International Journal of Scientific Research in Education (IJSRE)
ISSN: 1117-3259

Teacher Utilization of Instructional Equipment and Materials in Teaching Basic Electricity in Urban and Rural Technical Colleges

Kennedy E. Umunadi[i]
Technical and Business Education Department, Faculty of Education, Delta State University, Nigeria

---

Abstract

This study investigates the availability and usage of equipment and materials in the teaching of Basic Electricity in urban and rural Delta State (Nigeria) Technical Colleges. The study's sample contained 150 students from urban schools and 50 students from rural schools, for a total sample of 200 students. A questionnaire was used as the data collection instrument. Percentage, mean and standard deviation were used to analyze research results and the Z-test statistic was used to analyze the hypothesis. The hypothesis was tested at a 0.05 level of significance. The findings reveal, among other things, that there is inadequate Basic Electricity equipment and consumable material available in the Technical Colleges. In addition, teachers in Technical Colleges often fail to properly use the equipment, tools and materials needed in the teaching of the subject. Finally, a significant difference was found between urban and rural Technical College achievement. The researcher offers recommendations pertaining to the provision of instructional equipment and materials and the utilization of such equipment by Technical College teachers.

Keywords: Teachers, Instructional equipment and materials, Basic electricity, Urban, Rural, Technical colleges, Nigeria.

Umunadi, K. E. (2009). Teacher Utilization of Instructional Equipment and Materials in Teaching Basic Electricity in Urban and Rural Technical Colleges. *International Journal of Scientific Research in Education,* Vol. 2(2), 88-.95. Retrieved [DATE] from http://www.ijsre.com.

INTRODUCTION

The quality of the education and training given to youth depends greatly on the ability of institutions to adjust their educational content to the changing skill requirements of the nation. In other words, educational institutions are expected to provide knowledge and training that satisfies the human resource demands of the nation and the nation's economy (Mayindo, 1995). This is especially true of training in strategic occupations that are rapidly with the advent of new technologies. Institutional training should aim to equip students with useful skills and to improve their knowledge and capabilities in their chosen fields. Basic Electricity is one of the Technical College subjects taught in years I, II and III, as stipulated by the National Policy on Education (FRN, 2004). The areas covered in these courses include electrical installation, cable joining, battery charging, and the winding of electrical machines. The realization of the objectives of Technical College electricity programmes and their ability to improve student achievement depends on a number of factors. These include the availability of equipment, tools, and materials, an adequate supply of technical education teachers, and the proper implementation and usage of technical equipment, tools and materials (Umunadi, 2004).

Awobodu (2000) has noted that teacher utilization of relevant equipment, materials and tools in teaching electricity facilitates learning and enhances student achievement. Ezeji (1993) highlighted that teachers' utterances, actions, leadership styles, knowledge of the subject and skills in teaching were all considered important factors in student learning. That is, acquisition of the knowledge needed for effective utilization of basic electricity equipment during teacher training will help teachers to subsequently impart knowledge in their implementation of the curriculum.

Aromolaran (1985) noted that the lack of material and equipment was a significant problem in the Nigerian education system. The school system is also characterized by the rigidities of centralized curriculum development and a lack of human resources both of which restrict institutions from attempting more innovative and flexible approaches. So as to equip students to succeed at a time of rapid curriculum change in science and technology, the

practice of starving schools of equipment and funds needs to cease (Nwana, 1983). This study was developed to investigate and assess teacher utilization of equipment and materials when teaching Basic Electricity in Technical Colleges in urban and rural schools in the Delta State.

The Role of Training Programmes in Vocational Education Teacher Development

In February 1990, the United Nations Educational Scientific and Cultural Organization (UNESCO, 1990) hosted an international workshop on the management of science equipment and technology in Africa. The workshop recommended the establishment of an African network of training institutions around science and technology and equipment management and utilization.

