrical technology practical tools, dismantling and coupling of electrical equipment and maintenance of electrical equipment and devices using design and construction of 5kva inverter and charger controller performed higher than those taught without design and construction of inverter and charger controller. Based on the findings of study it recommended that the

Keywords: College of Education**,** Electrical/Electronic Technology, Construction, Inverter, Charger Controller. Skill Acquisition

INTRODUCTION

The unique power of education acts as a promoter for wider development goal of any nation. Education is meant to solve the problems of the society; and since new problems keep surfacing in the society from time to time, education too must respond accordingly to keep relevant (Bassey and Saue, 2024). The development goal of education can only be fully realized, if education is equitable beyond mere enrollment or completion rates but to meet the Sustainable Development Goals (SDGs). It is therefore vital that nations focus on the quality of teaching and learning in the classroom throughout the education lifecycle (Global Monitoring Report, World Bank, 2015). To meet up with the SDGs through the power of education is a serious financial investment which is currently beyond the reach of developing country

like Nigeria but innovative solutions such as those offered by Information and communication technology (ICT) can go a long way in bridging the gap (UNESCO, 2014). In line the assertion above, College of Education was established.

College of Education is the unit of tertiary education in Nigeria saddled with the responsibility of training teachers to obtain non-degree but qualitative professional certificate in education. The origin of Colleges of Education in Nigeria dates back to the 1950s. In the report of Ashby Commission of 1959, it is evident that there was a need to provide middle level manpower to meet Nigerian needs in the area of teaching manpower. It was observed that many teachers were not certificated and trained. This observation was followed by a suggestion for greater expansion of intermediate education for intermediate teachers, which was targeted at upgrading the existing teaching force (Isiyaku, 2007). The assertion however, underscores the major aim of Colleges of Education (Technical) according National Commission for Colleges of Education NCCE, (2008) as to produce qualified technical trade teachers and practitioners of technology capable of teaching introductory technology in junior secondary schools and to produce National Certificate of Education (NCE, (Technical) trade teachers who will be able to inculcate scientific and technological attitudes and values into the society.

Electrical/electronic technology program in tertiary institutions is to prepare and produce qualified graduates with the precise skills to participate in industrious work as well as for self-reliance. Electrical/electronic Technology is a course of study where students acquire knowledge and practical skills about various electronic appliances to fulfil human life needs. It deals with services and operations of machines, power tools, digital and analogue devices, electrical installation and systems that use conductors and metals to conduct a current or flow of electrons. Electronics, a field that uses devices that rely on the flow of electrons through semiconductors and vacuum, is a crucial component of the technology required for human and societal growth. The importance of electronic is seen in our homes, religion institutions, schools and healthcare centers. Electrical/electronic technology is one of the technical education courses in colleges of education where students are expected to acquire knowledge and practical skills for paid job after graduation. Electrical/electronic engineering technology in Nigeria Certificate in Education is designed to impart on the students specialized and useable skills in the field of technology. Electrical/Electronic technology skills perfection are made manifest to students in psychomotor domain though they originated from the general foundational basic skills such as: (a) ability to reason (b) ability to re-adjust one's own terms to cultural flux (c) ability to control and spend ones time with intelligence and purpose (d) ability to achieve and sustain rewarding relationship with others and (e) ability to preserve and extend ones uniqueness while participating harmoniously in the society (Olaitain, 1996 cited in Ogbu 2015). Electrical/Electronic Technology skill competency according to Usman (2020), poster students employability ability and be gainfully employed, either on a paid or self-employed or becoming self-employed and able to employ others. Electrical/Electronic technology encompasses not only the design and manufacture of all of the aforementioned Electrical systems, but also their installation, testing, and maintenance with high skills.

Skill acquisition can be defined as the form of training by individuals or group of individuals that can lead to acquisition of knowledge for self-sustenance. Skill acquisition is the manifestation of idea and knowledge through training which is geared towards instilling in individuals, the spirit of entrepreneurship needed for meaningful development (Donli in Idoko, 2014). Donli further, stressed that if individuals are given the opportunity to acquire relevant skills needed for self-sustenance in the economy, it will promote their charisma in any work environment. Accordingly, Magbagbeola (2004) posited that skills acquisition requires the accumulation of different skills that enhances task performance through the integration of both theoretical and practical forms of knowledge. It involves the training of people in different fields of trade under a legal agreement between the trainers and the trainees for certain duration and under certain conditions. Similarly, Ochiagha (1995) as cited in Idoko (2014) deposited that skill acquisition as the process of demonstrating the habit of active thinking or behaviour in a specific activity. He further stated that skill acquisition is seen as the ability to do or perform an activity that is related to some meaningful exercise, work or job. Ochiagha, maintains that for skill to be acquired,

