INTEGRATION OF CO-OPERATIVE EDUCATION IN ELECTRICAL AND ELECTRONIC ENGINEERING CURRICULUM OF POLYTECHNICS EDUCATION: A CASE STUDY OF NIGER STATE.

BY

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MATRIC NO: 2007/1/27302BT

DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION,

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A RESEARCH PROJECT SUMMITED TO THE DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION, SCHOOL OF SCIENCE AND SCIENCE EDUCATION, FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA.

IN THE PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF BACHELOR OF TECHNOLOGY (B.TECH) IN INDUSTRIAL AND TECHNOLOGY EDUCATION.

OCTOBER, 2012

CERTIFICATION

I **OPADERE, DAVID OLAYINKA** matriculation number **2007/1/27302BT**, an undergraduate student of the Department of Industrial and Technology Education certify that the work embodied in this project is original and has not been submitted in part or full for any other diploma or degree of this or any other university .

Name   Signature

APPROVAL PAGE

This project has been read and approved as meeting the requirement for the award of B.Tech Degree in Industrial and Technology Education of the Department of Industrial and Technology Education, School of Science and Science Education, Federal University of Technology, Minna.

______________________________ ______________________________

Supervisor Signature/Date

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Head of Department Signature/Date

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External Supervisor Signature/Date

DEDICATION

I hereby dedicate this project to the Almighty God who by grace preserved my life to see the end of this programme, even though I started rough, but finishing well. I also dedicate this work to my parent for their support and also to Mrs. Joseph and my Siblings (Lekan, Busayo and Damola).

ACKNOWLEDGEMENT

My appreciation goes to God Almighty for making this project a success. I humbly acknowledge my supervisor Mr. Saba T. Moses for his tireless effort towards the success of this project, even through my unseriousness, he still strive to bring out the best in me, and also to all other lecturers that has been of help to me, but my praise goes specifically to Mallan Sani and Mr. Kalat for their efforts. May God bless them all and reward them with wisdom, knowledge and understanding. I also greatly acknowledge my Parent for their moral and financial support during the course of my study as an undergraduate; I pray God will grant them long life. And to countless individual who have in one way or the other contributed to the success of this work, May Almighty God bless them abundantly, Amen.

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Abstract

The study investigates on the Integration of Co-operative Education in Electrical and Electronic Engineering Curriculum in Polytechnic education, with Niger State as a case study, but Specifically the study covers, the facilities needed for the integration of cooperative education into electrical and electronic engineering curriculum; the state of partnership existing between polytechnic and the industry; Strategies for effective integration of cooperative education into Electrical and Electronic Engineering curriculum; Strategies for effective integration of cooperative education into Electrical and Electronic Engineering curriculum.

A descriptive survey method was used. Three research questions and three null hypotheses were formulated and tested to guide this study and the questionnaire used has 56 items which were use to collect data from the respondents consisting of 37 Engineers and 21 lecturers in Four (4) selected electrical and electronic engineering industry and two (2) polytechnics respectively using random sampling from the original population of ten (10) related electrical and electronic industry and two (2) polytechnics all in Niger State. Data collected were analyses using frequency count, mean, standard deviation and t-test statistics. The null hypotheses were tested at 0.05 level of significance base on 55 degree of freedom.

The findings result revealed that the following facility should be used, AVO cable fault locator, Electrical Wattmeter, High Voltage tester is useful, Constant Power supply and some measuring instruments like ohmmeter, voltmeter and ammeter, also the Placement of students on work experience is also needed while the school and the industry should com e together to design the curriculum. Strategies of integrating of cooperative education can be hindered if there is no Constant supervision of students on training, no Cordial relationship between lecturers and industrial personnel or there is no Established Electrical/Electronics Industries for student easy asses.

The recommendations forwarded include Industries actively participating in the establishment of engineering workshops, laboratories for undergraduates to enhance quality training and research and the establishment of industrial-institution sabbaticals for both teachers and company's technocrats. Moreover, Regulatory and professional bodies such as Nigerian Society of Engineers (NSE), Council for the Regulation of Engineering in Nigeria (COREN) should be engaged in the moderation, standardization of quality assurance of various industrials institutional collaboration for students, teachers and facilities.

CHAPTER 1

INTRODUCTION

Background of the study

Electrical energy is the scientific form of electricity, and refers to the flow of power or the flow of charges along a conductor to create energy. Electrical energy is known to be a secondary source of energy, which means that we obtain electrical energy through the conversion of other forms of energy. These other forms of energy are known as the primary sources of energy and can be used from coal, nuclear energy, natural gas, or oil. Electrical energy may be made available through the flow of electric charge in a conductor, as claimed by thefreedictionary.com (2012). The primary sources from which we create electrical energy can be either non-renewable forms of energy or renewable forms of energy. Electrical energy however is neither a renewable nor non-renewable energy. Electrical energy is a standard part of nature, and it is our most widely used form of energy.

Electrical energy is the driving force of any industrialized economy. It is very important in industries, homes, schools and hospitals for a very effective and successful economy. The modernization, increase in the productivity in Agriculture and the improvement in the standard of living of the people basically depends on the adequate supply of electrical energy. It has penetrated deeply into virtually in all aspect of life. It has been stated that stability or the rate of growth of any Industrial economy depends largely on the availability and stability of electrical energy. Electrical energy however is produced by an electric generator which is a device for converting mechanical energy into electrical energy. The process is based on the relationship between magnetism and electricity.

However electrical energy generation is carried out by trained electrical technicians who work cannot be over emphases in our modern world today. Electricity is being discovered and is being maintained by them, and due to the high capacity and big electrical components, there as to be a need for constant routine maintenance or else they (electric equipment) will worn-out easily. An electrical engineer ‘capable of maintaining the generating system through the use of the knowledge gained and the experiences acquired during training’, Umele (2010).

Intellogist.com (2012), defines an Electrical Engineer as someone who traditionally deals with the technology of electricity, especially the design and application of circuitry and equipment for power generation and distribution, machine control and other aspect. Electrical and electronics engineering is a part or a branch of engineering that deal with the direct practical application of Electricity in science and technology. According to Eric (2005), Electrical Engineer is “a person who is trained to generate, transmit, distribute and service electricity”.

Electrical and electronic engineering technicians help design, develop, test, manufacture, and repair electrical and electronic equipment. Electrical components of equipment provide power. Electronic components control the equipment, although many types of equipment still are controlled with electrical devices. Technicians perform a wide variety of different tasks depending on the needs of their employer. Some electrical and electronic engineering technicians work for power companies that generate and transmit electricity, or they work for companies that use electricity to power machinery and lights. These employers may include large industries and institutions such as hospitals and colleges. Electrical and electronic engineering technicians are often directly involved in the generation of electricity. Sometimes they test and inspect generators, transformers, and other equipment. They often use their knowledge of electrical engineering technology to diagnose electrical problems. Electrical and electronic engineering technicians work with such hand tools as wrenches, screwdrivers, wire cutters, pliers, and soldering irons. They also use precise instruments such as voltmeters, ammeter and ohmmeter which help in measuring electricity. In addition, they must be able to perform some medium complex electrical repair and installation. Much of the work of electronics engineering technicians involves troubleshooting. They test circuits and parts to find out why a piece of equipment is not working properly.

You can get training as an electrical engineer at technical institute, University and Polytechnics. Most programs take about two to four years to complete. A very few numbers of companies offer on-the-job training, where worker are being sent from the company to train employer while still working, but before then polytechnics also offer training (outside training) while still in school which is known as “Co-operative education” which will be discuss later in this research. But now let’s take a look on polytechnic where the goal is to produce competent and well baked electrical engineers with the aid of a well refined curriculum.

Polytechnics play a vital role in the educational, scientific and technological progress of Nigeria. Oladele (1992) believes that polytechnics are established to train and produce the technical manpower necessary for the execution of the Nation's development plans, goals and strategies. The polytechnics offer a two year course of study leading to the award of the National Diploma (ND). After this, students are expected to go for a one year industrial attachment to enable them acquire requisite on the job and practical experience before proceeding to the Higher National Diploma (HND) programme. The HND programme also runs for two years. At the end of the HND programme, successful candidates proceed to the one year mandatory National Youth Service Corp scheme. A rector serves as the admistrative head of the school.

But for a polytechnic to successfully produce competent electrical engineer graduate, there must be a well refined curriculum which will serve as a guild. Cole (1992) says "the aim of any educational programme is to develop certain knowledge, skills and attitudes in the students to enable them to function effectively in the chosen discipline and for becoming responsible citizens who are able to serve the society and the world of work with the objectives for which they are technically trained". The system of polytechnics would be deemed effective if the product of the system matches with the requirements of the situation for which they are being trained, and this has to come to place by a well balance curriculum that affect every part of the learning activities.

Curriculum is define as 'a plan that consists of learning opportunities for a specific time frame and place, a tool that aims to bring about behavioral changes in students as a result of planned activities and includes all learning experiences received by students with the guidance of the school' Goodlad (1992). While Cronbleth (1992) defines curriculum as answering three questions: what knowledge, skills and values are most worthwhile? Why are they most worthwhile? How should the young acquire them? In other words curriculum is defined as the sum-total of all the subjects being offered in an institution and also the external experiences.

It is clear that curriculum of a programme is an important document based on which entire teaching‒learning process is planned to prepare suitable technical human resource. 'Curriculum is important for the learner to understand the scope of study' Oranu (1992), for the teacher to know what and how to teach and select appropriate learning experiences to be given to student for developing desired competencies in them, industry to understand the type of manpower and competencies possessed by the graduate of a programme and to facilitate Polytechnic Education.

Cooperative education is defined by a means or method of instruction that combines career and technical classroom instruction with paid employment directly related to the classroom instruction. Both student instruction and employment are planned and supervised by the school and the employer so that each contributes to the student's career objectives and employability. Cooperative education is a structured educational program, which integrates classroom learning with productive, structured work experience(s) which are directly related to the goals and objectives of the educational program. School credit is awarded for successfully completed Cooperative Work Experiences i.e. Industrial based experience. There is strong emphasis on integration between work site learning and classroom learning. Credit hours/outcomes and levels of intensity vary depending on the program of study. Cooperative work experience may be paid for or not.

According to Yabani (1990) "Cooperative education is an advanced method of career and technical education that provides the opportunity for technical application and job skill development". In a world of rapidly changing technology, the work education experience becomes a necessary component of career and technical education to provide current technical skill development. The Cooperative Education experience can also help identify the need for additional occupational and basic skill development that can take place within the vocational preparatory and academic classroom settings. According to Morgan, 'Cooperative Education nurtures a relationship between the business community and the school district'. This relationship, established through the efforts of the Co-op teacher-coordinator, can result in business support of the school district – support that takes the form of advisory committees, donation of equipment, and sharing of training resources. Community benefits include workforce development, economic development, and civic and service responsibility.

Statement of the problem

The ultimate aim of education at all level of learning is for human refinement. Education should enable the learner to formulate a positive outlook towards life and to accept a stand which suits the well being of the society and the individual as well. But today reversed is the case as the graduates of engineering in which electrical and electronics technicians is one of them, are facing serious problem of unemployment and they find it difficult to be self-employed because they lack needed skills. Somers (2001) lamented that high unemployment rate witness today is due to poor practical training received by Nigerian graduates and coupled with deplorable rate of training facilities in institutions of learning have caused the graduate to graduate without needed practical skills. Students work experience scheme (SIWES) which was designed to link the students to the world of work as been turned to a mere formality (Ma'aji, Ohize, Saba & Tsado, 2010).

Development of electrical and electronics Industries and the use of electrical and electronic gadgets calls for proper training of the electrical and electronics technicians to help in carrying out routine maintenance and repairs of malfunction gadgets, education recognized meaningful linkages between the world of work and world of education, which cooperative education bridge, as cooperative education integrates classroom learning with productive and structured work experience which are directly related to goals and objective of the educational programme. The graduation of unskilled graduates necessitate the integration of cooperative education into the training of electrical and electronics engineer.

Significance of the study

The integration of cooperative education into electrical and electronics engineering curriculum of polytechnics is timely as it bridge the gap between educational institutions and industries. The integration of cooperative education the curriculum of electrical and electronic engineering of polytechnics will be beneficial to government, employers, institutions, students and society at large.

The Students of the programme will benefit as it enhanced learning by providing better quality ‘real life’ learning experiences, relevance and application of classroom work. It will also enhance career prospect of graduates of the programme as essential personal and interpersonal skills developed, contacts made may lead to future career advantage and graduates with work experiences win position more easily.

The Employer will equally benefit from the programme by them having to get skilled and motivated non-permanent staff at a very low initial training and recruitment cost. It will also enhance projects to done easily and faster, at a reduced cost and due to the link with the students it will give an easy access to tertiary personnel and facilities without much procedure. The Industrial work experience programme will also give the Employer the opportunity to have a chance to access his potential workers and take uncertainty out of the appointment process

The Institutions also has an advantage in this as it will help enhance better quality programme, which will keep the school curricula up-to-date with any slight changes in the industry. It will also improve student and faculty access to the latest technology in industry which will improve or aid research, teaching and staff development. The study also serves as a major help to improve better level of applicants and also gear-up (motivate) students.

Its is also set to ensure proper increase in the level of well learned personnel living among the people of the community which will serve as a source of help to the reduction in the cost of purchase and repair of electrical electronic gadget, and also it is set for the improvement in the economy among the people.