Development patterns in many western countries have shown that a nation can make considerable progress based on the skills, ingenuity and technical know-how of its people. Germany and Japan made unprecedented economic recoveries after the ravages of the Second World War in part because of the emphasis both placed on training and technology. Likewise, the technological preeminence of the United States today is due in part to its research and development sector and its skilled workforce. With reference to employment, training has been described as the development of an individual's knowledge, skills and attitude for vocational purposes. The function of training, therefore, proceeds from the assumption that the gap between the required and actual performance, which calls for a bridge via training, is the result of inadequacies in knowledge, skills and attitudes (Okorie, 2000).

Mkpa (1988) has stated that teachers are the key element in science curriculum reforms. In order to produce teachers with good understandings of the philosophy, content and method of using available technical equipment, teachers must be exposed through in-service training to constantly evolving scientific approaches and content. Mkpa made it clear that it is the training given to these teachers that will ultimately enable them to acquire the new skills and knowledge needed to teach vocational and technical subjects effectively.

Olaitan (1983) has indicated that for the learning process to be effective, both knowledge of subject matter and teaching skills, are essential. There is a need, therefore, for a programme designed to train would-be teachers in the methodology and principles of teaching for effective transmission of knowledge. Teacher training programmes should be designed so that teachers are taught the methodology behind the uses of the equipment in a way that will in turn allow them to best equip students with the skills and knowledge demanded by the job market. Educators have also called for improvements to the quality of teaching aids so that the needs of non-typical students, including underachievers and slow learners, can be met and these students can, in turn, improve upon their achievements in science and technology (Ngoka, 1989).

Research Questions

This research sought to answer the following questions:

1. How adequate is the supply of Basic Electricity equipment and materials in terms of the quantity required for teaching electricity as a subject in both urban and rural schools in the Delta State?
2. How effectively is the available Basic Electricity equipment used in teaching the subject in both urban and rural schools in the Delta State?

Hypothesis

This study's null hypothesis is as follows:

Ho_1: There is no significant difference in the mean achievement of urban and rural Technical College students with the Basic Electricity equipment, tools and consumable materials needed to teach the subject.

METHODOLOGY

Population

This study's population consisted of 276 students from six Technical Colleges offering Basic Electricity and Electronics. The principal of each College, as indicated in Table 1, provided details on the population of students for the 2004 school year.

Sample and Sampling Techniques

A sample of 150 urban students and 50 rural students, for a total of 200 students, was created out of the study's total population. This sample was arrived at by adopting proportionate stratified random sampling as shown in Table 1. The appropriate number of students to be drawn from each stratum was determined by first identifying the proportion of the desired sample size in relation to the population and multiplying the size of each stratum in the population by this proportion (Nworgu, 1991).

Table 1: Distribution of a Population of 276 Students According to Urban and Rural Location in Delta State

S/N	*Location*	*Population Size*	*Proportion*	*Sample*
1	Urban	208	0.75	150
2	Rural	68	0.25	50
Total		276		200

Study Questionnaire

A questionnaire was the principle instrument used in this research. The questionnaire was a structured questionnaire that was developed through an intensive literature review based on the research questions to be investigated by this study. The questionnaire consisted of three sections. Section I dealt with items relating to the college of the respondent, while sections II and III were designed to elicit information on the adequacy of Basic Electricity equipment and materials in terms of the numbers required for teaching electricity in urban and rural colleges. These latter two sections also addressed issues of proper utilization of equipment in technical colleges.

In sections II and III, respondents answered questions on a five-point Likert-type scale of Not Available, Barely Available, Moderately Available, Highly Available and Very Highly Available. For questions on the utilization of equipment and materials, a similar five-point Likert-type scale of Not Used, Barely Used, Moderately Used, Highly Used and Very Highly Used representing values of 5, 4, 3, 2 and 1 respectively was employed. Research professionals and four experts in the field of industrial technical education validated the instrument. The reliability of the instrument was established using a test-retest reliability procedure. The Pearson product-moment correlation coefficient was employed to correlate the scores (Nworgu, 1991). A coefficient of internal consistency ($r = 55$) was computed and the result confirmed that the questionnaire items were appropriate for the study. The National Business and Technical Education Board (NABTEB) examination results of year III students in urban and rural schools were also used to enrich the questionnaire data acquired.