appropriate knowledge, attitudes, habits of thought and qualities of character are learnt to enable the acquirer develop intellectual, emotional and moral character which prepares him or her for a brighter future. Skills in electrical/electronic technology entails the abilities to design and develop high voltage systems and components that are used in light and heavy machinery, such as motors, generators, electrical power transmission and distribution systems, radio wave and visual instrument, converters, and switch systems (Hassan, 2021). Electrical/Electronic Know-how covers Electrical domestic fittings skills, Electrical industrial connection skills, technical work specific skills, transferable skills competency, intellectual skills competency, and safety skills competency as well as inverter and charge controller construction skills.

Electrical/Electronic construction is the process of building electronic circuits, equipment and device. Electronic equipment refers to devices that work by using electric currents or electromagnetic fields. They are equipment that generates, transfers, or measures these currents and fields. Electronic equipment contains transistors or silicon chips that control and change the electric current passing through the device. It generally comprises of an enclosure, assortment of electrical components, and often a power switch. Examples of these include: Lighting, an inverter and a charge controller that regulates the flow of electricity between solar panels and batteries in a solar power system. A solar charge controller, also known as a regulator, is a device that controls the voltage and current of electricity from solar panels to batteries and other electrical loads. A charge controller's main function is to prevent batteries from overcharging and deep discharging, which can damage them and reduce their performance. It also compensates for temperature and manages load. When the charging voltage is higher than the protection voltage, the battery is automatically disconnected. Once the voltage drops to the holding voltage, the battery enters a floating charge state. An inverter is an electrical power converter that changes direct current (DC) to alternating current (AC) (Institute of Electrical and Electronics Engineers IEE, 2000). It performs the opposite function of a rectifier which converts AC to DC. Dc-to-Ac converters are known as inverters. Variation of dc input voltage to a symmetrical Ac output voltage of desired magnitude and frequency is a major function an inverter. The output voltage could be fixed or variable at a fixed or variable frequency. The design and construction of a 6KVA inverter which converts 48 VDC from a battery to 240Vac, 6KVA output which can be used to power electrical technology circuits such as computers and other departmental equipment. Also wireless control system will be integrated into the inverter to reduce the stress involved in manual switching of the inverter.

The 6KVA inverter is a Pure Sine Wave inverter**.** The pure sine wave inverter denotes the modern inverter technology. The waveform created by this device is same as or better than the power conveyed by the value. Usually sine wave inverters are more expensive than the improved sine wave inverters due to their added circuitry (Institute of Electrical and Electronics Engineers IEE, 2000). The aim and objectives of designing and constructing of 6KVA inverter and charge controller are to produce teaching aid/resources that can facilitate the teaching and learning in electrical and electronics technology, solves the problem of power supply and promote acquisition of practical skills among electrical technology students in Federal college of education (technical) Ekiadolor. The 6KVA inverter and charge controller are important teaching aid/resources that can help students develop practical skills. However, these devices are dismount (dismantling) appropriate maintenance. Dismounting is a method in which components are removed in a constructive or destructive manner. It is the careful separation of machine or structure into its component parts. According to Ntegwung and Iyagbaye (2022), dismantling of a structure is often connected with the need to destroy the covered concrete or metal structures that are used to fix it. After disassembling is carried out, the removed equipment components are sorted and exported to the storage location and or inspected. Dismantling of inverter and charge controller in electrical/electronic technology workshop are carried out with the used of electrical tools. However, electrical tools are used for practical teaching and learning.

Teaching according to Ike (2012) is a polymorphous, dynamic and communicative process between the teacher and the learners. All teaching is carried out for a purpose to generate learning in students in order to produce an educated person. Teaching is a series of interactions between someone in the role of teacher

and someone in the role of a learner, with the explicit goal of changing one or more of the learners' cognitive states (Okujagu, 2013) Pollard, et al., (2008) opined that teaching is a complex and highly skilled activity which, in all demands that classroom should exercise judgment in deciding how to act. On the other hand, learning is developmental as new learning builds upon previous learning. Crow and Crow (1973) cited in Mangal and Mangal (2009) stated that, "learning is the acquisition of habits, knowledge and attitudes." It implies new ways of doing things and it involves an individual's attempts to overcome hindrances or to adjust to a new situation. Indeed, teaching and learning cannot be totally isolated from the teaching resources which invariably aides the entire teaching and learning process.