It is meant to serve the government also by stabilizing the economy i.e. government will no longer have to spend a large amount of money on the maintenance and the repair of the government properties, whereby the money can be diverted into another sector of the economy. Another great benefit that the government is set to enjoy is the high level of investor as a result of well skilled and well trained citizens which will serve as boost to the economy of the nation.

Purpose of the study

The main purpose of this study is to integrate cooperative education in the electrical and electronic engineering curriculum in polytechnic with Niger state as a case study.

Specifically, the research will determine:

1. The facilities needed for the integration of cooperative education into electrical and electronic engineering curriculum.
2. The state of partnership existing between polytechnic and the industry.
3. Strategies for effective integration of cooperative education into Electrical and Electronic Engineering curriculum.

Assumption of the study

The following assumption are made to guide the study,

1. The schools under the study would be sufficient to obtain relevant data necessary for answering questions and hypothesis formulated to guide the study.
2. Supervisors in the various industries and the qualified electrical and electronic engineering personnel with at least five years working experience are reliable sources of information on the type of skills needed to functions effectively in their various industries
3. The respondent to the instrument will not be biased i.e. they will respond very well to every questions asked.

Scope of study

The research project is majorly centered on the introduction of co-operative education in the curriculum of Polytechnic, but this study is only limited to higher diploma students in electrical and electronic engineering and students undergoing there industrial training using Niger state as the study area.

Research questions

This study provides possible answers to the following questions

1. What are the facilities needed for the integration of cooperative education into electrical and electronic engineering curriculum?
2. How can partnership exist between polytechnics and industry?

3. What are the strategies of integrating of cooperative education into Electrical and Electronic Engineering curriculum effectively?

Hypotheses

The null hypothesis were tested at point 0.05 level of significance

HO_1: There is no significant difference between the mean responses of lecturers and industrial personnel on facilities needed for the integration of cooperative education into electrical and electronic engineering curriculum.

HO_2: There is no significant difference between the mean responses of lecturers and industrial personnel on the state of partnership/cooperation existing between polytechnics and industries.

HO_3: There is no significant difference between the mean responses of lecturers and industrial personnel on the link between educational institutions and the industry for effective cooperative education programme.

CHAPTER II

REVIEW OF RELATED LITERATURE

This chapter reviewed literature related to the study, the review was organized under the following sub-heading.

1. Historical Development of Polytechnic Education in Nigeria
2. Concept of curriculum development and implementation
3. Concept of Co-operative Education
4. The needs for integrating Cooperative Education into the Curriculum of Electrical and Electronic Engineering in Polytechnics
5. Partnership existing between Institution and Industries
6. Strategies for effective implementation of Co-operative Education
7. Facilities needed for the integration of Co-operative Education
8. Summary of literature review.

Historical Development of Polytechnic Education in Nigeria

Polytechnic is an arm of (the three) tertiary level of education in Nigeria, It has come a long way and no doubt, has come to stay because of the current global move towards technological development. The word polytechnic is derived from two the Greek word ‘poli’ mean's many and ‘tekhnikos’ mean's arts. The Polytechnics have achieved immeasurable results in the provision of middle and high level technological know-how which is a move in the right direction towards the advancement of Nigeria from a developing to a developed economy- a move that is close to the heart of the present administration of the country. A polytechnic is a “non-university” higher education institution usually focusing on vocational education.

Polytechnic offers a variety of professional courses, both technical and vocational in nature. Acmtagra.com (2012) says that “The polytechnic objective is to offer the highest vocational education in applied sciences and arts and to reach this objective they train students to be professionals who are capable of working independently and whose skills in science are targeted towards applied research”. A polytechnic degree gives skills and know-how for the hanging demands of working life. The Polytechnic provides various career courses and allows a person to start his own business or get a decent job at a reputed place. The courses offered by polytechnics help an individual kick-start their career; it gives opportunities in professional career. In sort polytechnic education offers variety of practical courses that gives the necessary foundation for further professional education and training. Polytechnics have also established significant links with industry and commerce that are a decided advantage for the polytechnic graduates.

Polytechnics provide courses in the arts, sciences, technology and engineering disciplines. The Polytechnic Education is to design to offer a two year courses which are the National Diploma (ND) and The Higher national Diploma (HND). After the award of the National Diploma (ND), it is mandatory for the graduate to go for a one (1) year Industrial attachment training before proceeding for the HND programme (NBTE 1987). The HND programme also runs for two years. At the end of the HND programme, successful candidates proceed to the one year mandatory National Youth Service Corp scheme. To assist desiring individuals who for one reason or the other could not make it into the regular programme, most of the polytechnics run part time programme. The part-time programme takes three years to complete each of the normal two year duration. The polytechnics are under the purview of the National Board for Technical Education. This Board, the NBTE, established by law (National

Board for Technical Education Act 9 of January 1977) approves the setting up of each polytechnic, regulates the courses, and also sets the minimum standards on admission, teaching and infrastructure. The head of each polytechnic is known as Rector as decreed by FPS (1979). Each polytechnic is organized into schools or colleges (sometimes also called faculties) and departments. A school is made up of courses or disciples of same root and is headed by a Director of Studies (and sometimes Dean). For instance, the School of Engineering in the Niger State polytechnic Zugeru, is made up four (4) courses and departments. Each of the polytechnics also has what is known as Academic Board. This serves as the administrative council and is headed by the Rector Admission into a polytechnic is through applying and writing the Universal Matriculation Tertiary Examination (UMTE) conducted by the Joint Admissions and Matriculations Board (JAMB). Nbte.gov.ng (2012) found-out that in Nigeria there are 21 federal, 38 states, 15 private polytechnics fully that are fully recognized by the NBTE, who are governing council.

But according to the Federal Polytechnic Statue enacted Decree No. 33 of 1979 as amended by Decree No. 5 of 1993, it focuses on the legal basis for the establishment of Federal Polytechnics in Nigeria. ***Others are;***

- To provide full-time or part-time courses of instruction and training-

  (i) In technology, applied science, commerce and management; and

  (ii) In such other fields of applied learning relevant to the needs of the development of Nigeria in the area of industrial and agricultural production and distribution and for research in the development and adaptation of techniques as the Council may from time to time determine;

- To arrange conferences, seminars and study groups relative to the fields of learning specified in subsection *(1)* above.
- To perform such other functions as in the opinion of the Council may serve to promote the objectives of the polytechnic.
- The Head of a Polytechnic shall be called a "Rector"

The major aim of polytechnic education is to allow students to;

- Acquire quality education and training as preparation for life and work.
- Get on with professional training.
- Prepare for further professional education at the university.
- Equip themselves with the necessary skills to contribute to the technological, economic and social development of the nation's economy.

In a bid to achieve a paradigm shift in the country's educational system, The National Policy on Education (2004), stands firmly that polytechnics shall provide the technical knowledge and skills necessary for agricultural, industrial, commercial and economic development of Nigeria, and to impart the necessary skills for the training of technicians, technologists and other skilled personnel to make them enterprising and self-reliant. No meaningful national development could be achieved by any nation without sound and qualitative technical education which are being provided by polytechnics. No wonder, Prof. Uba Nwuba, one time Rector, Federal Polytechnic, Oko (2010) posited that the bedrock of technical emancipation for Nigeria is centered on Polytechnics education. Polytechnics offer highly technical, scientific as well as research-oriented education to students.

Ajayi in a seminar held in Abuja (2007) agreed that it is disheartening to observe today that these citadels of learning which were once cynosure of all eyes in developed economies of the world, has been relegated to the background in Nigeria, He stress further, saying, Nearly all the State-owned Polytechnics are just a little above the secondary school level, infrastructural wise, due to lack of adequate funding by successive administrations. Most Nigerian Polytechnics are synonymous with structural decay occasioned by neglect and misplaced priority on the part of the government on one hand and society on the other. The Chairman of the National Board for Technical Education (NBTE) Kaduna State, Dr. Ifejika (2007), has maintained that the continuous decline in Nigeria's industrial, agricultural, commercial manufacturing and economic sectors is as a result of the neglect of the polytechnic education by both government and society. According to him the low estimation of the competence of polytechnic education producing qualitative manpower for the country and discrimination against polytechnic graduates is a clear pointer to the neglect which the tertiary education and stressed that the situation called for a holistic approach through adoption of synergy by all stakeholders and government to implement policies that will remove all barriers against staff and graduates in order to enhance technological growth and development and make the polytechnic education more attractive to the general public.

Ajayi (2007) opined that it becomes necessary to remind ourselves that the Nigerian higher educational sub-system, of which polytechnics are part, is known more for frequent destabilization and the production of poor quality graduates. He further lamented that there are some institutional constraints which impose severe limitations on individual and organizational capacity for policy making, planning and management of the educational system as a whole, which in turn limits its (organization's) efficiency, effectiveness, productivity and accountability.

Oduola (2002) confirmed that "Polytechnic education is quite peculiar, considering its capital intensive nature at a time like this, when available fiscal resources are shared among several competing needs”. In this era of technological advancement, if polytechnics function effectively and efficiently, it will help to solve the problem of inadequate supply of technicians and technologists who will drive our industries. Jambgodi (2003) suggested that polytechnic curriculum should be constantly overhauled to reflect the expectation and aspiration of a true and dynamic polytechnic education, capable of meeting the needs of individuals concerned and the society at all time.

Concept of curriculum development and implementation

The word “curriculum” derives from the Latin *currere* meaning ‘*to run’*. This implies that one of the functions of a curriculum is to provide a template or design which enables learning to take place. Curricula usually define the learning that is expected to take place during a course or programme of study in terms of knowledge, skills and attitudes, they should specify the main teaching, learning and assessment methods and provide an indication of the learning resources required to support the effective delivery of the course. Development means the act of growing something bigger or moving it to a higher or more advance state without disrupting the original aim. A curriculum may also refer to a defined and prescribed course of studies, which students must fulfill in order to pass a certain level of education. Also Goodlad (1992) define curriculum as a plan that consists of learning opportunities for a specific time frame and place, a tool that aims to bring about behavior changes in students as a result of planned activities and includes all learning experiences received by students with the guidance of the school. Curriculum of a school is defined as the formal and informal context and process by which learners gain knowledge and understanding, develop skills and attitudes, appreciations, and values under the auspices of that school.

Curriculum is to be based on learning goals that include content standards, skills, and habit of mind. Akinseinde (2004) argued that the curriculum as became one of the key concerns of today's school personnel and its meaning has expanded over the years. Polytechnics might refer to a curriculum as the courses required to be gone through in order to receive one's diploma, and the Strength of the curriculum is beyond the written documents produced by the faculty but solely depend on the final output which is only done by the teachers, that why the teacher is often referred to as the "soul of Curriculum". According to Groenewald (2003) curriculum is the result of bringing together a number of elements - content, strategies and methods – to ensure quality in education and excellence in performance, but should have a right mix of elements to ensure efficiency and to facilitate learning.

Harden (2001) elaborated on this concept saying that a curriculum is a sophisticated blend of educational strategies, course content, learning outcomes, educational experiences, assessment, the educational environment and the individual students' learning style, personal timetable and the program of work. It is a guideline for teaching and learning process in schools, without it, it will be difficult to know the right thing to teach at the right time, that's why "Curriculum should force learning process which is as similar as possible to professional activities" as opined by Garcia-Barbero (1995). Akinseide (2004) proclaimed that the curriculum is a coherent unit of planned activities that are undertaken by a learner during his entire learning career under the coaching of the polytechnic education. The curriculum indicates what objectives must be achieved by the student and what tasks must be fulfilled in order to achieve these. A curriculum always primarily relates to an entire study program and consists of course subjects and possibly groups of course subjects.

Curriculum development is the organized preparation of whatever is going to be taught in schools at a given time in a given year. Curriculum development is the arrangement of the curriculum or what the student is meant to go through at a defined period of time, the gradual building of the curriculum with the consideration of different factors. Curriculum development according to Barnett (2000), is the term used to describe the building up of curriculum materials, which had been adjudge during the curriculum planning period to be most relevant in accomplishing specific goals. Tech-nology.com (2012) suggested that the curriculum document should be made into official documents, as guides for teachers, and made obligatory by provincial and territorial departments. Curriculum development involves the refurbishing, refining of the inadequacies in instructional methods, curriculum content, material, implementation strategies and procedure in planned and implemented curriculum for implementation; geared towards curriculum improvements.

The father of curriculum Ralph Tyler (1949) as cited by Prof Momoh (2012) published his classic text on curriculum development. It was organized around four questions:

- What educational purposes should the school seek to attain?
- How can learning experiences that are likely to be useful in attaining these objectives, be selected?
- How can the learning experience be organized for effective instruction?
- How can the effectiveness of learning experiences be evaluated?

These Tyler (1949) steps can now been modify into different stages as arranged by Jerome Bruner (2000), which makes developing a curriculum easier;

- Determine and agree the educational or professional context in which the programme is to be developed and delivered.
- Define the needs of the learners in line with the requirements of professional bodies.
- Determine the aims and broad learning outcomes of the programme.
- Identify ideas and constraints.
- Agree the broad structure and framework of the programme, the main areas of teaching and learning, the sequence of the main topics and the key assessments.
- Allocate the detailed development of each topic or course area in terms of defining objectives and learning outcomes to individuals or teams.
- Course teams to develop coherent programme which have defined learning outcomes, time-tables, contents, appropriate teaching, learning and assessment methods and which utilize relevant and available learning resources.
- Implement and refine the programme.
- Develop an appropriate and deliverable evaluation strategy.
- Review and revise the course in line with feedback – has it met the identified needs of the learners and other stakeholders?