Data Collection Techniques

An introductory letter, outlining the purpose of the study, accompanied each copy of the questionnaire. The researcher employed the assistance of Basic Electricity teachers to distribute, administer, collect and return (to the researcher) the questionnaires. The researcher relied on Technical College principals to supply the results of NABTEB Basic Electricity results for the 2004 session under consideration.

Data Analysis Techniques

The raw scores collected from the NABTEB Basic Electricity exams were analyzed using a critical ratio Z-test. The scores obtained from responses in each questionnaire were computed and tabulated into frequency tables.

RESULTS

The findings of this study are presented in Tables 1 to 5.

Research Question One

How adequate is the supply of Basic Electricity equipment and materials in terms of the quantity required for teaching electricity as a subject in both urban and rural schools in the Delta State?

Table 2: Respondents' Opinion About Adequacy of Basic Electricity Equipment and Materials

Subject	*School Location*	*Not Available (%)*	*Barely Available (%)*	*Moderately Available (%)*	*Highly Available (%)*	*Very Highly Available (%)*
Basic Electricity	Urban	41.99	31.61	22.29	3.68	0.43
	Rural	44.22	39.05	11.26	2.58	2.89

Table 2 shows an inadequacy of equipment in urban and rural colleges. The percentages are used to represent the adequacy of Basic Electricity equipment and utilization in Technical Colleges raised in Research Question One.

Table 3: Respondents' Opinion About Adequacy of Basic Electricity Equipment and Materials

S/N	*School Location*	*Urban*		*Rural*		*Remarks*
	Item Description	Mean Urban	SD Urban	Mean Rural	SD Rural	
1	Alternator	0.99	0.89	1.12	1.02	Not Adequate
2	Ammeter 0-5A	1.00	0.86	1.02	1.49	Not Adequate
3	Digital clock	0.98	1.73	1.18	1.75	Not Adequate
4	Electromagnet	1.00	1.65	1.00	1.23	Not Adequate
5	Induction coil; Inductors;	1.02	1.71	0.80	0.84	Not Adequate
6	Voltmeter 100V	1.00	1.77	1.00	1.19	Not Adequate
7	Digital Meter	1.00	1.43	1.00	1.07	Not Adequate
8	Earth Rod	0.80	1.06	1.00	1.71	Not Adequate
9	Transistors, Integrated Circuits	1.00	1.78	1.00	2.24	Not Adequate
10	Ebonite Rode	1.00	1.85	1.00	2.05	Not Adequate
11	Lead –Acid Accumulator(Batteries	1.00	1.72	1.00	1.73	Not Adequate
12	Iron Fillings	1.00	1.72	1.00	1.21	Not Adequate
13	Galvanometer	1.00	1..36	1.00	1.21	Not Adequate
14	Resistors; Capacitors Transformers	0.82	1.06	1.00	2.11	Not Adequate
15	Switches, One–Way Toggle	0.80	1.39	1.00	2.05	Not Adequate
16	Ohmmeter	1.00	2.18	1.00	1.57	Not Adequate
17	Generator1.5KVA	1.00	2.16	1.00	1..38	Not Adequate
18	Millimeter	1.02	2.04	1.00	2.23	Not Adequate
19	Oscilloscope	1.00	1.79	1.00	1.72	Not Adequate
20	Soldering Iron Soldering Lead.	1.00	1.77	1.00	1.74	Not Adequate
	Grand Mean X	0.97		1.01		Not Adequate
	Standard Deviation	0.07		0.07		Not Adequate

Establishment of cut off = 3.50, Basic Electricity Teachers

In Table 3, the equipment listed is the Basic Electricity equipment necessary for the effective teaching of the subject as recommended by National Board for Technical Education (NBTE) in urban and rural Technical Colleges in the Delta State. Basic Electricity equipment received a mean of 0.97 and an SD of 0.07 in urban schools while rural schools merited a mean of 1.01 and an SD of 0.07. It is possible to conclude that Basic Electricity workshops have inadequate equipment in both rural and urban Technical College given that the grand mean resulted in a value of less than 3.50 for both urban and rural locations.

