Replacing SIWES with Open Apprenticeship Scheme for Electrical and Electronics Technology Students in Technical Colleges in Edo State for Sustainable Livelihood

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Abstract
It has become too worrisome among the people in Nigeria; especially stakeholders in the education sector that graduates produced at all level of education can not fit into the jobs for which they are trained. The case of technical college graduates is most pronounced. Instead of looking for white collar jobs as it is currently experienced, graduates of technical colleges generally and of course that of electrical and electronics technology are suppose to set up their own workshops or be employed in the industries. The reverse seems to be the case. This paper therefore examined the state of electrical and electronics workshops in our technical colleges. The decay in infrastructure and technical teachers’ attitude to work and its impact on students learning were discussed. It was discovered that the level of competencies as relate to skills acquisition needed by electrical and electronics students cannot be achieved if students fully relied on the school workshops. It was also noted that SIWES programme can no longer be relied on for students’ practical experiences because most industries in Nigeria have relocated to other neighbouring countries because of the prevailing challenges. The need to replace SIWES with open apprenticeship scheme was comprehensively discussed. It was recommended that all technical college students should register in open apprenticeship scheme and that government should make of the technical education policies.

Keywords: Technical Colleges, SIWES Programme, Apprenticeship Scheme, Skills Acquisition

Introduction
The need for a type of education that will empower the recipients to become self reliant, employers of labour and to have means of sustainable livelihood brought about the establishment of technical schools in Nigeria. Introduction of technical college or vocational education was not only to improve the skill acquisition but also to encourage occupational development (Puyate, 2010). There is degree of positive correlation between the quality of manpower development in a country and her level of social and economic development. Ugwu (2007) observed that the future of any nation lies on skills, knowledge and abilities of her children that are expected to be acquired from technical education.
Technical college now known as Government Science and Technical College is a post primary institution where vocational and Technical subjects are offered. It has three levels of classes: vocational I, vocational II and Vocational III. According to FRN (2004) minimum entry requirements into the technical college (VOC I) shall be the Junior School Certificate (JSC) now Basic School Certificate (BSC). Entry could also be based on evidence of aptitude shown in the technical courses and a reasonably good performance in mathematics and science. In addition to general education, wide ranges of courses including trade courses are offered in technical college. All the trade courses are in two parts: theory and practice. More periods of lesson are a signed to the workshop practice per week than the theory lessons. The essence is to make the students to be highly grounded in practical skills that are expected of them in the world of works.

Okafor (2010) stated that technical education is aimed at impacting to its recipients, skills, scientific knowledge and competencies that can enable them work very effectively in industrial and commercial ventures through a systematic and well-programmed training and instructions. He went further to defined technical education as that segment of education charged with preparing people for work. He also said that is the backbone of the nation’s employment related education and training programme. Osuala (2000) in his view defined technical education as the training of individual at the adult post-entrance into employment in occupation which are defined as technical by industrial, scientific, commercial and government agencies. Okoro (2000) explained technical education as any form of education whose primary purpose is to prepare for employment in any recognized occupation.

The Federal Republic of Nigeria (FRN, 2004) states that technical education is that educational programme, which leads to the acquisition of practical and applied skills as well as basic scientific knowledge. This implies that technical education is to prepare individuals for gainful employment and also serve as the heart of nation building. Consequently, the federal Government directed the National Board for Technical Education (NBTE) to draw up circular for technical education institutions and supervise the running of technical education and this led to more establishment of technical colleges all over the country where courses like mechanical engineering, electrical engineering, fabrication engineering, automobile technology, building technology, furniture technology, drafting. The focus of this paper is on Electrical and Electronics Technology.

**Concept and Scope of Electrical and Electronics Technology**

Electrical and Electronics Technology is one of the core subjects offered by students in technical colleges in Nigeria. Students offering this course are expected to be grounded in the rudiments of the theory and practice of the subject. The field of electrical and electronics deals with electric current and the practical application of atomic reactions which result from special properties and behaviour of infinitesimally charged particles called electrons. It is the science of technology of controlling the flow of electrons to produce useful result. It is also the study of electron devices and their utilization (Onyehulu, 2010).