In curriculum development, the educational and professional context must be discussed and clearly defined. This can reflect a number of factors: current or prevailing educational or social ideology, culture, politics, economy, students, teachers and parents, commerce and industry, professional bodies, exam boards, funding bodies and history or influence of the past.

In any discipline, there may be current trends in general education which need to be addressed and specific trends or issues in Engineering or education. Programmes may be modular in structure or credit based, depending on the type of educational programme it is designed for within which the curriculum is being designed.

Turning Points schools (2000) administration outline clearly for a successful curriculum to be developed, these facts must be put in mind

- Curriculum should be grounded in an understanding of the middle school child understanding.
- Curriculum should be based on what we want students to know and be able to do.
- Students and teachers should be engaged in authentic, intellectual work.
- Assessment should demonstrate that students can do important work.
- A coherent curriculum should be developed across the entire school.

Any curriculum is needed to be developed in the light of the Educational programme or context in which it is going to be delivered. If a teacher is developing a small part of a course or programme, then this must fit (in terms of approach, level and content) with the overall course. If a new course is being designed and developed then there are a number of approaches that must be taken into consideration and issues that need to be addressed to meet the needs of all stakeholders involved and also to meet the need of the targeted audience.

Also at the beginning of the curriculum development process, teachers create assessments to help determine what students will do as the unit progresses. The pre-assessment of the student is very necessary, in the light that it gives the insight of

- Transparent—students know the criteria, learning goals, and timing of assessment.
- Drives curriculum planning and teaching—what students are asked to do depends on how they will be asked to demonstrate their learning.
- Takes many forms including projects, exhibitions, portfolios, and demonstrations.
- Helps students, teachers, and parents understand what a child knows and can do and allows them to understand what a child needs to do to improve.
- Is ongoing, tied to the learning goals, and used to inform curriculum planning, teaching, and professional development.

Implementation of a new school curriculum covers a wide range of related aspects and proper planning of the implementation is essential. This planning includes the drafting of implementation plans. Agba, (2007) posed that Curriculum implementation plans and the subsequent management of these implementation plans as crucial to ensuring successful implementation of a new curriculum.

Implementation is the carrying out of something or the practical application of a method, procedure or desired purpose. Lewy (1977) define curriculum implementation as the trying out of a new practice and what it looks like when actually used in a school system. For example, a curriculum plan in enhancing technology integration across the curriculum is introduced and you would want to know whether what was intended in the plan is actually being done in the classroom. The major aim for developing a curriculum is to make a difference to learners. Simply put that, ‘Curriculum implementation is bringing about change and hopefully improvement.’

In other words, how do you ensure that the curriculum brings about the desired changes? Before you can bring about change, you need to know what the change is! “Change results from new knowledge”. However, the presence of new knowledge is not sufficient for change. People generally are reluctant to change because they are comfortable with what they are currently doing. So, to change, they must recognize the need for change. People are more likely to recognize the need for change if they understand change and how it works.

Consequently, a new curriculum may be described as an attempt to change teaching and learning practices which will also include the transformation of some of the beliefs and understanding hitherto existent in the setting to be changed. It is usually strong on the material side by providing a written curriculum, text books, recommendations for teaching strategies, working material for students, and probably also new artifacts for learning. It is usually less explicit on the organizational side but may also advocate the use of changed time tabling and new social structures, such as peer group interaction, decision making in the subject group, etc.

But for a curriculum implementation to be possible there as to be need for a successful plan which Earley and Bubb (2004) agreed that curriculum implementation plans are required to assist the implementers to obtain a common understanding of the required curriculum practice. These plans become devices for identifying ways of solving or minimizing problems related to implementation. Appropriate plans clarify the focus points of the implementation process. Clarity reduces the risks of non-delivery. Plans do not only make the tasks relevant to the users’ contexts, but they also facilitate the integration of tasks and help to detect the possibility of overloading the implementers (Doe 2003). Earley and Bubb (2004) thus see curriculum implementation plans as ‘descriptors’ of the envisaged curriculum improvement. Similarly, Walker (1997) defines curriculum implementation plans as a school’s ‘record’ of implementation. Fullan (2001) also argues that curriculum implementation plans provide clear guidance to the users (in this case the school management teams and teachers) in terms of what should be done to meet particular needs related to curriculum implementation or to solve a particular related problem.

Problem with Implementing New Curriculum: The problem is not only related to the redefinition of the traditional boundaries among disciplines in response to the changing epistemological nature of how knowledge is constructed, validated and finally applied in daily life, but also about how the new knowledge organization really affects the processes of teaching and learning in the classroom. For example, an Electrical engineering syllabus would surely be a better way of sharing with students more comprehensive frames of reference in order to understand the world they live in, and the way things are produced or repaired than a traditional syllabus based on history and geography as separate and disconnected subjects. According to Bolaji, (2007), But it could also generate a lot of confusion and uncertainty if teachers and heads of department oppose the new syllabus and do not even try to understand it.

According to Balogun (1995), factors that limit effective curriculum implementation in Nigeria include inadequate planning, syllabus overloading or unrealistic goals, insufficient teachers and lack of adequate resources. Others are lack of in-service training, are lack of commitment from both government and teachers, and lack of adequate monitoring and evaluation in the education system. Similarly, Agba (2007) posit that incessant industrial crisis and lack of school physical facilities impedes the potency of education as instrument of sustainable development in Nigeria. Morinho (2009) observed that “Based on inarticulate policies, inadequate resource and poor plan0ning, curriculum implementation has become ineffective and lacks any useful feedback mechanism anchored in review, analysis and design processes." Declined budgetary allocation to education from 1994 to 2009 obstructed the effective implementation of school curriculum at all levels of education. It was evidence that between 1994 and 2009 yearly budgeting allocation to education at national level declined from 7.83 percent in 1994 to 1.6 percent in 2009 (culled from Asuu 2009). Gulloma (2009) and Agba (2009) observed that public expenditure on education in Nigeria is within the region of 5 percent of the Gross Domestic Product (GDP) which is far below the average of most countries. Consequently aggregate per capita expenditure on students continues to dwindle since 1994.

There is also problem associated with overloading of the curriculum and curriculum content because of the high number of subjects that must be taken by students for their certification. Overcrowded classes and timetable became pronounced as a result rapid population change in Nigeria. An average classroom in a tertiary institution (Polytechnics), should be at an average of 35 to 40 at any given time, but this are being over-flogged as a result of large number of people pursuing tertiary education, and this development added stress on school personnel, resources and school scheduling, teacher workload, classroom management and the maintenance of order and discipline. "There is strain on teachers, learners and material resources of the school", Oladele (2002) lamented. One of the biggest obstacles to enhancing technological literacy in Nigeria is the limited amount of high-quality instructional materials to cope with the curriculum. Although some good materials have been developed, the developers do not have the sustained funding, time, or expertise to disseminate their work to a broad audience.

Some teachers, education researchers, and curriculum developers have created interesting and effective approaches to engaging students in technology and design activities, but most of them are known only in the school or school system where they originated. Paucity of textbooks and other learning aids is another problem. Ivowi (1998) gave His view by positing that the problems of book scarcity and the cost have hindered the successful implementation of many laudable educational programmes and curriculum projects. To teach a new curriculum at all levels of education, the teachers or instructors currently employed by the Government have to receive further training in teaching the new body of knowledge. Most of the teachers are not qualified to teach the subjects introduced in the new curriculum. In addition, new experts have to be trained locally or abroad while some experts have to be recruited from abroad in such disciplines where no qualified Nigerians are yet available. All these projects depend on the availability of funds and unfortunately, the picture today is that funds are not sufficiently available for the kinds of curriculum innovation activities described above; therefore the National Policy on Education has not been fully implemented.

Also in some Nigerian tertiary institution, new/reformed curriculum meant to be implemented are not properly followed-up, and this cause a drastic change in the original plan of the curriculum developer, and this problem can be cause by the poor communication among the implementers during the implementation process.

Possible solutions: Earley and Bubb (2004) argue that, central to effectual curriculum implementation, is the notion of support. Support, in the context of management of curriculum implementation, includes all the activities pertaining to the development of the implementers' advocacy. Also the curriculum users require support in the form of peer-networking, direct coaching, as well as mentoring. This kind of reinforcement needs to be managed. Support strategies should make provision for the training of implementers, observation of peers' classroom teaching and scheduling of regular meetings for reflective discussions (Hass 1987) and this can only happen if and only if there are competent and well trained teachers/instructors.

Curriculum implementation can further be facilitated by workshops on the utilization of material resources, development of assessment plans, and so forth (Coleman *et al.*, 2003).

When implementing the new/reviewed curriculum, proper communication between all (students, institution and implementers) the role players are vital. The managers of the implementation process need to ensure adequate information flow, and in this regard, Coleman *et al*. (2003) recommend the drafting of an organizational chart which is derived from the implementation plan. Earley and Bubb (2004) however, argue that the users themselves also need to take ownership of the implementation process. Yet, these authors emphasize that users will only take ownership if they are involved in and committed to the process. The personal element should thus never be overlooked. In this regard, Taylor (1987) stresses the importance of nurturing positive relationships between the implementers. He argues that, due to the users' involvement in teams and subsequent interaction with other role players, their awareness regarding the implications of curriculum implementation grows.

Concept of Co-operative Education

Dictionary.reference.com (2012) defines Co-operation as an act or instance of working together for a common purpose for benefit. It is working together of two or more entity for an objective.

Education involves giving systematic instruction to students in a formal setting such as schools, colleges or universities. Education is the process of learning or the process of acquiring knowledge and information.

Cooperative education is a structured educational program, which integrates classroom learning with productive, structured work experience(s) which are directly related to the goals and objectives of the educational program.

The first cooperative education program started in united state 1906 at the University of Cincinnati with an enrolment of 27 students, while the first program in Canada started in 1957 at what came to be known as the University of Waterloo. It had an enrolment of 75 students. Both of these programs were engineering programs. The first programs in both the United States and Canada were met with great resistance from both traditional educators and non-committed industrialists; however, these two programs expanded very quickly and proved to be successful. They were soon used as models for many other universities which started to implement cooperative education in their engineering programs. As well, cooperative education programs in disciplines other than engineering started to appear. (CAFCE: Canadian Association, 2004).

Cooperative education programs were established initially to bridge the gap between theory and practice in engineering education, meet the new developments in industrial needs, and make university education accessible to the growing number of students Zeiteh (2002). The objectives that Schneider, the father of cooperative education, hoped that a student would achieve through cooperative education are described by Park (1943) as “A natural method of arriving at a suitable type of work, an opportunity to gain a maximum of educational content from his industrial environment, an understanding of human factor in industry, acquisition of certain disciplinary values as a result of his shop experience, and acquisition of certain economic values” (as cited in Dressler & Keeling, 2004).

Cooperative Education (co-op) is a term which denotes “a structured educational program, which integrates classroom learning with productive, structured work experience(s) which are directly related to the goals and objectives of the educational program". It is called "cooperative education" because it involves a cooperative effort on the part of colleges, employers, and students to form an exceptional educational program. Cooperative education is a method of instruction that enables students to combine academic classroom instruction (school-based learning component) with occupational instruction through learning on the job (work-based learning component) in a career area of choice. Emphasis is placed on the students' education and employability skills.Working together, a synergistic learning process is created that integrates classroom studies with supervised work experiences. The National Commission for Cooperative Education defines cooperative education as a structured educational strategy integrating classroom studies with learning through productive work experiences in a field related to a student's academic or career goals. Groenewald (2004) reviewed existing definitions of the term cooperative education and their historical development. He concluded that cooperative education can be reduced to four core dimensions … namely:

(a) An integrated curriculum,

(b) Learning derived from work experience,

(c) Cultivation of a support-base, and

(d) The logistical organization and coordination of the learning experience.

The four components refer to developing a curriculum which integrates the needs of industry with academic requirements; careful design of the work component to ensure its contribution to the experiential learning process; the cultivation of a loyal supporting industrial base; and establishing a structure which ensure sound practices of monitoring and evaluating students before, during, and after the work experience.

The Schools and participating businesses/organizations develop written cooperative training and evaluation plans to guide and measure the progress and the success of the student. Cooperative education majorly deals with combining both academic work/study with paid employment. These can be worked out in a number of ways depending on the student's course of study/programme and the college's academic requirements. Educators have long recognized that an effective way to prepare for a specific employment area is to receive on-the-job experience in that occupation. In many instructional areas, classroom laboratories closely approximate actual situations, but a better way to obtain job competence is by supplementing the classroom laboratory and instruction with an actual job. Most young undergraduates often find it difficult to think on an abstract level, but learn readily when they see the theory in operation and have an opportunity to practice what they are learning, so the need for practical for students cannot be over-emphasis because it literarily helps the student to really learn and master what they have been taught in class.

Co-operative Education is an experiential method of learning that formally integrates academic study and classroom theory with practical experience at a work site in the community. This program is based on a partnership between school and the community, and involves the participation of students, teachers, employers and employees. Co-operative Education provides students with the opportunity to enhance their in-school learning while developing a greater awareness and understanding of the world of work. It also provides the time to explore a number of occupational areas and to develop skills, knowledge and attitudes needed to become productive and satisfied members of society.

Co-operative Education is an educational model rather than a job placement strategy. Co-op Education promotes continuous learning through the integration of classroom and applied work-based learning. It has gained recognition within the employer and academic communities as having an increased educational value, providing the opportunity for students to develop both discipline specific and general education goals. Students may attend classes and study or they may alternate between semesters – working one semester while studying another.