Teaching and learning resources are materials that teachers use to help students meet learning objectives and expectations. Teaching and learning resources form a vital aspect of teaching and learning, hence their significance in school curriculum implementation. Regular utilization of appropriate teaching and learning resources aids retention thereby promoting permanence in learning. Teaching and learning resources available within an educational institution have a positive relationship with the quality of teaching and learning activities which in turn leads to the attainment of set goals. This is because students learn and assimilate better when most of the senses are appealed to by the instruction and the use of instructional materials provides the required sensory experiences needed by the learners for an effective and meaningful behavioral change. National Policy on Education (2011) highlighted the objectives of instructional materials as to; enhance teaching and improve the competence of teachers, make learning more meaningful to students, and develop the effective use of innovative materials in schools. Aina cited in Muhammad (2023), stressed that, instructional materials are those materials or resources used in any teaching exercise to promote a greater understanding of the learning experiences. Teaching and learning resources are materials or tools used by a teacher to enhance classroom instruction. Teaching resources arouses the interest of learners. The 6KVA inverter and charge controller are Teaching and learning facilities that can be used to arouse the interest of learners. According to Ezeanichinedu (2017), instructional facilities as a systematic way of designing, carrying out and evaluating the total process of learning and teaching in terms of specific, objective to bring about more effective learning. Utilization of designing and construction methods in teaching will improve the acquisition of practical skills. Ibrahim (2011) classified instructional aids as printed and reference materials, graphic materials, display materials, projected materials, audio and visual materials and community resource. Corroborating with the above, Afolabi (2012) posited that teaching and learning resources refers to the site, building, furniture and equipment that contribute to a positive learning environment and quality of education for all students. It is critical that teachers keep in mind the purpose for which these instructional materials are used, the characteristics and the special need of pupils to be taught by using them and the bases for selecting the materials most be to help the learners achieve the objectives of their study.

Statement of Problem

Electrical/Electronic Technology is one of the Technical education courses in colleges of education (Technical) where students are expected to acquire knowledge attitudes and skills for paid or self-employment after graduation. The Nigeria Certificate Education (NCE) programme which is Electrical/Electronic technology is designed to impart on the students specialized and useable skills in the field of education and technology. Also The objectives technical education programme which Electrical/Electronic Technology is included in colleges of education as enshrined in the Minimum Standard document of National Commission for Colleges of Education (NCCE) include among others: to produce NCE Technical Teachers who will be able to inculcate Scientific and Technological attitudes and values into the society and to produce qualified technical teachers motivated to sustain the much-desired revolution of Technological development right from the Nigerian Schools. Studies and experiences of the researchers have shown that many NCE Electrical/Electronic Technology teachers produced from colleges of education (Technical) are not sufficiently equipped with practical skills to inculcate Scientific and Technological attitudes and values into the society. What then could be the result of this skills gap? Could it be that, the Minimum Standard document of National Commission for Technical education in Colleges of Education (Technical) is obsolete or could it be that proper instructional methods are not used

for practical content delivery? The problem of this study is therefore, the construction of 5kva inverter and charge controller: implications on electrical technology student's practical skills acquisition in federal college of education (technical).

Purpose of the Study

The purpose of the study is to design and construct 5kva inverter and charger controller. Specifically the study sought to Investigate:

1. the effect of design and construction of 5kva inverter and charger controller on students' performance in identification of electrical technology practical tools in Federal college of education (technical) Ekiadolor.
2. the effect of design and construction of 5kva inverter and charger controller on students' performance in dismantling and coupling of electrical equipment in Federal college of education (technical) Ekiadolor.
3. the effect of design and construction of 5kva inverter and charger controller on students' performance in maintenance of electrical equipment and devices in Federal college of education (technical) Ekiadolor.

Research Questions

1. What is the effect of design and construction of 5kva inverter and charger controller on students' performance in identification of electrical technology practical tools in Federal college of education (technical) Ekiadolor.

2. What is the effect of design and construction of 5kva inverter and charger controller on students' performance in dismantling and coupling of electrical equipment in Federal college of education (technical) Ekiadolor.

3. What is the effect of design and construction of 5kva inverter and charger controller on students' performance in maintenance of electrical equipment and devices in Federal college of education (technical) Ekiadolor

Hypothesis

The following null hypotheses were tested at the .05 level of significance

H_{o1}: There is no significant difference between the mean performance scores of students exposed to designing and construction of 5kva inverter and charger controller and those that were not involved in designing and construction of 5kva inverter and charger controller in Federal college of education (technical) Ekiadolor.