The field of electrical and electronics have advanced from the use of analog system to more complex digital system. The scope of study according to Okala (2010), includes power generation, transmission, and distribution; measurement, instrumentation, installation and maintenance; circuit analysis; networking, power and control system, electrical and electronics drawing, drafting and interpretation; radio communication and domestic and
industrial wiring. Okala also stated that the emergence of internet and various communication, and security gadgets have widen the horizon of electrical and electronics. The complexity in the act of field electrical and electronics require a specialized school workshop; classrooms, workshops, laboratories, libraries, school location and teachers.

According to Federal Republic of Nigeria (FRN, 2004), the scope of electrical and electronics for technical college students includes:
- Electrical Installation and Maintenance works
- Radio, Television and Electrical works

This implies that upon completion of course of study in electrical and electronics in technical college, the students’ academic performance will be determine on their ability to install and maintain electrical and electronics devices, equipment and appliances and their ability to carry out major and minor domestic wiring. This cannot be possible if electrical and electronics workshops in technical colleges are not well equipped with the relevant facilities and equipment. Electrical and electronics technology is not like other technical subjects. For example, in building and woodwork technology, the learners can see and feel the real objects and materials. The concepts in electrical and electronics technology are too abstract that students find it difficult to comprehend and concretise, then. If the teaching and learning of electrical and electronics must be effective, that is if the students must be equipped in both theory and practice, the workshops must be equip with modem facilities and equipment.

Practical Skills in Electrical and Electronic Technology Needed by Technical College Students for Sustainable Livelihood

Electrical and Electronic Technology is a practical subject. This, of course is the reason for assigning more time for workshop practice on the school time table. A carful study of the time table in technical colleges reveals that three periods of forty (40) minutes, that is two (2) hours each a week is allocated for theory whereas, it is three hours for workshop practice. It shows that more emphas is given to practical exercise than the theory aspect of Electrical and Electronic Technology. According to Digberi-Besmart (1994) the venue for acquiring practical skills by technical college students is the workshop. In order to acquire employable skills in Electrical and Electronic Technology, the students need to be familiar with the use of facilities in the workshop. It is important for each student to be able to indentify each tool, equipment, consumables, their uses and care. Table 1, shows the skills needed by electrical and electronics technology students and the tools/materials that are required to carry out the various activities.

Table 1: Shows the skills and the tools/materials needed in Electrical and Electronics Workshops for Technical College.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Skills</th>
<th>Tools/Materials</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Observation of safety rules when handling tools, instruments and machines</td>
<td>Safety helmet and footwear</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hand gloves</td>
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<td></td>
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<td>Uniform</td>
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### Identification of tools, instrument and equipment; their uses and care

- All hand and power tools used in Electrical and Electronics workshops: screwdrivers, pliers, soldering pit, measuring instrument, spanners, hacksaw, hammer, etc.

### Correct handling of tools, instrument and equipment

- All hand and power tools used in Electrical and Electronics workshops: screwdrivers, pliers, soldering pit, measuring instrument, spanners, hacksaw, hammer, etc.

### Identification and uses of the right cables for the right job.

- All types and sizes of cables... for both domestic and industrial wiring.

### Identification and use of all types and power rating of electrical accessories.

- Measuring instruments.

### Ability to identify and correct trouble shooting in house wiring

- All instruments and tools needed (screwdriver, multi-metre, lamp tester, pliers, etc.).

### Ability to carryout both surface and conduct wiring without supervision

- All the tools and equipment for wiring.

### Ability to carryout all installation test (Earthing, continuity, etc).

- All the tools and equipment need for installation test.