Cooperative education is a program that allows students to earn school credits while completing a work placement in the community/industry. Levin (1994) claims that Cooperative education allows students (especially Females) to participate in valuable learning experiences that help prepare them for the next stage of their lives, whether in apprenticeship training, college, community living, university, or the workplace. Okoro (1999) however claims that ever since technical operations in industry became based on scientific and technological principles it has been considered that engineers and technicians should be educated and trained partly in educational institutions and partly in industry. Each partner in the process should attend to those activities for which it is best fitted. Co-operative education provides students with an opportunity to utilize their education and apply it to the workplace. The knowledge and skills that students acquire in the classroom are taken to the real world. Combining these experiences gives students an opportunity to gain relevant work experience and actually apply the knowledge they receive in the classroom. A well reformed co-operative education helps to demonstrates relevancy of academic and technical skills needed on the job, Provides an opportunity to gain on-the-job knowledge and/or technical skills, if only if students are skillfully supervised and they are being ensured to enroll in a related program of study. If the rule is clearly followed, Mafe (2002) also argued that the graduate engineer will have a qualification that identifies him as someone who has received a theoretical and practical education enabling him to begin practicing an engineering technology at an advanced level. It is in industry that technologies are practiced in order to solve practical problems.

The inputs to industry are raw materials, finance, information and people. Engineering colleges are today, in all countries, the most important source of engineers. They also supply information to industry. In return, the colleges receive, or should receive, information, equipment and financial support; they should also recruit some of their educators from industrial enterprises. It is a fact that industry, in general, considers graduate engineers as the most important output of engineering polytechnics. The information arising from the research and development activities of the colleges merges with information from many other sources and is thus harder to identify as originating in educational institutions. This knowledge is also only a fraction of the new knowledge accumulating all the time. Engineering polytechnics exist because industry exists and it needs well educated and well-trained engineers, so Engineering polytechnics should therefore attend to the important functions of industry such as research, design and production and possibly even to management and operations.

There as being a lot of benefits accord to Cooperative education, it benefits the students, the Employer, the institution and the community at large.

Student Benefits: Dressler and Keeling (2004) suggest that student benefits have to be evaluated in the context of the objectives of students' learning, the systematic learning experience which can be used to achieve the objectives, and the extent of the students' achievement. They summarize the student benefits as reported in the literature. Among these are: "Increased disciplined thinking; improved learning: taking responsibility for learning; provides assistance in making career decisions; provides first hand exposure to a range of career options; provides references for future employers; develops transferable employability skills; promotes understanding of the link between what is learned in the classroom and how it is applied at work; develops confidence, skills and on the job experiences; learn how to learn; allows for valuable training by experts in the field; improved problem-solving; analytical thinking; improved performance in the classroom, alternative method of earning credits; increased commitment to educational goals; increased ability to finance their education" (Dressler & Keeling, 2004).

Employer Benefits: Studies in the employers' perceptions about cooperative education show that employers participate in these programs to hire motivated new employees, to improve their corporate image, to save on the cost of operation, to create a more dynamic work environment, and to create a pool for career recruitment (Millis 2002). Zhonghua (2005) reported that studies surveying employers about the benefits of cooperative education indicate that the benefits most often reported by the employers are "screening of new hires; hiring of enthusiastic employees; interacting positively with universities and other institutions; accruing cost savings; and hiring coops for special projects".

Institution Benefits: As students become aware of the benefits of cooperative education, their choice of which post-secondary institution to join is affected. Enrolments are affected by the existence of cooperative education programs (Weisz & Chapman, 2004; Martin, 1997). Other benefits that educational institutions may gain include enhanced relationships with industry, curriculum development, and staff development (Weisz & Chapman, 2004). Cooperative education programs represent an added burden to their institutions, they are also costly to maintain. Several investigators developed economic models to quantify the financial gain from cooperative education programs (e.g., Weisz & Chapman, 2004; Cutt & Loken, 1995). However, these benefits can be considered to accrue not only to the institution but also to the economy in general. Furthermore, this could be used by an institution's administration to negotiate with its government to increase the institution's grant.

The Needs for Integrating Cooperative Education into the Curriculum of Electrical and Electronic Engineering in Polytechnics.

Ogwo (2002), referred to curriculum in electrical and electronic engineering as the totality of those experiences, knowledge, skills and activities systematically planned to train the students for gainful employment in any industry of choice. Cooperative education is one of such organized activities that assist in occupational competence.

Cooperative Education has received a great deal of attention in many technologically advanced nations, according to Kanu (2001) cited by Okafor (1992). Electrical and electronic engineering in the united state has a tested mechanism in cooperative education that can be expanded to coordinate school instruction. In this process, fresh graduates are empowered and unemployment rate is reduced. Ezeji (2005) opined that granting the paucity of facilities, closer linkage should be instituted between technology education and the industry as practice in other technological advance countries such as Germany. In Nigeria, the partnership between the school and the industry in curriculum design and implementation is yet to be a reality. So far, what is recorded are occasional donations obsolete equipments, money and reluctant acceptance of students for short period Industrial attachments. These have contributed very little to the enhancement of skill training among Nigerian polytechnics graduates.

In a rapidly changing global economy, the need to increase the school industry link through the integration of cooperative education into technology education programs is evident. Adenipekun (2004) supports this view when he wrote "the restructuring of the curriculum of

Nigeria's Polytechnics has long been overdue. For over twenty years, Nigerian Polytechnics have been churning out graduates who have neither entrepreneur skill nor imbued with the spirit of self-reliance, resulting in mass unemployment among graduates.

The value of cooperative Education to the realization of the objectives of technology Education cannot be over-emphasis. When properly organized and coordinate, a few of the benefits of the programme as highlighted by Kingston (1978) include to:

- Provide the necessary articulation between academic theory and the world of work
- Help the students make a supervised transition to human adjustment to the fast changing world of technology.
- Provide an opportunity to develop positive on-the-job attitudes and personality characteristics.
- Enable students become directly involved with need procedure and machines.
- Learn to recognize the importance of desirable attitudes and acceptable behaviour as they work with others in the adult world.

In the same vein, Osuala (1987) posited that properly deigned cooperative education provides opportunities for exploration of the three major vocational capability areas - technical occupational adjustment and carrier development through the employing organization's physical facilities and its human environment. Writing on the importance on this type of dual habits and are afforded first-hand opportunity of deciding to continue in their chosen trades. Work experience and class work should be as clearly related to each other as possible if the students are to be empowered with skills for employment.

Partnership existing between Institution and Industries

Partnership is the state of being a partners which is also an association or formal agreement between two or more parties as that have agreed to work together to achieve a common goal and objective (culled from spvm.qc.ca 2012).

An Industry - educational Partnership is a collaboration between a School and an individual business, group of firms, chamber of commerce, industry association, or sector partnership, with the purpose of using the combined resources to create alternative School education programs that are tightly linked to regional economic development and labor force needs for non-traditional students—for students in need of skills and education.

One major aim of this partnership to integrate practice and research so as to make education more productive and fulfilling for students and more just in its social consequences. Partners can contribute human resources, finances, facilities and equipment, and leadership to help accomplish the agreed upon goals and outcomes. The expectation is that students who complete these partnership programs and obtain credentials will have skills that meet the needs of area business, improve regional or national competitiveness, help them earn a family-sustaining wage, and also prepare them for further learning. Credentials can include occupational licenses, technical certification, and associates and bachelor's degrees.

The quality of engineering graduates from Nigerian Polytechnics has been a major subject of concern of most industries in Nigeria. Most industries complaint stem from inadequate skill requirement for most cutting edge technology, low practical knowledge and confidence. Most Nigerian engineering graduates are subjected to several re -training programme since most of the graduates are considered non - employable going by the quality of training acquired from their various institutions. The level of economic development of any nation depends on its level of human resources development, particularly in science and engineering as well as technological advancement and industrialization. Nigeria is far from experiencing any landmark in technological growth towards industrialization due to poor infrastructural status despite the huge number of graduates from various engineering faculties of Polytechnics that have failed to impact positively on the growth of industries for economic emancipation and industrialization. Upon all the numerous institution present in Nigeria (University and Polytechnic), only about 10% of graduates from these various institutions are annually employed, as observed by Olorunfemi, and Ashaolu (2009),

Various studies have queried the relevance of graduates and research results to the industry considering the low academic status and skill acquired by product from various institutions. The training programme is not addressing the growing need of the industry and society. A change of direction is required to close up the widening gap over a period of time between the engineer -in-industry and the engineer-in academia. Change of focus will require the re -orientation and possibly the adaptation of the present engineering curricula and training to meet the indigenous demand. The UNESCO (2011) report observed that most engineering facilities in Africa are established by colonial governments and the curricula and engineering education system were modelled as such. This has possible affected the appropriate structuring of the curriculum to meet the immediate growing need of the people.

One of the ways Institution and Government are looking to solve this situation is the advent of Student Industrial Work-Experience Scheme (SIWES). The SIWES is a planned and supervised training intervention based on stated and specific learning and career objectives, and geared towards developing the occupational competencies of the participants. It is a programme required to be undertaken by all students of tertiary institutions in Nigeria pursuing courses in “specialized engineering, technical, business, applied sciences and applied arts” (ITF, 2004a). Therefore, SIWES is generic, cutting across over 60 programmes in the universities, over 40 programmes in the polytechnics and about 10 programmes in the colleges of education. Thus, SIWES is not specific to any one course of study or discipline. Consequently, the effectiveness of SIWES cannot be looked at in isolation with respect to a single discipline; it is better explored in a holistic manner since many of the attributes, positive outcomes and challenges associated with SIWES are common to all disciplines participating in the scheme.

Objectives of SIWES: The Industrial Training Fund’s Policy Document No. 1 of 1973 (ITF, 1973) which established SIWES outlined the objectives of the scheme. The objectives are to:

- Provide an avenue for students in institutions of higher learning to acquire industrial skills and experience during their courses of study;
- Prepare students for industrial work situations that they are likely to meet after graduation;
- Expose students to work methods and techniques in handling equipment and machinery that may not be available in their institutions;
- Make the transition from school to the world of work easier and enhance students’ contacts for later job placements;
- Provide students with the opportunities to apply their educational knowledge in real work situations, thereby bridging the gap between theory and practice;
- Enlist and strengthen employers’ involvement in the entire educational process through SIWES.

Through this educational strategy, co-op students can gain an enriched understanding of their academic program through practical application. Falade (2002) posed the co-op experience can motivate students to further education as well as lead to relevant employment after graduation. Studies show that co-op students gain employment sooner after graduation, have higher salaries, and are more likely to find employment related to their degree area than non-co-op graduates. Through the competitive co-op placement process, students develop the ability to assess their skill level, to prepare a polished resume, and to interview successfully. Mafe (1997) agreed that through work experiences, students develop and refine employability skills, gain an understanding of career opportunities in their field, and gain an understanding of the realities of the workplace. Co-op coordinators observe students growing in maturity and self-confidence as they progress through their co-op program.

The wide gap between the two establishments is due to ineffective concert curriculum structure and colonial syndrome wherein the nation is import driven in most facets of endeavours. Government interest did not help either. Most researches fund support is not properly channelled to solving industrial problems but rather abstract. Most industries problem are solved internally and widening the interactive zone between the industry and institution which should have benefited both sides. The Polytechnics became ignorant of activities in the industry and also the Industry is also ignorant of all the things taken place in the industry thus resulting in the weak link as presented below. The effect is the turn-out of fairly baked graduates from various engineering faculties.

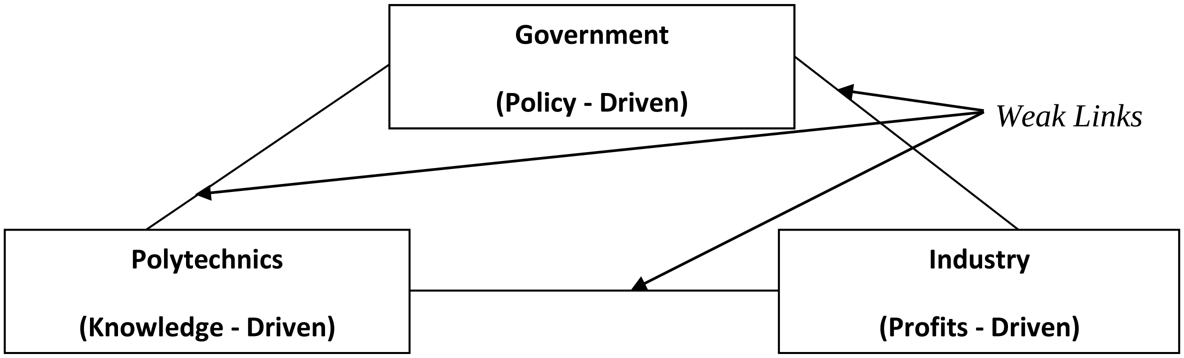

Fig. 1: Government-Polytechnics-Industry Interaction

Employer participation as partners in Co-operative Education varies with the degree to which co-op programs meet their needs as employers. When co-op programs provide access to students who meet assessed employer and industry needs, employer participation can extend beyond hiring both work term students and graduates, to include on-campus education activities, engaging students in industry events, fund raising and co-op program development. Industry partnerships with schools improves the quality of the workplace, provide employees with learning experiences and a new understanding of the educational system, provide opportunities for student's career exploration, bring resources to enrich the curriculum, ensure that school teaching is relevant to the skills required of industry, improve the education setting through upgrading facilities or equipment, integrate young people into the labour market by involving them in cooperative education experiences, connect schools with local businesses, assist with curriculum development, new learning opportunities and skill development, meet the labour market needs of business and industry.