Literature Review

In recent years, there has been an increasing focus on hands-on learning approaches in electrical/eletronic technology education. The design and construction of inverters and charge controllers are critical components of electrical/eletronic technology education. These devices not only play a vital role in renewable energy systems but also serve as practical learning tools for electrical/eletronic technology students. Understanding the implications of these equipment on practical skills acquisition is essential in shaping effective educational strategies. This literature review blends current research findings related to instructional methods, practical skill development, and the overall impact on student learning within the context of electrical/eletronic technology programs. The flipped classroom model has emerged as a promising pedagogical strategy for enhancing student engagement and practical skills acquisition in electrical technology. Love et al. (2014) demonstrate that active learning environments, where theoretical concepts are learned outside of the classroom, allow students to dedicate class time to hands-on projects, such as building inverters and charge controllers. This method not only deepens understanding of electrical systems but also fosters practical skill development through real-world applications (Love et al., 2014). The findings suggest that this approach could significantly enhance the educational experience for students, making them more adept at designing and constructing essential electrical components. In conjunction with the flipped classroom model, problem-based learning (PBL) presents another effective strategy for engaging students in practical skills acquisition. Reza and Baig (2015) highlight the

importance of PBL in promoting critical thinking and problem-solving abilities among students. When applied to the context of inverter and charge controller design, PBL encourages students to tackle real-world challenges, thereby enhancing their technical competencies. The positive impact of PBL on student engagement and practical skills aligns with the objectives of electrical technology education, suggesting that integrating PBL into curricula could lead to improved workforce readiness (Reza & Baig, 2015). Research indicates a strong correlation between practical skills and academic performance in technical disciplines. The findings from Nguyen et al. (2019) underscore the importance of hands-on experiences in improving academic outcomes in ICT and engineering fields. In the context of electrical technology, practical engagement with inverters and charge controllers can serve as a pivotal factor in shaping students' academic success. By establishing a framework that connects practical skills with academic performance, educators can gain insights into how to better facilitate learning experiences and ensure that students acquire the necessary competencies for future employment (Nguyen et al., 2019) Despite the promising findings related to pedagogical strategies and practical skills acquisition, several knowledge gaps remain. Firstly, there is a need for empirical studies that quantitatively measure the impact of specific teaching methods, such as the flipped classroom and PBL, on students' ability to design and construct inverters and charge controllers. Future research could explore the long-term effects of these educational strategies on students' career trajectories in the field of electrical technology. Additionally, while current literature emphasizes the importance of practical skills, there is limited exploration of how these skills are assessed and integrated into existing curricula. Future studies could investigate effective assessment methods that accurately reflect students' competencies in designing and constructing electrical systems. Finally, research should also consider the role of emerging technologies, such as simulation software and digital tools, in enhancing practical skills acquisition in electrical technology education. Understanding how these tools can be effectively integrated into teaching practices will be crucial for preparing students for the demands of modern electrical engineering environments

METHODOLOGY

The study employed Research and Development (R & D) incorporating a quasi-experimental research design. This is because quasi-experimental designs identify a comparison group that is as similar as possible to the treatment group in terms of baseline (pre-intervention) characteristics.. In other words, quasi-experimental design involves the use of pre-test and post-test design with experimental and control groups (Ogundu, 2011). This design according to Ali (2006) cited in Wilson (2022) is often used in classroom experiment, when experimental and control groups are assembled as intact classes and no possibility of randomization. Research and Development (R & D) is a general term for all those investigative activities that an educational institute conducts with the intention of making a discovery that can either lead to the development of new educational products (e.g., curricula, learning materials) or procedures (e.g., teaching or assessment procedures), or to improvement of existing educational products or procedures. The study was carried out in Federal college of education (technical) Ekiadolor, Benin city Edo State. The population for this study comprised all the NCE II students studying electrical/electronic technology in Federal college of education (technical) Ekiadolor. The study was a census as the entire population was studied. The instrument for data collection was titled: Construction of Inverter and Charge Controller Performance Rating Scale Test (CICCPRST),. CICCPRST was used to test the students' performance in Electrical/electronic technology using designing and construction of 5kva inverter and charger controller to teach the students in identification of electrical technology practical tools, dismantling and coupling electrical equipment and maintenance of electrical equipment and devices skills. CICCPRST contained 30 rating items. The test items were validated by two (2) experts from the Department of Electrical/Electronic Technology in Federal College of Education (Technical) Ekiadolor. They checked and made some observations which the researcher used to modify and qualify the instrument (CICCPRST) for effective instruction and worthy of use. The reliability co-efficient of CICCPRST was determined using Analysis of Co-variance and .75 was obtained as the reliability coefficient. The test was administered on the students by Electrical lecturers in each group. The test results was gathered by the