### Ability to carryout simple, maintenance work in electrical machines (motor, alternator, transformers)

- Screwdrivers, pliers, multimeter spanners, sand paper, grease, oil

### Ability to join cables using different methods

- Pliers, wire cutter soldering bit, solder, flux

### Ability to carry out maintenance and repair in electronics gadgets

- Signal generator, meters, sold erring bit, solder, flux

**Source:** Checklist of tools and equipment supplied to technical colleges, Edo State 2013/2014.

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**Technical College Students’ Industrial Work Experience Scheme (SIWES) and Skill Acquisition**

In order to enhance the practical skills of students of engineering and related courses, the government established Students Industrial Work Experience Scheme (SIWES) through
Industrial Training Fund (ITF) in 1973/74. The purpose of SIWES is to make higher institution students in engineering and related courses and those in technical colleges familiarize themselves with the activities in the industries for which they are being prepared for. In SIWES exercise, students are acquainted with skills of handling equipment, machinery, keeping and posting and posting of entries into relevant books and the understanding of work methods and procedures, SIWES, a division of the field services department of Industrial Training Fund (ITF) is a skill training programme designed to expose and prepare students of universities, polytechnic, colleges of Education and Technical colleges from the college environment to work (Akerejoba, 2008). SIWES is a skill training programme designed to expose and prepare students of Agriculture, Engineering, Technology, Environmental, Science, Medical Science and Applied Science for the industrial work situation they are likely to meet after graduation and as such, the attachment in the industries should be the one compactable with students’ area of study. This is why SIWES is a compulsory exercise for all students studying course that need industrial experience. Asogwa and Drogu as cited by Osuyi (2005) maintained that there is an urgent need for people attention to be redirected towards self-reliant and sustainable means of livelihood which technical education provides,

Most industries in Nigeria have relocated to other Africa countries due to the prevailing circumstances. The alarming level of insecurity, the frustrating epileptic power supply and couple with deplorable state of our roads are among the factors that are responsible for the absence of industrial in Nigeria. These industries, in addition to creating jobs, compliment the efforts of the technical school by allowing students to undertake training in their industries. But recently, technical college graduates hardly acquire any technical skill that would enable them to gain employment in the industries. It is now common to find technical college students not participating in SIWES exercise. Many of them do the training in areas not relevant to their course of study.

State of Electrical and Electronics Workshop Facilities and Equipment in Technical Colleges in Nigeria

Workshop facilities are the tools, machines, equipment as well as instructional materials used to facilitate teaching and learning in the school workshop. While workshop equipment are non-fragile, non-moveable and moveable apparatus, articles, machines, furniture, bound books, models, films, set of training aids, etc., that are used in the workshop. Suleman (1998) define, workshop equipment as the movable or fixed unit of furniture or furnishings, an instrument, a machine, an apparatus, a kit or a set of articles which meet the following conditions:

- Retain its original shape and appearance with use.
- Non expendable that is if the article is damage or some of its parts are lost or worn out, it is usually more feasible to repair than replace it entirely with new unit,
- It represents an investment of money which makes it visible and advisable to capitalize the item.
- It does not lose it identify through incorporation into a different or more complex units or substance.

The state of workshops in technical colleges generally is alarming. The facilities and equipment in electrical and electronics workshops are most worrisome. The tools and machines are now just mere iron structures, worn out and obsolete. No wonder that, in some colleges, the workshop have been turn to staff rooms, examination halls and classrooms. The remains of the machines have been converted to cupboards and drawers for stationeries
(Osuyi, 2005). Many graduates of electrical and electronics left school without participating in practical exercise and as such they are not able to find relevant job in the Industries. To further worsen the situation is the power supply which has rendered the few equipment epileptic left not useful.

Reasons for Replacing SIWES with Open Apprenticeship for Electrical and Electronics Students in Technical Colleges

Researchers have shown that there are acute shortages of tools, instruments and equipment in Nigerian technical colleges. The few ones purchased by government in the 1960s are obsolete and are lying fallow in the dilapidated workshops buildings in technical colleges. In fact Electrical and Electronics workshops have been turned to mere laboratories, classrooms, staff rooms and even examination halls (Osuyi, 2005). Students only learn the concepts and theories of Electrical and Electronics and less of the techniques of maintenance and repair of electrical machines. Many of these graduates did not have the opportunity to use the equipments and tools for Electrical and Electronics practicals when they were in school. They graduated without any practical experience. Assessment of the quality of manpower produced by technical and vocation and Training Institution, cited by Audu (2010) revealed that technical and vocational education in Nigeria has not met the needs of the labour market. The World Bank further asserted that there is a mis-match between the quality of preparedness and supply of graduates and need of the labour market.