Most industry–school relationships in Nigeria currently exist as links rather than partnerships. Industry–school links in Engineering-technology exist in a range of forms that may be generalised as being concerned with the following activities:

- Workshops, conferences, tours, exchange programs, classroom visits, assemblies, workplace visits, science fairs, guest speakers; seminars; presentations;
- Work experience programs, internships, tutoring, skills training, career development activities
- Mentoring, job–shadowing, apprenticeship, and on–the job training;
- Recruiting, training, school to career information, guidance;
- Curriculum support, teacher development, teacher placements;
- Grants, scholarships, equipment, money, fund-raising; starting an education foundation.

Strategies for effective implementation of cooperative education

Can we keep up with the world if our skills and education lag behind? Can we develop an export culture - a culture of excellence - with a second-rate education and training system? Can we encourage business to adopt international best practice if we as a nation cannot? Questions asked by Mayfield (2000)

Best practice in Nigeria is beginning to evolve beyond links to one of partnerships, where both industry and education seek outcomes that are of mutual benefit to each party. Such relationships are more pro-active and allow educators to play a more crucial role, beyond that of recipients of sponsorship funding from industries. As investigation as showed that the move toward industry–education partnerships, Employers have showed interests in partnerships as a way of breaking down the perceived (rather than actual) insularity of the school sector and a desire to improve skills, standards and relevance of the curriculum, Partnerships have also enjoyed greatest influence when they have been a catalyst for existing educational reform supported or initiated by government which are commonly concerned with curriculum development, industry visits, experiential placements for both teachers and students, other teacher professional development and the undertaking of problem solving projects.

The local school district/career and technical school, professionally involved school personnel such as teachers, counsellors, administrators and the cooperative education teacher-coordinator, parent/guardian, student and training site all share in the responsibility of job shadowing and internships. The primary area of concern usually arises from tort liability and negligence. Thus, it is important to establish local school board policy for all concerned parties. Although there are no state professional certification requirements for the category of job shadowing or internships, it is highly recommended that persons working with students in these areas be professionally prepared. Also, any form of student job shadowing or internship should be addressed and adopted as part of the school/career and technical centre strategic plan. Co-operative education manual (2003; pages 83-84).

Often professional associations will provide special student rates, or occasionally free admission to encourage students to attend regular meetings and industry events also Co-op student volunteers can provide useful services at industry events and their conferences, while gaining valuable networking opportunities (Co-op manual 2005). Co-op students, active and visible in the business community, can positively profile and market their program.

Cooperation tends to increase with length of time or intensity of mutual exposure as common interests emerge. Educators, politicians and industry need to accept the integration of partnerships into the mainstream of their work and work together to form a coalition of mutual interests, rather than indulging in an ‘unruly free for all’ of competing agendas.

These are some outline in strategies for effective implementation of cooperative education

- consult with experienced co-op educators to gain an understanding of co-op models, procedures, and costs
- gain the approval of the institution's senior administration to proceed and also analyzing the employer interest, job market potential and student interest
- gain departmental, Faculty, and Decanal support
- determine co-op program structure best suited for academic area (e.g., academic requirements, academic/work schedule, projected enrolment)
- consult with appropriate institutional units (e.g., Registrar's Office, Accounting Services)
- consult with appropriate professional organizations and governing bodies, if appropriate, to ensure professional standards are met
- determine co-op office and staff requirements
- undertake budget and cost analysis
- prepare proposal for Senate or Board approval

Some studies made by Lepani & Currie (1993) have examined the relationships between industry and education in recent years. These studies raise numbers of key issues which are useful to take into account as a strategy for developing industry–school and partnerships.

1. Understand the background environment - industry in general needs to ensure value for any investment of time and money, while educators attempt to meet the community's growing expectations of schools and schooling.
2. Ensure that the type of partnership entered into reflects the desired outcomes of both parties - considerable damage can be done to industry–school relations through ill judged or unfocused activities.

3. Invest time, effort and the resources necessary to develop a vision and framework of common understanding - the needs of both parties must be articulated and understood if the link is to develop into an on-going partnership. This should take the form of a formal policy.
4. Ensure the link has the strong support of top management on both sides. Unless the persons negotiating the relationship are in a position of influence within their respective organisations, the relationship will suffer in terms of commitment and resourcing.
5. Identify knowledgeable and enthusiastic staff members to act as link coordinators.
6. Establish good communication and trust.
7. Integrate the link into the culture of both parties - the link should become a normal part of the activities of each of the parties, perpetuating and nourishing the benefits available (i.e. the link becomes a partnership).
8. Allow key stakeholders to 'own' the relationship to ensure broad-based support in the school and with the industry partner.
9. Manage continuity and succession - broad-based ownership (particularly across curriculum areas) will ensure that the link survives the departure of a charismatic champion or coordinator.
10. Work toward local and systemic coordination of the link projects - confusion currently exists regarding the multitude of link schemes. Industry likes to deal succinctly with people empowered to speak on behalf of 'education links', rather than just one program within many.

The most effective strategies were found to combine a training component with strong links to the employer community, more formal training linked to on-the-job training and work experience, and job search assistance and transitional wage subsidies (culled HRDC 1997). Another strategy is to encourage cooperative education coordinators to administer reflective work term assignments to help students transform their work experience into learning experience. There is some evidence that co-operative education programs lead to improved employment outcomes after school, although the number of work experience placements offered by employers is quite limited. Another strategy is to bring cooperative education into the realm of experiential learning i.e. Students need to be given reflective assignments during their work terms to enable them to develop their "shop" experience into learning experience. Integrating work term experience into classroom instructions which can be accomplished through encouraging faculty to allow students to use their work term experience as part of their projects or written assignments while credit is given to parts of the work term experience which can be legitimately classified as academic laboratory exercise. There are a number of concerns regarding the presence of corporations in the school. There is a fear that the active involvement of business will encourage governments to retreat from their role as the primary funders of education Aliu (2001). Other issues of corporate involvement in schools reveal disquieting implications of a corporate ideology and ethos entering the learning experience of our young people as stressed by Gross Davis and Barbara (1999).

The cooperative education teacher-coordinator must strive to provide supportive services/strategies as needed. Strategies include:

1. To bring about a thorough understanding of what is expected of students in the classroom and on the job by explaining:

a) The training agreement.

b) Problems arising in connection with the job.

c) The value of the program to students and employees.

2. To introduce areas of information to beginning workers, by describing:

a) State and federal laws.

b) Workers' compensation, unemployment compensation, etc.

c) Initial employer expectations – promptness, correct dress, willingness to work, etc.

Facilities needed for the integration of cooperative education

For the proper running of the cooperative education program is schools and industry then there as to be some facilities which will aid in facilitating it program both in the School and Industry. Some of the facilities required are:

- Equipments
- Teachers/Human resources/instructor.
- Finance/Funding.

Equipments

It is important that adequate classroom space be available for the teaching of general and occupationally specific information to cooperative education students. The cooperative education facilities should be comparable to other classrooms at the school. Space requirements will depend upon the size of the co-op program and the structural model chosen. A centralized co-op office will require space for reception and support and coordination staff. As well, dedicated space for interviews and a student resource area are desirable. When co-op programs are located within the academic units, usually the academic units are responsible for providing the required space.

As co-op programs grow, there will be an increased number of students returning during the term to continue their academic program. This may place an increased pressure on facilities such as libraries, food services, athletics, etc. Institutions should make every effort possible to provide year-round services so students returning for a term are not disadvantaged. This will include academic units scheduling appropriate courses for co-op students to continue their academic program during a summer campus term. The location and layout of the co-op office are important to the smooth and efficient operation of the program. The office would ideally be in close proximity to the students it serves. Ideally, parking should be convenient for employers coming to campus to conduct interviews. Signage should clearly lay out the location of the co-op office.

If designing new space or modifying existing space, the following are considerations or rooms should be included:

Interview Rooms: Interview rooms really are the first impression of the co-op office. Interview rooms that preferably have solid walls and are not cubicles are really important. Ideally, the rooms would have a window and be attractively furnished.

Failing a window, the air supply should be fresh and have temperature regulation. They should be well lighted with adequate data and phone lines. Hopefully, one room can be devoted to the audiovisual needs of the office. Here you might house the video camera, TV, and VCR for recording mock interviews, as well as video conference equipment if you own it. Shelving in this room can be used to store tapes, etc. Each interview room should have a spacious table, comfortable chairs, a telephone table with internal and external phone books, pens, paper, and artwork on the wall. The doors should have a glass window so that staff can check on the progress of the interviews without disturbing the process. Carpet is not helpful on the floors due to allergies. A minimum of three fully serviceable interview rooms is required for most medium-sized co-op offices. More is great. Preferably these are in close proximity so that staff can easily attend to the needs of the employer. A boardroom with a large table that will accommodate all staff is helpful and can serve as another interview room for panel interviews, if required. It also serves as a project area when more space is required.

Central Area: The support staff should be positioned in such a way as to control the flow of traffic. Be sure to ensure that there are enough data and voice lines to support staff phones, the fax, and computers. A computer with a fax modem and the printers located in the central area, along with the photocopier, scanner, and the fax, will aid the efficiency of the office. Shared equipment grouped to provide easy access for support staff facilitates a smoother operation. Central office files should be located in this area. Student files, administrative files, etc., should be housed here so that the contents can be safeguarded.

Student Area: This area requires considerable space. It is important that there are computers dedicated to student use, a large table, and several comfortable chairs in this area. The space should also house the employer files for student use and the resource library. Shelving for adequate display of resource materials takes up considerable space, a wooden slotted cabinet located outside the co-op office allows the students to drop off resumes after office hours. The cabinet needs individually named job slots and should be locked. This can be very helpful to the students. Lighting is important to all areas of the co-op office, especially in those areas students may be reading or working on computers also a coat rack and mirror allow students to “tidy up” before their interviews.

Coordinators' Offices: Each office should ensure privacy; however, a door with a window can ensure that people are not disrupted when working with students or others. The office should be professional in design with a desk, phone, computer, filing cabinet, bookcase, and a comfortable chair. It is appropriate for coordinators to display their personal academic certificates and mementos in their offices. Have peoples' names on the doors.

Director's Office: The director's office should be larger than the coordinators due to the fact that the director may have to have several people in the office at once. There should be ample cabinet space for filing of confidential documents, as well as a bookcase, a table to interview people, comfortable chairs, and computer. The overall tone of the co-op office should be an efficient, friendly atmosphere. Warm colours on walls with interesting artwork will make the environment lively. Borrow artwork from your art gallery. It is important to create the reality of a modern, efficient office that is friendly to students, employers, and faculty alike.

Electrical equipments: This are the gadgets needed for proper training of the students in the industry during the cooperative educational programme. Practical are carried-out with the use of this equipments and with a good instructor which will direct the student on how to go about operating them. The electrical component ranges from simple to heavy, that is, small and easy use to big and complex equipments

Human Resources/Instructor/Teachers:

Depending upon the administrative structure and other support structures, a single co-op program may handle anywhere from 100 – 1,000 placements per year. For the majority of co-op programs, staff salaries and benefits comprise 80% of the program's budget. This are the major facility needed for a successful cooperative education program, because without the lecturers/teachers there will be nobody to pass the knowledge across, and without proper guidance by the instructor the student have greater tendency to misbehave and do things the wrong way.

A full-time co-op education coordinator may handle in the area of 100 – 300 placements a year if all equipment were set in place. If the program area is decentralized, the coordinator will likely handle all tasks associated with the placement process – student preparation, job development, matching, monitoring (site visits), and evaluation. In this case, a full-time coordinator, with part-time support staff (20 hours per week), may handle in the range of 100 – 140 co-op placements reasonably. If placements increase, it may be necessary to increase the support staff time. Coordinators at the low end of this range may perform other duties such as teaching or lab instruction.

If the program area is centralized, with coordinated support services, a full-time coordinator may handle upwards of 300 placements per year. At many institutions, co-op coordinators fall into the mid-to-high range of the institution's salary scale. For budget planning purposes, it is best to determine appropriate staffing levels and then factor in the salary and operating budget costs. Teachers/Instructor they may be refer to as co-ordinator in most cases,

Financial Planning

Sources of Income

- **Tuition Fees:** While some students will be performing off-campus work assignments, on-campus space will be relieved and the institution may be able to increase its overall student intake. The total increase will depend on the tuition fees charged by the institution in every semester. In a cost analysis, it is necessary to project the expected enrollment each year until the program reaches full capacity in order to calculate the additional student intake the institution can accommodate.

- **Co-op Fees:** Most co-op institutions charge the students a co-op fee to partially offset the additional administrative cost involved in co-op activities. Some charge a fee for every work term, others may charge on a per academic term basis or a lump sum per year regardless of the number of work terms undertaken by the student. Fees should not be regarded as a placement fee or a guarantee of a job. When determining the amount of the co-op fee, the institution should consider whether it is financially feasible for the student. The fee collected should also contribute reasonably to the operating cost. For some institutions, the co-op fee reflects 20 – 25% of the co-op budget. Other institutions that charge a substantially higher co-op fee may be able to cover as much as 80 – 90% of the direct costs.
- **Special Government Funding:** In order to promote the development of co-operative education, some provincial governments provide special grants to co-op institutions and employers. The purposes of these grants may be to assist in offsetting co-op administrative costs or to subsidize employers in salaries paid to co-op students.
- **Miscellaneous Income:** Other miscellaneous sources of revenue would be similar to those received by a regular academic unit in the institution – donations and grants contributed by private foundations or co-op employers, fees charged on counselling, services, and consultation projects undertaken by co-op staff. However, income from these sources is usually minimal and irregular and should not be relied upon to support ongoing budget commitments.