Research Question Two

How effectively is the available Basic Electricity equipment used in teaching the subject in both urban and rural schools in the Delta State?

Table 4: Respondents' Opinion About Extent of Utilization of Basic Electricity Equipment and Materials

Subject	*College Location*	*Not Used (%)*	*Barely Used (%)*	*Moderately Used (%)*	*Highly Used (%)*	*Very Highly Used (%)*
Basic Electricity	Urban	25.54	37.23	33.12	4.00	0.11
	Rural	38.05	38.33	17.53	3.82	2.27

As indicated in Table 4, questionnaire respondents agreed that the utilization of Basic Electricity equipment by teachers was low. This measure was marked with low percentages in both urban and rural locations - 0.11 to 37.23 percent and 2.27 to 38.33 percent respectively.

Table 5: Extent of utilization of Basic Electricity Equipment and Materials by Technical College Teachers

S/N	*School Location*	*Urban*		*Rural*		*Remarks*
	Item Description	Mean Urban	SD Urban	Mean Rural	SD Rural	
1	Alternator	0.85	1.00	1.00	0.88	Not utilized
2	Ammeter 0-5A	1.00	0.67	1.00	0.91	Not utilized
3	Digital clock	1.00	1.33	1.00	0.77	Not utilized
4	Electromagnet	1.00	1.69	1.00	1.59	Not utilized
5	Induction coil; Inductors;	1.00	1.43	1.00	1.09	Not utilized
6	Voltmeter 100V	1.00	1.18	1.00	0.88	Not utilized
7	Digital Meter	1.00	1.23	1.00	1.67	Not utilized
8	Earth Rod	.080	0.86	0.80	0.93	Not utilized
9	Transistors, Integrated Circuits	0.80	0.93	1.00	1.09	Not utilized
10	Ebonite Rode	1.00	2.07	1.00	1.33	Not utilized
11	Lead –Acid Accumulator(Batteries	1.00	1.23	1.00	1.69	Not utilized
12	Iron Fillings	1.00	1.96	1.00	1.67	Not utilized
13	Galvanometer	0..90	1.87	0.80	0.86	Not utilized
14	Resistors; Capacitors Transformers	0.80	0.93	1.00	1.18	Not utilized
15	Switches, One–Way Toggle	1.00	2.13	1.00	1.09	Not utilized
16	Ohmmeter	1.00	1.22	1.00	1.76	Not utilized
17	Generator1.5KVA	1.00	0.88	1.00	1.33	Not utilized
18	Millimeter	1.00	1.99	0.80	0.93	Not utilized
19	Oscilloscope	0.80	0.86	1.00	1.18	Not utilized
20	Soldering Iron Soldering Lead.	1.00	0.99	1.00	2.13	Not utilized
	Grand Mean X	0.95		0.97		Not utilized
	Standard Deviation	0.09		0.73		Not utilized

Establishment of cut off = 3.50, Basic Electricity Teachers

Table 5 depicts the degree of Basic Electricity equipment utilization. The utilization of Basic Electricity equipment in the urban areas merited a mean of 0.95 where SD = 0.09, while the rural schools demonstrated a mean of 0.97 where SD = 0.73. Both urban and rural locations indicated a value of less than 3.50 utilization of equipment.

Hypothesis One

There is no significant difference in the mean achievement of urban and rural Technical College students with adequate Basic Electricity equipment.