Many Electrical and Electronics teachers seem not to have the required competency to teach the students practical skills. Researchers have shown that some of the teachers employed by government to teach Electrical and Electronics subjects are those who read physics or chemistry or mathematics. These categories of teachers do not have any form of training in workshop practice and as such they shy away from practical exercises (Uwameiye, 2000). This is one of the major reasons that graduates from technical colleges are without the required skills that would make them employable in the world of work. Okoro (2000) is of the opinion that effective vocational training can only be given where the training jobs are carried out of the same way, with the same tools and the same machines as in the occupation itself. He stressed further that technical education well be efficient on proportion as the standard of the workshop in which the learner is trained is replica of the environment in which the learner must subsequently work. Environment in this wise is the Electrical and Electronics workshop and its facilities

In a workshop where there are no learning facilities, students are taught with pictures and diagrams which are never the same with the real objects. For example, servicing of electrical machines cannot be taught theoretically. There must be a typical electrical machine, the necessary tools and materials. If these facilities are available, the students can participate actively in the servicing of the equipment. Repeated processes over time will enable the students to master the procedure. Modern Electrical and Electronics facilities are not actually found in technical colleges workshop and couple with teachers’ commitment and attitude to practical exercise had made the students not to be skillful in practical work.

The Electrical and Electronics technicians’ workshops are quite different from the school workshops. The Technicians’ workshops are usually established by a master craft man who probably had his training both from formal school and apprenticeship scheme. The Electrical and Electronics technicians have the necessary tools and equipments for the maintenance and repair which are used in workshop activities daily. The activities of repeated procedures such
as disassembling of electrical machine every time enable the apprentice to learn by doing. In the area of house wiring, the practical in the school workshops are not exactly the same with that of the building. Laying of cables, electrical accessories on the wiring board is not the same as laying of cables on the surface of building walls or laying conduct pipes on the walls. Effective vocational training can only be given where the training jobs are carried out of the same way, with the same tools and the same machines as in the occupation itself. This is where the efficacy of the open apprenticeship scheme e workshop training cannot be undermined. In open apprenticeship scheme, the technical student is able to link the concepts, principles learnt in the classroom to the reality found in the workshop outside the school. Also, the practical works that were poorly done in school workshop due to time constraint and the level of ability of the technical teacher could better be established in the students by attending training in open apprenticeship workshop. Some of the advantages of this system include time, repetition of exercise; master craft man is more competent in practical under real work situation.

SIWES that was established by government to cater for these lapses have not been able to produce the needed result in the aspect of equipping the technical students with the requisite skills. Apart from the scarcity of the relevant industries in Nigeria where students could be attached for industrial works experience, other challenges have bedevilled the scheme. SIWES is now becoming a mere formality to both students and technical teachers. However, students perceive it as one of the courses that they should score high grade and as such they are more interested in the grades the supervisors will award to them. The practice of scoring students based on what they recorded in the log books has not contributed any good to the system. There are reported cases of the supervisors asking students to submit their log books to them in the offices for the purpose of awarding marks without visiting the students at the work place. For this reason, many students have decided not to bother themselves looking for relevant industries for industrial training, instead they forge, private documents and submit to the supervisors in their offices.

Another serious challenge facing SIWES is non-acceptance of students by some industries. This is evident in that many students come back after several weeks to complain that they could not get any place for training. For example, in 2012 sixty-four (64) students from Department of Vocational and Technical Education, Faculty of Education, University of Benin were sent out for industrial training, only fifteen were able to secure relevant places for attachment, while others went to any where that accepted them for the sake of doing it.

Other challenges hindering the effective implement of SIWES include:

- Insufficient SIWES orientation programme for students.
- Delay in pay students allowance.
- Ineffective handling of complains from institutions and students.
- Poor collaboration between the institutions and industries.
- Bureaucracy on the part of the industries and the supervising agencies.
- Poor infrastructures for learning in some industries.