research assistants and submitted to the researcher for analysis. The data for the three research questions of this study was analysed using mean and standard deviation. The hypothesis was tested at .05 level of significance using analysis of covariance (ANCOVA). The pre-test was used to control the initial differences, across the groups as well as increasing the precision due to the extraneous variables reducing error variance. The statistical package for social sciences (SPSS version 23) was used for all data analysis in this study. With the calculated f-ratio being greater than the table or critical f-ratio, the null hypothesis was rejected. The value of calculated f-ratio being less than the table f-ratio value, the null hypothesis was accepted. The value of f-ratio at.05 level of significance and above was accepted while the value of f-ratio less than.05 level of significance was rejected.

RESULTS AND FINDINGS

Research Question 1: *What is the effect of design and construction of 5kva inverter and charger controller on students' performance in identification of electrical technology practical tools in Federal college of education (technical) Ekiadolor?*

Table 1: Mean Scores of Students Taught Identification of Electrical Technology Practical Tools using Design and Construction of Inverter and Charger Controller

Group	N	Pre-test		Post-test		Mean Difference	Mean Gain
		$\bar{x}$	SD	$\bar{x}$	SD		
Experimental	5	15.80	4.207	89.40	8.019	73.6	28.85
Control	4	15.25	4.031	60.00	5.888	44.75	

Table 1 shows the pre-test and post-test mean score of students' performance in in identification of electrical technology practical tools both treatment and control groups. Result shows that the students in the treatment group had a pre-test mean score of 15.80 with a standard deviation of 4.207 and a post-test mean score of 89.40 with a standard deviation of 8.019. The difference between the pre-test and post-test mean for the experiment group was 73.6, while the control group had a pre-test mean score 15.25 with a standard deviation of 4.031 and a post-test mean score of 60.00 and standard deviation of 5.888. The difference between the pre-test and post-test mean for the control group is 44.75. This shows that the mean score for the treatment group is higher than the control group, indicating that those taught design and construction inverter and charger controller performed better with a mean gain of 28.85

Research Question 2: *What is the effect of design and construction of 5kva inverter and charger controller on students' performance in dismantling and coupling of electrical equipment in Federal college of education (technical) Ekiadolor?*

Table 2: Mean Scores of Students Taught Dismantling and Coupling of Electrical Equipment using Design and Construction of Inverter and Charger Controller

Group	N	Pre-test		Post-test		Mean Difference	Mean Gain
		$\bar{x}$	SD	$\bar{x}$	SD		
Experimental	5	16.60	2.302	79.40	11.567	62.8	40.8
Control	4	20.75	2.500	42.75	2.217	22	

Table 2 shows the pre-test and post-test mean score of students' performance in dismantling and coupling of electrical equipment for both treatment and control groups. Result shows that the students in the treatment group had a pre-test mean score of 16.60 with a standard deviation of 2.302 and a post-test mean score of 79.40 with a standard deviation of 11.567. The difference between the pre-test and post-test mean for the experiment group was 62.8, while the control group had a pre-test mean score 20.75 with a standard deviation of 2.500 and a post-test mean score of 42.75 and standard deviation of 2.217. While the difference between the pre-test and post-test mean for the control group was 22. This shows that the mean score for the treatment group is higher than the control group, indicating that those exposed to design and construction of 5kva inverter and charger controller performed better with a mean gain of 40.8

Research Question 3: *What is the effect of design and construction of 5kva inverter and charger controller on students' performance in maintenance of electrical equipment and devices in Federal college of education (technical) Ekiadolor?*

Table 3: Mean Scores of Students Taught Maintenance of Electrical Equipment and Devices using Design and Construction of Inverter and Charger Controller

Group	N	Pre-test		Post-test		Mean Difference	Mean Gain
		$\overline{x}$	SD	$\overline{x}$	SD		
Experimental	5	18.80	6.058	81.60	7.925	62.8	34.8
Control	4	21.00	6.055	49.00	3.464	28	