Table 6: Z- test Analysis of Grades Obtained by Technical College Students in Urban with Adequate Basic Electricity Equipment and Consumable Materials and Students in Rural with Such Equipment

School Location	*Mean X*	*Standard Deviation*	*N*	*Degree of Freedom (Df)*	*Z- Calculated*	*Z- Critical*	*Remarks*
Urban	57.60	14.61	150			1.96 at 0.05 Level	Reject HO_1
Rural	15.44	4.77	50	198	15.53	of Significance	

In Table 6 the figures represent the mean and standard deviations of grades obtained at Technical Colleges. The calculated Z-value was 15.53 and thus fell in the rejection region. The null hypothesis, which states that there is no significant difference in the mean achievement of urban and rural Technical College students with adequate Basic Electricity equipment, is thus rejected. Z cal = 15.53 which is greater than the Z-critical of 1.96 at a 0.05 level of significance with a degree of freedom of 198. This implies that there is a significant difference in the mean achievement of urban and rural technical students with adequate equipment - students in urban Technical Colleges with Basic Electricity equipment performed better than their rural counter parts with similar equipment.

DISCUSSION

Research question one, pertaining to the adequacy of Basic Electricity equipment in terms of the numbers required for teaching the subject in urban and rural Technical Colleges revealed that there is an inadequate amount of equipment. In an effort to answer research question one in greater detail, some of the Basic Electricity principals and teachers were asked questions on the issues of availability and adequacy of the equipment. Their responses tended towards uniformity. The principals indicated that the equipment supplied by the government was inadequate, especially given that every year an increasing number of students were admitted into the Technical Colleges. This has lead to more students using the already limited equipment and has contributed to the over usage and damage of some of the equipment needed for practical work in the class.

Yalam and Fatokun (2007) identified "practical drill modes of learning" as essential and as the most advanced method for teaching psychomotor skills. They pointed out that drill modes of learning can assist students engaged in subjects like metal work, woodwork and other practical lessons. They also pointed out that it is necessary for students to continually practice the act until they reach an acceptable degree of competency. Research question one, which seeks to determine whether there is a sufficient amount of the Basic Electricity equipment needed for teaching in urban and rural Colleges, has returned a negative finding.

The findings of research question two, pertaining to the effectiveness of how the available Basic Electricity equipment is used in teaching in urban and rural Technical Colleges, reveal that the available equipment is not properly or fully utilized. Respondents revealed that even where the equipment is supplied it is often not used.

Basic Electricity teachers and principals helped to highlight that equipment utilization is greater in the urban Colleges (relative to rural Colleges). It is possible that this is because teachers in rural Technical Colleges are not given a sufficient supply of electricity and there are no incentives to properly or fully teach the subject, as there are in more urban locations. It would seem that the few teachers actually involved in the subject in rural areas do not make use of the equipment available in the workshop. It is also possible that there generally tends to be inadequate utilization of Basic Electricity equipment in both urban and rural Colleges because the school principals are not technical personnel. These conditions exist even though the subject is compulsory in the NABTEB examination. In short, sixty percent of principals and teachers in Technical Colleges are not trained as technical personnel with the understanding required to properly use Basic Electricity. This under-utilization is a serious problem that effects students' ability to function, succeed and contribute to economic advancements once they leave school.

Okorie (2000) contends that the workshops, laboratories and the overall vocational education environment must be adequately equipped so as to reflect the actual working environment beyond the classroom. Theories of vocational education as espoused by Okorie (2000) dictate that the school environment should expose students to the use of the Basic Electricity equipment in a way that will lead students to acquire relevant knowledge and skills. He added that the skills being developed by students in training are necessarily limited by the availability of equipment. Nigerian technology has not yet developed to involve highly sophisticated equipment for faster subject-specific training. As the industry and hence the skill requirements of workers become more complex, the training demands, with respect to the practical components of Technical College curriculum, become more exacting. Thus, the present dearth and underutilization of Basic Electricity equipment during practical demonstrations and assignments has serious real world implications. Ukoha (2007) encourages teachers to teach through practice as experience shows that students learn best by practice, especially with regard to psychomotor activities, which in turn become more advanced. He did observe, however, that some of the equipment supplied to schools has begun

to rust in crates, as it was never installed for use in the Colleges.