Budget Planning: In operating a co-op program it is important to consider the direct costs incurred by the co-op offices as well as the indirect costs assumed by other units as a result of change in the system. The indirect costs of implementing a co-op program can affect many areas of the institution. Additional resources may be needed to account for the increased use of facilities due to higher student enrolment and a year-round operation. The alternating structure of co-op will increase the number of students undertaking a summer academic term; hence there will pressure not only on facilities but also on academic units to provide adequate course offerings. If agreement has been made for faculty to participate in grading co-op work term reports and other activities, their normal teaching load may have to be reduced and more teaching staff will have to be hired. As a result, a co-op program may be asked to provide financial support to offset increased departmental or administrative costs.

Ongoing budget planning will involve strategies for planning for program growth (new programs and/or enrolments), managing budget cuts, reallocation of resources, sharing of resources for greater efficiencies, salary and benefit changes, support to academic or other units impacted by co-op, etc.

Summary of Literature Review

Review of the related literature for this study helps to relate that Polytechnic is a tertiary institution, which serves as a link between the man and work, by giving adequate knowledge and skills needed to face the actual experience needed to face the real world, which is the major aim of establishing polytechnics (The National Policy on Education (2004)). Polytechnics chew out graduate every year into the labour force.

However the role of curriculum development in the achievement of greater educational output in electrical electronic engineering in Polytechnics is very vital and must not be put to away and this can only be done by putting together effective team in the review of curriculum.

Industry – institution partnership in training, research, curriculum development, funding and facilities upgrading is a major missing link in the quest for industrialization in developing economy like Nigeria. The present training methods as evaluated provides weak foundation, which cannot sustain industrial development. Most training programmes in major institutions are not in tune with modern facilities, which only the multi -nationals can afford. Most of these institutions are poorly funded. The interaction of institutions and industries in formulating programmes and curricula development will benefit the students, staff and companies. It will avails the companies the opportunity to evaluate the performance of young highly motivated graduates, which eventually serve as pool from which the companies can seek future full –time employees.

Lastly it is believed the use of appropriate facilities such as buildings, good human resources and up-to-date equipments aid cooperative education and help to achieve the major aim of cooperative education.

CHAPTER III

METHODOLOGY

This chapter strictly deals with the description of procedure or the method employ in the course of study. It includes the research design, area of the study, population, sample and sampling techniques, validation of instrument administration of instrument, methods of data analysis and the decision rule.

Research Design

The research design that was used in carrying out this study is the descriptive survey method, where questionnaire are used to solicit opinions of respondent on the issue under investigation. Olaitan (1999) defines a survey research design as "a descriptive study in which the entire population or representative sample of the entire population is studied by collecting and analyzing data from the group through the use of questionnaires". The survey deign was considered suitable since the study will seek information from a sample that was drawn from a population using questionnaire.

Area of study

The study was carried out in all the electrical and electronic related industries in Niger State as well as both Polytechnics in Niger state. See table I for the list of electrical and electronic industries in Niger state and also Table II shows the list of the polytechnics in Niger state.

Population

The population targeted for the study is three-hundred (300) which comprises of two-hundred and sixty-seven (267) supervising Engineers working at various Electrical and electronic Industry in Niger state and thirty-three (33) Lecturers in the two Polytechnics in Niger State.

Table I:

Showing the relationship between Industries in Niger State and the Numbers of Engineer in those Industries.

S/N	Industry Distributions	Numbers of Supervising Engineer
1	Shiroro hydropower Station	50
2	Kainji Hydropower station	70
3	Jebba hydropower Station	55
4	Nigerian Television Authority(NTA), Minna	15
5	Nigerian Television Authority(NTA), Kotangora	9
6	Nigerian Television Authority(NTA), Bida	10
7	Power FM Radio Station, Bida	6
8	Crystal FM Radio Station, Minna	4
9	PHCN Distribution Unit, Tunga Minna	26
10	PHCN Distribution Unit Bosso Minna	22
	TOTAL	**267**

Table II:

Showing the relationship between Polytechnics in Niger State and the Number of the Electrical/Electrical Engineering Lecturer.

S/N	Polytechnics in Niger State	Number of Lecturers
1	Federal Polytechnics of Technology, Bida	18
2	Niger State Polytechnics, Zugaru	15
	TOTAL	**33**

Sample of the Study

A total number fifty-seven (57) questionnaire were collected from four (4) industries with thirty-six (36) engineers and two (2) Polytechnics with twenty-one (21) teachers were sampled using random method of sampling, in which the validated questionnaires were distributed to.

Table III:

Showing the relationship between the sample of industry chosen

S/N	Industry Distribution	No of Engineer/Lecturers
1	Nigerian Television Authority(NTA), Minna	12
2	Nigerian television Authority(NTA), Bida	6
3	PHCN Distribution Unit, Tunga Minna	9
4	PHCH Distribution Unit, Bosso Minna	10
5	Federal Polytechnics of Technology, Bida	13
6	Niger State Polytechnics, Zugaru	7
	TOTAL	**57**

Instrument for Data Collection

The Instrument used for data collection was a questionnaire developed by the researcher for this study. It consists of parts I and II. Part I consist of the introductory part in which the respondent info is being put, and also have Part II which consist of fifty six (56) items which consistitute of three Research questions. All items are to be responded to by indicating the respondents' best perception using Four (4) point scales except for Research Question 1 that has a three (3) points scale.

Research question one (1) has twenty-four (24) items which helps to solve the facilities which are needed for integrating co-operative education in the curriculum of electrical/electronic curriculum.

Research question two (2) has seventeen (17) items which talks majorly about the partnership existing between the Polytechnic and industry and lastly,

There are fifteen (15) items in Research question three (3) which elaborate on strategy of integrating cooperative education into Electrical/Electronic curriculum effectively.

Validation of Instrument

The instrument for the collection of data was designed by the researcher and also validated by three (3) lecturers in the Department, where the lecturers are from the department of Industrial and Technology Education Department of the Federal University of Technology (FUT), Minna, Niger state.

Administration of the Instrument

A total of seventy-eight (78) questionnaires were administered by the researcher to the respondent in four (4) selected electrical and electronic related industry and two (2) polytechnic in Niger State and a total numbers of fifty seven (57) were collected which is constitute (73.1%) as showed in the table below.

Table 1V:

Showing the relationship between the numbers of questionnaire issued to the number collected

S/N	Industry Distribution	Issued	Collected
1	Nigerian Television Authority(NTA), Minna	12	12
2	Nigerian television Authority(NTA), Bida	15	6
3	PHCN Distribution Unit, Tunga Minna	10	9
4	PHCH Distribution Unit, Bosso Minna	13	10
5	Federal Polytechnics of Technology, Bida	16	13
6	Niger State Polytechnics, Zugaru	12	7
	TOTAL	**78**	**57**

Total Issued = 78 copies (100%) **Total Collected** = 57 copies (73.1%)

Method of data Analysis

The analysis of data for research question and hypothesis were accomplished using frequency counts, mean, standard deviation and t-test is use. Mean was used to determine the degree of acceptance and rejection in research questions.

SA	=	Strongly Agreed	=	**4**	**VN**	=	Very Needed	=	**3**
A	=	Agreed	=	**3**	**N**	=	Needed	=	**2**
D	=	Disagreed	=	**2**	**NN**	=	Not Needed	=	**1**
SD	=	Strongly Disagreed	=	**1**					

Decision Rule

To determine the acceptance level for research question two (2) and three (3) in line with the four scale rating, the mean of 2.50 was used as deciding point between agreed and disagreed. Thus responses with a mean of 2.50 and above were considered agreed while responses below 2.50 were considered disagreed. Also for research question one (1) which a three scale rating, the mean of 2.00 was used to decide the point between agreed and disagreed.

Also an inferential statistic t-test was used to test the hypothesis at 0.05 level of significant to compare the mean response of the two groups. Therefore any item with t-calculated value less than t-critical (t-table value) was regarded as not significant. While any item with t-calculated value equal or greater than t-critical was regarded as significant.

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

This chapter deals with the presentation and analysis of data for the purpose of answering the research questions posed by the researcher. The result of data analysis for the research questions are presented below.

Research question 1

What are the facilities needed for the integration of cooperative education into electrical and electronic engineering curriculum?

Table V:

Mean response of the industrial personnel (engineers) and Lecturers on the facilities needed for the integration of cooperative education into electrical and electronic engineering curriculum.

N_1 = 36 AND N_2 = 21

S/N	ITEMS	$\bar{X}_1$	$\bar{X}_2$	$\bar{X}_t$	REMARK
1	Automatic Electric Drive Control	2.80	2.52	2.66	Agreed
2	Synchronous Motor Control	2.56	2.52	2.54	Agreed
3	Transducer of instrumentation trainer	2.56	2.67	2.62	Agreed
4	Oscilloscope	2.72	2.71	2.72	Agreed
5	High voltage tester	2.75	2.67	2.71	Agreed
6	AVO cable fault locator	2.42	2.57	2.49	Agreed
7	Electronic wattmeter	2.89	2.52	2.71	Agreed
8	Resistors-capacitors Board	2.78	2.81	2.76	Agreed

9	Transformer trainer	2.72	2.19	2.46	Agreed
10	Microsoft system trainer	2.08	2.09	2.09	Agreed
11	Variable function generator	2.42	2.00	2.21	Agreed
12	Transfer function analyzer	2.44	2.48	2.46	Agreed
13	Construction of practical centre	2.78	2.95	2.87	Agreed
14	Availability of buildings	2.83	2.81	2.82	Agreed
15	Electrical and Electronic industry	2.81	2.90	2.86	Agreed
16	Micro processor application trainer	2.14	2.05	2.09	Agreed
17	High power motor generating set	2.69	2.29	2.49	Agreed
18	Telecommunicating training modules	2.58	2.38	2.48	Agreed
19	High voltage generating modules	2.69	2.71	2.70	Agreed
20	Digital system trainer	2.81	2.57	2.69	Agreed
21	Electrical machine tutor	2.58	2.81	2.69	Agreed
22	Constant Power supply	2.83	2.95	2.76	Agreed
23	Servo system demonstrator	2.58	2.86	2.72	Agreed
24	Measuring devices (ohmmeter, voltage and ammeter)	2.69	3.00	2.85	Agreed

Keys

N_1 = Numbers of Engineers **N_2** = Numbers of Lecturers

$\bar{X}_1$ = Mean of Engineers $\bar{X}_2$ = Mean of lecturers

$\bar{X}_t$ = Average mean of Engineers and Lecturers

The data presented in the table above shows that respondents agreed with all the items with mean score ranging between **2.09** and **2.86** as the facilities needed for the integration of cooperative education into electrical and electronic engineering curriculum.

Research question 2

How can partnership exist between polytechnics and industry?

Table VI*:*

Mean responses of the industrial personnel (engineers) and Lecturers on the partnership existing between polytechnics and Industry

N_1 = 36 AND N_2 = 21

S/N	ITEMS	$\bar{X}_1$	$\bar{X}_2$	$\bar{X}_t$	REMARK
1	Electrical industrial assess student’s practical projects	3.81	3.76	3.79	Agreed
2	Supervision of students during industrial work experience	3.69	3.67	3.68	Agreed
3	Staff industrial trainings	3.33	3.29	3.31	Agreed
4	Placement of students on work experience	3.72	3.86	3.79	Agreed
5	Provision of facilities to aid students in industries	3.78	3.86	3.82	Agreed
6	Industries should contribute in curriculum development	3.33	3.43	3.38	Agreed
7	Train and re-train industrial in institutions	3.44	3.62	3.53	Agreed
8	Students allow to undergone work experience in industries for two semester	3.42	2.81	3.12	Agreed
9	Students allow to be in classroom in institutions after two semesters	3.33	3.62	3.47	Agreed
10	Industrial personnel should be part of accreditation team	3.58	3.62	3.60	Agreed
11	Cooperative work study by the lectures and supervising engineers	3.64	3.29	3.46	Agreed

12	School – Industry organize joint seminar/conferences	3.61	3.52	3.56	Agreed
13	Schools invite industrial personnel to project exhibition	3.69	3.86	3.77	Agreed
14	Students are allowed for industrial visits	3.50	3.90	3.70	Agreed
15	Industries personnel serve as lecturers	3.47	3.19	3.33	Agreed
16	Industries examine student psychomotor skills	3.36	3.85	3.60	Agreed
17	Institutions examine students cognitive	3.42	3.81	3.61	Agreed

Keys

N_1 = Numbers of Engineers **N_2** = Numbers of Lecturers

$\bar{X}_1$ = Mean of Engineers $\bar{X}_2$ = Mean of lecturers

$\bar{X}_t$ = Average mean of Engineers and Lecturers

The data presented in the table above shows that respondents agreed with all the items with mean score ranging between **3.12** and **3.82** as on the partnership existing between polytechnics and Industry.

Research Question 3

What are the strategies of integrating of cooperative education into Electrical and Electronic Engineering curriculum effective?

TABLE VII:

Mean response of the industrial personnel (engineers) and Lecturers on the strategies of integrating of cooperative education into Electrical and Electronic Engineering curriculum effectively in polytechnic education.