Table 3 shows the pre-test and post-test mean score of students' performance in maintenance of electrical equipment and devices for both treatment and control groups. Result shows that the students in the treatment group had a pre-test mean score of 18.80 with a standard deviation of 6.058 and a post-test mean score of 81.60 with a standard deviation of 7.925. The difference between the pre-test and post-test mean for the experiment group was 62.8, while the control group had a pre-test mean score 21.00 with a standard deviation of 6.055 and a post-test mean score of 49.00 and standard deviation of 3.464. This shows that the mean score for the treatment group is higher than the control group, indicating that those exposed to design and construction of 5kva inverter and charger controller performed better with a mean gain of 34.8

Test of Hypothesis

There is no significant difference between the mean performance scores of students exposed to designing and construction of 5kva inverter and charger controller and those that were not involved in designing and construction of 5kva inverter and charger controller in Federal college of education (technical) Ekiadolor.

Table 4: Analysis of Covariance on Students' Performance on Design and Construction of 5kva Inverter and Charger Controller.

Tests of Between-Subjects Effects

Dependent Variable: Posttest

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	2984.939[b]	1	2984.939	37.994	.000
Intercept	33156.939	1	33156.939	422.036	.000
Pretest	38.272	1	38.272	6.706	.036
Group	2984.939	1	2984.939	37.994	.000
Error	39.950	7	5.707		
Total	39382.000	9			
Corrected Total	3534.889	8			

a. R Squared = .489 (Adjusted R Squared = .416)

Table 4. above shows the calculated value of F_{method}(37.994) with associated probability value (P= .000). The associated probability value was less than .05 level of significance (P<.05) set by the researcher. This indicated that the f-ratio is higher than the significant level of .00. It therefore implies that the null hypothesis is rejected. There is a significant difference between the mean performance scores of students involved in designing and construction of 5kva inverter and charger controller and those not involved in designing and construction of 5kva inverter and charger controller in Federal college of education (technical) Ekiadolor.

DISCUSSION OF FINDINGS

Students taught identification of electrical technology practical tools, dismantling and coupling of electrical equipment and maintenance of electrical equipment and devices using design and construction of 5kva inverter and charger controller performed higher than those taught without design and construction of inverter and charger controller. This is supported by the fact that there is a significant difference between the mean performance scores of students exposed to design and construction of 5kva inverter and charger controller and those that were not involved in designing and construction of 5kva inverter and charger controller in Federal college of education (technical) Ekiadolor. The findings of the study is in agreement with Barcu and Ozlem (2018) who were of the opinion that project method of teaching and learning is a better strategy that should be adopted in teaching science and technology because it is activity oriented and involves practical demonstration, discussion and experimentation. The finding also agrees with Onyebuenyi (2022) who viewed project learning as an effective instructional strategy through which students interact with their environment by exploring and manuplating objects, struggling with questions and controversies or performing experiments. The finding of this result is in agreement with Mulyasa (2013) who asserted that project teaching method is aimed at focusing on students' complex problem, where it is necessary to investigate, hence makes students to understand through investigation. Furthermore, the finding also agrees with the views of Sari and Angreni (2018) that project method involves students through research activities to complete a specific learning project by developing and solving skills problem in working on a project to produce something.

CONCLUSION

The design and construction of inverters and charge controllers represent a vital area of focus within electrical technology education. Current research highlights the effectiveness of pedagogical approaches such as the flipped classroom and problem-based learning in fostering practical skills acquisition. However, significant knowledge gaps remain, particularly concerning the assessment of practical skills and the integration of emerging technologies. Addressing these gaps through future research will be essential for enhancing educational practices and ensuring that students are well-equipped for successful careers in the field of electrical technology. These devices not only play a vital role in renewable energy systems but also serve as practical learning tools for electrical/electronic technology students. Understanding the implications of inverters and charge controllers on practical skills acquisition is essential in shaping effective educational strategies. As, the findings of this study revealed that Students exposed to design and construction of 5kva inverter and charger controller performed higher than those taught without design and construction of inverter and charger controller. This entail that project method of teaching and learning is a better approach that should be adopted in teaching science and technology because it is activity oriented and involves practical demonstration, discussion and experimentation.

RECOMMENDATION

1. Lecturers of Electrical/Electronic technology should adopt design and construction of 5kva inverter and charger controller as project method in practical contents of Electrical/Electronic technology rather than using the monotonous and hasty lecture method that has dominated our colleges of education in recent time.

2. Electrical/Electronic technology Lecturers and other technology educators generally should adopt the project method which is more practical oriented than other instructional strategies.

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