Respondents pointed out that electricity from the Power Holding Company of Nigeria (PHCN) is not always available or supplied to rural areas where it is required for the teaching of Basic Electricity. Such electricity problems coupled with a failure to install received equipment and the under-training of Technical College teachers results in the under or poor utilization of Basic Electricity. Consequently the students to not get the full (possible) advantages offered by the courses in which they are enrolled.

The findings reveal that there is a significant difference in the mean achievement of the urban and rural Technical College students with similarly adequate Basic Electricity equipment. Generally, one might expect that since the government supplies the Basic Electricity equipment to all Technical Colleges, the equipment would be equally adequate and available across the board. If this were the case, Technical College student achievement on the NABTEB examination should be equal. However, the study shows otherwise. Could it be that there is a disparity in the standards of the urban and rural Colleges or that there is a lack of commitment by Basic Electricity teachers in the urban and rural colleges? Despite the fact the technical equipment is inadequate in both urban and rural locations, urban students still out-performed their rural counter parts.

At the same time, Basic Electricity teachers showed that rural students with inadequate equipment could achieve success, if the limited equipment was in fact used in teaching. It is also possible that rural students may also develop more interest and preference for the subject than their urban colleagues. In this regard the hypothesis (Ho) seeking to determine if there is a significant difference between the Basic Electricity achievement of urban and rural technical college students, revealed that there is a significant difference in mean achievement.

CONCLUSION AND RECOMMENDATIONS

This study was designed to determine whether the available Basic Electricity equipment is adequate and the extent of its use in teaching Basic Electricity in Delta State urban and rural Technical Colleges. The purpose was also to uncover possible solutions that the Delta State government might pursue where Basic Electricity equipment is not available or where it is available but not properly used.

The Delta State government places considerable value on Basic Electricity subjects as being capable of preparing the nation for much-desired self-reliance and technological growth. As such, the findings of this study are disconcerting. It was determined that there are Technical Colleges where Basic Electricity equipment does not exist as well as Technical Colleges where equipment is available and adequate but not installed. This latter scenario is most often the result of a lack of teacher and principal expertise.

In the light of these serious problems, Nigerian educationists hope that the government, educational planners, and those responsible for implementing Basic Electricity ptogrammes will begin make greater efforts toward discovering implementation problems and tackle those problems immediately. The government might begin to address the dual problems of the lack of equipment and inadequate utilization by sending assessors to the Colleges. The government should also marshal the findings of this research towards the progress of the Basic Electricity subject. Based on the results of this study the following points are recommended:

(1) The government should supply Basic Electricity equipment, materials and tools to the Colleges in large numbers to cater to the ever-growing population of students.
(2) The government should train Basic Electricity teachers to enable to properly use the equipment in the Technical Colleges.
(3) The Basic Electricity equipment, materials and tools supplied to the Technical Colleges should be installed and adequate power supply from the Power Holding Company of Nigeria (PHCN) must be made available.
(4) Basic Electricity courses require the services of a well trained and qualified Basic Electricity teacher to utilize and handle the complex and sophisticated tools and equipment and to teach the theoretical and practical aspect of the subject.
(5) The government should seek the assistance of trained and qualified Basic Electricity teachers and technical experts to advise the appointed government representatives on the types of Basic Electricity equipment, tools, and materials needed in the Technical Colleges
(6) The government should post a minimum of four Basic Electricity teachers to each Technical College to enable students to best make use of the available Basic Electricity equipment and to learn the subject thoroughly and effectively.
(7) The government should endeavour to install all existing (and uninstalled) Basic Electricity equipment and to replace obsolete equipment. The government should also train teachers to install and operate the equipment as well as to assess the state of equipment needing repair or replacement.
(8) Finally, the government should send inspectors from the Ministry of Education (Technical Division) to

monitor Basic Electricity equipment utilization in each Technical College and to enforce the use of the equipment during the duration of their visit.