N_1 = 36 AND N_2 = 21

S/N	ITEMS	$\bar{X}_1$	$\bar{X}_2$	$\bar{X}_t$	REMARK
1	Schools and Industries should jointly design curriculum	3.58	3.43	3.50	Agreed
2	Lecturers and industrial personnel should belong to the same professional bodies	3.08	3.28	3.18	Agreed
3	Schools and industrial joint organize conferences	3.52	3.38	3.40	Agreed
4	Industrial personnel should form team of accreditation	3.67	3.67	3.67	Agreed
5	Cordial relationship between lecturers and industrial personnel	3.67	3.86	3.76	Agreed
6	Polytechnics should form industrial advisory board	3.61	2.95	3.28	Agreed
7	Constant supervision of students on training	3.67	3.95	3.81	Agreed
8	Engineers in the industries should be given the opportunity to lecture in polytechnics	3.58	3.14	3.36	Agreed
9	Lecturers should be accepted for industrial training	3.64	3.05	3.34	Agreed
10	Students should be allowed for practical in industries	3.75	3.90	3.82	Agreed
11	Establishment of Electrical/Electronics Industries	3.72	4.00	3.86	Agreed
12	Industries should sponsor research work in institutions	3.75	3.52	3.63	Agreed
13	Industrial personnel should be involved in assessing student practical projects	3.72	3.52	3.62	Agreed

14	School and industry should support cooperative work study	3.83	3.48	3.65	Agreed
15	Electrical/Electronic training school should be built where polytechnics are located	3.61	3.80	3.70	Agreed

Keys

N_1 = Numbers of Engineers **N_2** = Numbers of Lecturers

$\bar{X}_1$ = Mean of Engineers **$\bar{X}_2$** = Mean of lecturers

$\bar{X}_t$ = Average mean of Engineers and Lecturers

The data presented in the table above shows that respondents agreed with all the items with mean score ranging between **3.18** and **3.86** as the strategies of integrating of cooperative education into Electrical and Electronic Engineering curriculum effectively in polytechnic education.

Hypothesis 1

There is no significant difference between the mean responses of lecturers and industrial personnel on facilities needed for the integration of cooperative education into electrical and electronic engineering curriculum.

TABLE VIII:

The analysis of the industrial personnel (engineers) and Lecturers on the facilities needed for the integration of cooperative education into electrical and electronic engineering curriculum in polytechnic education.

N_1 = 36 AND N_2 = 21

S/N	ITEMS	SD_1	SD_2	T	REMARK
1	Automatic Electric Drive Control	0.38	0.45	2.38	NS
2	Synchronous Motor Control	0.56	0.73	0.22	S
3	Transducer of instrumentation trainer	0.50	0.58	-0.73	S
4	Oscilloscope	0.45	0.41	0.08	S
5	High voltage tester	0.44	0.43	0.67	S
6	AVO cable fault locator	0.67	0.51	-0.96	S
7	Electronic wattmeter	0.32	0.51	2.99	NS
8	Resistors-capacitors Board	0.48	0.40	-0.25	S
9	Transformer trainer	0.51	0.50	3.79	NS
10	Microsoft system trainer	0.73	0.70	-0.05	S
11	Variable function generator	0.65	0.67	2.31	NS
12	Transfer function analyzer	0.58	0.60	-0.25	S
13	Construction of practical centre	0.48	0.22	-1.82	S
14	Availability of buildings	0.38	0.46	0.17	S

15	Electrical and Electronic industry	0.45	0.30	-0.91	S
16	Micro processor application trainer	0.64	0.49	0.61	S
17	High power motor generating set	0.58	0.56	2.58	NS
18	Telecommunicating training modules	0.50	0.74	1.11	S
19	High voltage generating modules	0.47	0.46	-0.16	S
20	Digital system trainer	0.40	0.68	1.48	S
21	Electrical machine tutor	0.50	0.62	-1.45	S
22	Constant Power supply	0.38	0.22	-1.52	S
23	Servo system demonstrator	0.55	0.58	-1.78	S
24	Measuring devices (ohmmeter, voltage and ammeter)	0.52	0.00	-3.54	NS

Keys

N_1 = Numbers of Engineers **N_2** = Numbers of Lecturers

SD_1 = Standard deviation of Engineers **SD_2** = Standard deviation of Lecturers

S = Significant **NS** = Not Significant

t = t-test

The data presented in the table above shows that the hypotheses was not accepted for items 1, 7, 9, 11, 17 and 24, while the remaining were accepted for the facilities needed for the integration of co-operative education in electrical and electronic engineering curriculum in polytechnics education, using t-test value of +/- 2.00.

Hypothesis 2

There is no significant difference between the mean responses of lecturers and industrial personnel on the state of partnership/cooperation existing between polytechnics and industries.

TABLE IX:

The analysis of the industrial personnel (engineers) and Lecturers on the partnership existing between polytechnics and industry

N_1 = 36 AND N_2 = 21

S/N	ITEMS	SD_1	SD_2	T	REMARK
1	Electrical industrial personnel should assess student's practical projects	0.40	0.44	0.17	S
2	Supervision of students during industrial work experience	0.52	0.58	0.13	S
3	Staff industrial training	0.86	0.78	0.18	S
4	Placement of students on work experience	0.75	0.59	-0.78	S
5	Provision of facilities to aid students in industries	0.42	0.36	-0.76	S
6	Industries should contribute in curriculum development	0.76	0.87	-0.44	S
7	Train and re-train industrial in institutions	0.56	0.49	-1.19	S
8	Students allow to undergone work experience in industries for two semester	0.65	0.81	2.93	NS
9	Students allow to be in classroom in institutions after two semesters	0.68	0.67	-1.57	S
10	Industrial personnel are part of accreditation team	0.69	0.67	-0.22	S
11	Cooperative work study by the lectures and supervising engineers	0.54	0.56	2.30	NS
12	School – Industry organize joint seminar/conferences	0.55	0.60	0.56	S
13	Schools invite industrial personnel to project exhibition	0.47	0.36	-1.54	S

14	Students are allowed for industrial visits	0.56	0.30	-3.50	NS
15	Industries personnel serve as lecturers	0.69	0.68	1.49	S
16	Industries examine student psychomotor skills	0.64	0.36	-3.68	NS
17	Institutions examine students cognitive	0.60	0.40	-2.92	NS

Keys

N_1 = Numbers of Engineers N_2 = Numbers of Lecturers

SD_1 = Standard deviation of Engineers SD_2 = Standard deviation of Lecturers

S = Significant   **NS** = Not Significant

t = t-test

The data presented in the table above shows that the hypotheses was not accepted for items 8, 11, 14, 16, and 17, while the remaining were accepted for the partnership that exist between Polytechnics and Industry using t-test value of +/- 2.00.

Hypothesis 3

There is no significant difference between the mean responses of lecturers and industrial personnel on the link between educational institutions and the industry for effective cooperative education programme.

TABLE X:

The analysis of the industrial personnel (engineers) and Lecturers on the on the strategies of integrating of cooperative education into Electrical and Electronic Engineering curriculum effectively in polytechnic education.

N_1 = 36 AND N_2 = 21

S/N	ITEMS	SD_1	SD_2	T	REMARK
1	Schools and Industries should jointly design curriculum	0.55	0.67	0.86	S
2	Lecturers and industrial personnel should belong to the same professional bodies	1.02	1.01	-0.72	S
3	Schools and industrial joint organize conferences	0.66	0.80	0.68	S
4	Industrial personnel should form team of accreditation	0.66	0.48	0	S
5	Cordial relationship between lecturers and industrial personnel	0.52	0.36	-1.63	S
6	Polytechnics should form industrial advisory board	0.59	1.16	2.44	NS
7	Constant supervision of students on training	0.63	0.22	-1.49	S
8	Engineers in the industries should be given the opportunity to lecture in polytechnics	0.81	0.48	2.59	NS
9	Lecturers should be accepted for industrial training	0.54	0.69	3.34	NS
10	Students should be allowed for practical in industries	0.47	0.30	-0.68	S
11	Establishment of Electrical/Electronics Industries	0.45	0	-3.69	NS
12	Industries should sponsor research work in institutions	0.44	0.50	1.74	S

13	Industrial personnel should be involved in assessing student practical projects	0.45	0.68	1.20	S
14	School and industry should support cooperative work study	0.38	0.81	1.86	S
15	Electrical/Electronic training school should be built where polytechnics are located	0.60	0.40	-1.43	S

Keys

N_1 = Numbers of Engineers **N_2** = Numbers of Lecturers

SD_1 = Standard deviation of Engineers **SD_2** = Standard deviation of Lecturers

S = Significant **NS** = Not Significant

t = t-test

The data presented in the table above shows that the hypotheses was not accepted for items 6, 8, 9 and 11, while the remaining were accepted for the strategies of integrating of cooperative education into Electrical and Electronic Engineering curriculum effectively in polytechnic education, using t-test value of +/- 2.00.

Findings

Based on the data collected and analyzed, the findings are being drawn for two (2) different parties which are the Industrial Engineers and the lecturers in polytechnics all in Niger State. And the following findings have been made and are alighted below.

Facilities needed for the integration of cooperative education in the curriculum of electrical and electronic curriculum

1. Instrument called Automatic Electric Drive Control is needed
2. The use of AVO cable fault locator is absolutely necessary
3. Electrical Wattmeter is also needed
4. High Voltage tester is useful
5. Practical centers are to be constructed and also Buildings should be made available
6. There should be Electrical and Electronic Industry
7. Constant Power supply should be made available.
8. Measuring instruments like ohmmeter, voltmeter and ammeter are needed.

Findings related to the partnership that exists between polytechnics and Industry.

1. Electrical industrial should assess student’s practical projects to be able to give proper assessment to it with a little expect touch.
2. Students are to be supervised during their industrial work experience to insure seriousness and for the student to be able to do the needed thing.
3. There should be adequate provision of facilities to aid students in industries for update their knowledge on the latest facilities.
4. Industries should also make meaningful contribution in the development of Polytechnics curriculum.

5. Cooperative work study must be carried-out by lectures and the supervising engineers in the industry.
6. Students are allowed for industrial visits.
7. Industries should examine student psychomotor skills.
8. Institutions should also examine student cognitive skills.

Findings according to the strategy for integrating cooperative education into the Electrical and Electronic engineering curriculum effectively.

1. Schools and Industries should jointly design the curriculum.
2. Lecturers and industrial personnel should belong to the same professional bodies and be ruled under one umbrella. Decisions are to be agreed between and standard should be set to up in coordinating both.
3. Polytechnics should form industrial advisory board
4. Students should be allowed for practical in industries
5. Engineers in the industries should be given the opportunity to lecture in polytechnics.
6. Establishment of Electrical/Electronics Industries
7. Industries should sponsor research work in institutions

Discussion of findings

The discussions of the findings are based and organize on the research question and hypothesis posed as regards to the Integration of Co-operative Education in Electrical and Electronic Engineering Curriculum, in view of Niger state Polytechnics..

The findings of the study indicated that two groups of the respondents for this study agreed that all the Facilities needed for the integration of cooperative education in the curriculum of electrical and electronic curriculum, such facilities such as Automatic Electric Drive Control, AVO cable fault locator, High Voltage tester and the Electrical Wattmeter is needed. Eduframe.net (2012) gives a definition of an electric drive as a system that consists of various system combined together for the purpose of motion control or movement control. Wikipedia (2012) regards a wattmeter as an instrument which measures electrical energy in watt hours (Wh) over a period of time and cost of electricity consume. Also a High Voltage tester is also called dielectric strength test which can be made into A.C or D.C, which aid in the testing of high voltages and check for Breakdown.

Practical centers are to be constructed and also Electrical and Electronic Industry should be made readily available for Student for easy asses to practical. Measuring instruments such as ohmmeter, voltmeter and ammeter are needed, and are being regarded as the basic or fundamental equipment which are being used by an electrical/electronic student. Ammeter is an electrical instrument which helps in current in a circuit.

The findings that are related to the partnership that exist between the industry and Polytechnics involves, Electrical industrial personnel assessing student's practical projects. This is aid in a current validation of the project and could be Practical oriented, and not all about theories.

Another finding is that Students are to be supervised during their industrial work experience to insure seriousness and for the student to be able to do the required thing. Public.callutheran.edu (2012) supported that project whether Practical, performance or library-based, can take vast amount of time and student can go over the top of it with just the right amount of Supervision done by expects. Supervision is simply given a guide instruction without a doubt; it should be done before, during and after the project.

Also Polytechnics should serve a form industrial advisory board for the industry. This is just to aid in the updating the polytechnics with up-to-date information about. An advisory committee should be set-up, by providing the opportunity between the School and industry, and also to be able to provide expertise to the program, by reviewing curriculum, facilities, budget, Student competencies and student placemen in related Occupation.

Another finding reveals that there should be provision of facilities to aid students in industries for carrying-out there work effectively. While the school tends to equip itself theoretically, they can contribute to the industry growth by the provision of equipment to be used by the students while carrying-out there practical work.

A finding also suggests that Cooperative work study must be carried-out by lectures and the engineers in the industry. Co-operation work-study means the coming together of lecturers and Engineers to set an agreed objective, and to be able to work together, to achieve such objective. A Co-operative work study is essential to provide them knowledge in both practical and theory, and to serve as an opportunity for the student to be trained by many expect in related occupational field.

Findings according to the strategies for integrating cooperative education into the Electrical and Electronic Engineering curriculum effectively, reveals that Schools and Industries should jointly design the curriculum. Curriculum is simply the totality of all the learning experience a student is exposed, and for a curriculum to be a valid one, it must entails both practical and theory, with should be jointly done by the Lecturers and the Industrial personnel.

Advice is sought at key points from teachers, professional associations and curriculum experts as well as from the broader educational community, and should entails details on what teachers are expected to teach, what Practical they are suppose to carry-out and what each students are expected to learn.