The decay status of infrastructures of our technical schools, especially in the area of workshop facilities and couple with the challenges facing SIWES, has become a serious challenge to technological advancement in Nigeria. It will be worse if stakeholders in technical education programme still rely on the school workshops and SIWES for the acquisition of e technical skills. Those challenges didn’t just start now. They have been in the system. They have been identified severally by stakeholders. Government had in several
occasion professed solution to the problems, but did not yield any good result.

In 1979, Federal government withdrew the management of SIWES from Industrial Training Fund (ITF) due to some logistics and the increased financial burden. Consequently, the federal Government founded the scheme through the National Universities Commission (NUC) and the National Board for Technical Education (NBTE) which could not manage the scheme satisfactorily and in 1984, the management of SIWES was taken over again by ITF. Statistics available revealed that there is tremendous improvement in the number of students who enroll in the scheme yet by employers of labour is that the vocational and technical education graduates lack employable skills. It is on this note that this paper strongly opined that the SIWES could be replaced with open Apprenticeship scheme (OAS).

Open Apprenticeship Scheme is a government approved learning programme to all interested unemployed youths for the acquisition of marketable skills for gainful employment or for self employment. It is a scheme organized by individual or group of individuals, supported by government. It is a skill training programme which is done in an organized workshop. Such workshops are normally equipment with relevant learning facilities. The instructors are usually skilled men and who specialized in practical exercises in their various disciplines. Recently, government at all levels has been involved in “Skill Acquisition Centre”. There is collaboration between the government and the centre in the area of funding and supervision. The workshops used for such training are usually commercialized. That is, they are engaged in rendering services to the public such workshops are always very busy with activities beneficial to the apprentice. Those in electrical and electronics works engage in electrical appliances and houses wiring. The money they generate is able to cater for the well being of the instructors and maintenance of the equipment. It has the advantage of allowing learners to attend the workshop at their own convenience. This sort of arrangement will enable technical college students to attend the workshop during weekends and holidays. Apart from the initial cost of enrolment, learners are not to pay fees; instead they generate income for the scheme. This exercise that should run for three years (VOC I to III) should involve the parents, the government and the school in the areas of funding and supervision. At the end of the three years, technical students are expected to take practical test that would lead to the award of Trade Test Certificate. The certificate will now be a pre-requisite in addition to National Technical Certificate (NTC) for gaining employment in the industries.

Conclusion
It has become clear that one major ways to reducing unemployment in Nigeria is to revisit vocational and technical education with a view of revitalizing the programme. Our technical colleges can no longer afford to produce technicians who only are able to memorise electrical/electronics concepts and solve mathematical equations. This will not bring about the technical development everyone is yearning for in Nigeria. There is urgent need to revisit the state of our technical school workshops. This paper is of the opinion that even the SIWES programme has failed in its duty of enhancing the practical experiences of technical school students because there are few companies and industries in Nigeria. This, coupled with the non-availability of facilities and equipment in our technical school workshops have crippled vocational education at that level. One major ways out of this menace is the replacement of SIWES with open Apprenticeship scheme. With this measure, technical college students will be able to acquire the relevant knowledge and skills that will serve as means of sustainable livelihood.
Recommendations
It is very evident that there is high level of infrastructural decay in our technical colleges. Competent technical teachers are scare and some in teaching service, have obtained higher qualifications and as such have secured better employment in companies or as lecturers in high institutions. The technical teachers who are currently teaching the students exhibit poor attitude to work probably because they lack the technical know-how required to impact the necessary knowledge and skills to the students. The result is that graduates of electrical and electronics are without the requisite skills to gain employment or be self employed as stated in National Policy on Education. This paper therefore recommends that:
1. Technical students, precisely electrical and electronics students should register with open apprenticeship scheme workshop where they can acquire practical skills.
2. Government and all stakeholders should not rely on Students’ Industrial Work Experience Scheme (SIWES) for acquiring practical skills, because there are few industries where the exercises could be carried out.
3. As against the current practice, government should make open apprenticeship scheme for all technical students as one of the technical education policies.

References