REFERENCES

Aromoloran, E. A (1995, July, 1985, 22). Teaching Principles of Account. Daily Times. p. 18.

Awobodu, V. Y (2000). Materials resources utilization for teaching primary science in the era of universal Basic education in A. W. Ajetunmobi, F. O. Ezeudu; O. M. Adesope; G. D. Momoh (Eds) Technology education and the universal Basic education in Nigeria, *Nigerian Association of Teachers of Technology* Lagos: Alographiks kommunikations company pp. 204-207.

Ezeji, S. C. O. A. (1993). An evaluation of relevance of technical education programmes to job market needs. *International Journal of Education Research,* 5(6), 10-15.

Federal Republic of Nigeria (2004). *National Policy on Education* (4th Ed) Lagos: FGN Nigerian Educational Research and Development Council (NERDC).

Manyindo, B and Luguijo, E (1995). "Pilot project on co-operation between educational institution and enterprises in Technical and Vocational education in "ganda". *A paper presented at the UNESCO seminar*. Breda pp 52-65.

Mkpa, N. (1988). School Related Strategies for winning more students to science and technology. *Belsu Journal of Education,* 1(1) 293-297.

Ngoka, G.N. (1989).Improving the Quality of Teaching in Schools. *The Journal of Education,* 58(8) 1-5.

Nwana, O. C (1983). Curriculum designing for the junior secondary and senior secondary. *The Nigeria principal Journal of ANOPPS, 1*(4), 25-33.

Nworgu B. G. (1991). *Educational Research: Basic Issues and Methodology*. Ibadan: Wisdom Publishers Limited.

Nworgu B. G. (2007). *Optimization of service Delivery in the education sector: Issues and strategies*. Nssuka: University Trust Publishers.

Okorie,J.U.(2000).*Developing Nigeria's Workforce*. Calabar: Page Environ publisher

Olaitan (1983). Role expectation of a co-operating teacher in a student teaching programme. *Review of Education*. Viii & Ix, 69-75.

Onwuka, U (1994). *Curriculum development for Africa*. Lagos: African-Feb. publisher Limited.

Ukoha, U. A. (2007). *Optimization of service Delivery in the education sector: Emerging Technology in Electronics with Implication for Teaching in the Practical Components of Nigeria Certificate in Education (Technical) Curriculum*. Nssuka: University Trust Publishers.

Ukoha, U. A. (2007).). *Optimization of service Delivery in the education sector: Emerging Technology in Electronics with Implication for Teaching in the Practical Components of Nigeria Certificate in Education (Technical) Curriculum*. Nssuka: University Trust Publishers.

Umunadi, E. K. (2004). Utilization of equipment and facilities for teaching and learning in technical colleges in Nigeria. *Journal of Education Research and Development.3 (1)100-108.*

United Nations Educational Scientific and Cultural Organization (UNESCO, 1990). *International Conference on general technical education*. Italy: Turin.

National Business and Technical Examination Board (NABTEB) 2003-2006) Statistics on the Number OF Students that enrolled Basic Electricity in the NABTEB Examination from 2003-20065 in Delta State. Benin City: NABTEB Office.

Yalam, S.M. & Fatokun, J.O. (2007). *Optimization of service Delivery in the education sector: Effect of guided Delivery approach on student's performance in RTV fault Diagnosis and repairs skills at the technical colleges*. Nssuka: University Trust Publishers.

---

[i] Dr. Kennedy E. Umunadi is a lecturer in the Department of Technical and Business Education, Delta State University, P.M.B. 1, Abraka, Delta State, Nigeria. He can be reached at Email: kedinad@yahoo.com, +234 (0) 8062965789