CHAPTER V

SUMMARY, CONCLUTION AND RECOMMENDATION

In this chapter, summary of the study, Conclusion, Implication of the study, recommendations and suggestions for further research are presented.

Summary of the study

The study is centered on the integration of cooperative education in the curriculum of electrical and electronic engineering. Specifically the study assessed Polytechnics Education in Nigeria, Curriculum development and implementation and also C-operative education and the strategy for its implementation.

The study talks about electrical energy, that take into practices Electrical engineering which is a branch of engineering science that deals with the studies of the uses of electricity and equipment for the power generation and distribution of the power. Electrical engineer are the nations driving force to accompling a good industrialized economy, they help design, develop, test, manufacture, and repair electrical and electronic equipment. Polytechnics helps to provide the needed training to became a competent engineer which training can either be done in the National diploma (ND) and in the Higher National Diploma (HND) programme all with a good and well standardized curriculum which can be define as the totality of all the learning experience a student is set to pass through. The statement of the problem of the study talks about the high rate of unemployment in Nigeria system today, which can be blame down to the poor state of the Polytechnics in Nigeria; whereby there are poor electrical and electronic training equipments. The purpose of this study as it is been stated clearly in the Chapter one (1) of this work are; the state of partnership with exist between polytechnics and industries, Strategies for effective integration of cooperative education into Electrical and Electronic Engineering curriculum; among others. The hypotheses of this study were tested at a point of 0.05 level of significance.

The review of some related literatures were reviewed under the following sub-headings; the concept of co-operative education and of curriculum development and implementation, the development of polytechnic Education in Nigeria: among others. Where Co-operative education is defined as the type of education in which the student have the opportunity of learning in the school along with industries learning. Some strategies for the integration of co-operative education which were discussed are that both parties should support a good top management, they should emulate the habit of good communication skills and trust and there should be a good understanding of the general needs of both sides. And the facilities to be used for the good co-operative education integration are; Equipments, Teachers and good financing or funding Strategies.

The method use in this research, which include the research design, area of the study, population, sample and sampling techniques, validation of instrument administration of instrument, methods of data analysis and the decision rule are being discussed in details in chapter III. However the area of study of this research work is between ten (10) electrical and electronics related industries as well as the two (2) polytechnics, but with a case study of Niger state. The population of the study consists of 267 engineers, in as well as 33 Polytechnic Lecturers, but a sample population of fifty-seven (57) was chosen which constitute of thirty-six (36) engineers and twenty-one (21) lecturers all in four (4) and two (2) industries and polytechnics respectively. The data were collected using the questionnaire method consistute of fifty-six (56) items all within there (3) research questions and were calculated with the acceptance and rejection decision rule of 2.00 for research question one (1) and 2.50 for question two (2) and there (3).

The analysis of the data collected were presented in Chapter IV which consist of six (6) tables. The mean responses of the respondent are being presented in the tables as well as the average mean ($\overline{X}_t$), Standard deviation and the t-cal. The significance level used is **+/-2.00,** Some of the findings derived from this study are; Staff industrial trainings, Train and re-train industrial in institutions, Industrial personnel should be part of accreditation team, Industries personnel serve as lecturers, Schools and Industries should jointly design curriculum, Polytechnics should form industrial advisory board, Students should be allowed for practical in industries, Automatic Electric Drive Control, High voltage tester AVO cable fault locator and Constant Power supply among others. And few are being discussed.

Implication of the study

The finding of the study reveals that the student should use the AVO cable fault locator as part of the equipment to be used for a good curriculum. Automatic faults locator aids in the detection of fault in electrical cables, and the points where the problem lies is being detected automatically. This make the student work more easier and faults are been located with aids in the delivering the work more effectively.

Another finding of the study suggests the availability of constant power supply, in which the students and the engineers can be able to carry-out there work more efficiently without any break in power outbreak. Most industry major problem is as a result of shortage of power supply and with this problem solved helps in carrying-out the work easily. A power supply is said to be constant if its voltage output is essentially constant despite variations in variables, such as load resistance, line voltage, and temperature.

A finding also suggest that for a co-operative education to be efficient, the use of facilities such as the Ammeter, Voltmeter and Ohmmeter is absolutely necessary for easy measurement of data. Measurements are needed to be carried-out with precision instrument like the Ammeter to be able to get accurate information.

Findings also shows that Electrical industrial should assess student's practical projects to be able to give proper assessment to it with a little expect touch. If the industrial personnel also have a hand in the inspection, supervision and funding of polytechnic student projects, there will be more room accuracy, motivation, up-to-date information and will be easily done.

A finding also aids Cooperative work study must be carried-out by lectures and the supervising engineers in the industry. The implication of this finding is that there will be joint work between the schools and the industry and this will create a more avenue for achieving efficient collaboration between them. According to Millis (2002) it create a more dynamic work environment, and to create a pool for career recruitment.

The finding supporting Schools and Industries jointly designing the curriculum has the implication of the curriculum being of good standard, in the sense that the student will have the opportunity to be expose to good and quality syllabus. The curriculum has it is known is the totality of all the learning experience a student is exposed to under the auspices of the school. So with the schools and industry coming together to design it will give a standard one.

Recommendations

1. Industries should participate actively in the establishment of engineering workshops, laboratories for undergraduates to enhance quality training and research.
2. Industries/Academia cooperation in the areas of research and development with a view of establishing pilots projects, plants to enhance industrial experience of both teachers and students.
3. Regulatory and professional bodies such as Nigerian Society of Engineers (NSE), Council for the Regulation of Engineering in Nigeria (COREN) should be engaged in the moderation, standardization of quality assurance of various industrials institutional collaboration for students, teachers and facilities.
4. Establishment of industrial-institution sabbaticals for both teachers and company's technocrats.

Conclusion

Based on the findings of this study, it was concluded that there is need for the integration of Co-operative education into Electrical and electronic engineering curriculum in polytechnics. Since the polytechnic is the place where student are being taught on vocational and technical education which is to be used in the field of work, and it will be required for the student to be updated with knowledge of both theoretical and practical all with the help of co-operative education.

The effect of the result of this study will provide the curriculum developer of what is needed to be included in the curriculum, and it will give the polytechnics and the industry the needed ways and strategy to teach the student effectively and blend between classroom work and industry work.

Suggestions for further research

1. The effects of co-operative education on the learning ability of the electrical and electronic engineering student in polytechnics.
2. Strategies of improving the weak relationship between University and the Industry.

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APPENDIX I

APPENDIX II

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

DEPARTMENT OF INDUSTRAIL AND TECHNOLOGY EDUCATION

ELECTRICAL AND ELECTRONIC TECHNLOGY OPTION

QUEISTIONAIRE ON:

THE INTEGRATION OF CO-OPERATIVE EDUCATION IN ELECTRICAL AND ELECTRONIC ENGINEERING CURRICULUM IN POLYTECHNICS: A CASE STUDY OF NIGER STATE.

SECTION A

PERSONNAL DATA

Please kindly provide the information required bellow. All information and responses supplied to the items of this questionnaire will be used particularly for the purpose of this research work and will be treated as confidential. Your prompt and honest response will be duly appreciated.

i. Name of School/Industry: ____

ii. Department: ____

SECTION B

QUESTION AIRES

Please indicate the option that appeal to you by ticking the appropriate box.

Key to response options

SA	=	Strongly Agreed	VN	=	Very Needed
A	=	Agreed	N	=	Needed
D	=	Disagreed	NN	=	Not Needed
SD	=	Strongly Disagreed			

RESEARCH QUESTION I

What are the facilities needed for the integration of cooperative education into electrical and electronic engineering curriculum?

S/N	ITEMS	VN	N	NN
1	Automatic Electric Drive Control			
2	Synchronous Motor Control			
3	Transducer of instrumentation trainer			
4	Oscilloscope			
5	High voltage tester			
6	AVO cable fault locator			
7	Electronic wattmeter			
8	Resistors-capacitors Board			
9	Transformer trainer			
10	Microsoft system trainer			
11	Variable function generator			
12	Transfer function analyzer			
13	Construction of practical centre			
14	Availability of buildings			
15	Electrical and Electronic industry			
16	Micro processor application trainer			
17	High power motor generating set			
18	Telecommunicating training modules			

19	High voltage generating modules			
20	Digital system trainer			
21	Electrical machine tutor			
22	Constant Power supply			
23	Servo system demonstrator			
24	Measuring devices (ohmmeter, voltage and ammeter)			

RESEARCH QUESTION 2

How can partnership exist between polytechnics and industry?

S/N	**ITEMS**	**SA**	**A**	**D**	**SD**
25	Electrical industrial assess student's practical projects				
26	Supervision of students during industrial work experience				
27	Staff industrial training				
28	Placement of students on work experience				
29	Provision of facilities to aid students in industries				
30	Industries should contribute in curriculum development				
31	Train and re-train industrial in institutions				
32	Students allow to undergone work experience in industries for two semester				
33	Students to be allow back in the classroom after two semesters in industry				
34	Industrial personnel are part of accreditation team				
35	Cooperative work study by the lectures and supervising engineers				
36	School – Industry organize joint seminar/conferences				
37	Schools invite industrial personnel to project exhibition				

38	Students are allowed for industrial visits				
39	Industries personnel serve as lecturers				
40	Industries examine student psychomotor skills				
41	Institutions examine students cognitive skills				

RESEARCH QUESTION 3

What are the strategies of integrating of cooperative education into Electrical and Electronic Engineering curriculum effectively?

S/N	ITEMS	SA	A	D	SD
42	Schools and Industries should jointly design curriculum				
43	Lecturers and industrial personnel should belong to the same professional bodies				
44	Schools and industrial joint organize conferences				
45	Industrial personnel should form team of accreditation				
46	Cordial relationship between lecturers and industrial personnel				
47	Polytechnics should form industrial advisory board				
48	Constant supervision of students on training				
49	Engineers in the industries should be given the opportunity to lecture in polytechnics				
50	Lecturers should be accepted for industrial training				
51	Students should be allowed for practical in industries				
52	Establishment of Electrical/Electronics Industries				
53	Industries should sponsor research work in institutions				
54	Industrial personnel should be involved in assessing student practical projects				
55	School and industry should support cooperative work study				

56	Electrical/Electronic training school should be built where polytechnics are located				

APPENDIX III

Computation of mean and standard deviation for the **ENGINEERS** and **LECTURERS**

Mean formula used in data analysis and meaning

$\bar{X} = \frac{\sum f X}{N} = \frac{fX3 + fX2 + fX1}{N}$ for research question One (I)

$\bar{X} = \frac{\sum f X}{N} = \frac{fX4 + fX3 + fX2 + fX1}{N}$ for research question Two (II) and Three (III)

Where:

$\bar{X}_1$ = mean score of Engineers

$\bar{X}_2$ = mean score of Polytechnics Lecturers

$\bar{X}_t$ = Average of $X_1 + X_2$

N_1 = Total population of Engineers

N_2 = Total population of Polytechnics Lecturers

$\bar{X}$ = Mean

$\sum$ = Summation

f = Frequency of respondents

$\bar{X}$ = Rating scale

N = Numbers of respondents

fX_4 = Frequency of four (IV) points

fX_3 = Frequency of three (III) points

fX_2 = Frequency of two (II) points

fX_1 = Frequency of one (I) point.

Table XI

Computation of mean for **ENGINEERS**

Reponses	**X**	**F**	**FX**
Strongly Agreed	4	18	72
Agreed	3	8	24
Disagreed	2	6	12
Strongly Disagreed	1	4	4
		N = 36	**$\sum$ f X = 112**

Mean $(\bar{X}) = \frac{\sum \mathrm{f\,X}}{\mathrm{N}} = \frac{fX4+fX3+fX2+fX1}{N}$

= 112/36

= **3.11**

Table XII

Computation of mean for **LECTURERS**

Reponses	**X**	**F**	**FX**
Strongly Agreed Agreed Disagreed Strongly Disagreed	4 3 2 1	10 7 4 0	40 21 8 0
		N = 21	**$\sum$ f X = 69**

Mean $(\bar{X}) = \frac{\sum \text{f X}}{\text{N}} = \frac{fX3+fX2+fX1}{N}$

= 69/21

= 1.81

= **3.29**

Computation of Standard Deviation for **ENGINEERS**

$\bar{X}$ = **3.11**

Reponses	**X**	**F**	**X-$\bar{X}$**	**(X-$\bar{X}$)^2**	**F(X-$\bar{X}$)^2**
Strongly Agreed	4	18	0.89	0.79	18.79
Agreed	3	8	-0.11	0.01	0.08
Disagreed	2	6	-1.11	1.23	7.38
Strongly Disagreed	1	4	-2.11	4.45	17.8
					$\sum F(X-\bar{X})^2$=**44.05**

Standard Deviation = $\frac{\sum F(X-\bar{X})2}{N}$

= $\frac{44.05}{36}$

= **1.22**

Computation of Standard Deviation for **LECTURERS**

$\bar{X}$ = 3.29

Reponses	**X**	**F**	**X-$\bar{X}$**	**(X-$\bar{X}$)^2**	**F(X-$\bar{X}$)^2**
Strongly Agreed	4	10	0.71	0.50	5.00
Agreed	3	7	0.29	0.08	0.56
Disagreed	2	4	1.29	1.66	6.64
Strongly Disagreed	1	0	2.29	5.24	0
					$\sum F(X-\bar{X})^2$**=12.2**

Standard Deviation = $\frac{\sum F(X-\bar{X})2}{N}$

$= \frac{12.2}{21}$

= **0.58**