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# Assessment on Star Delta Starter System Skills Needs for Employment of Electrical Electronics Graduates of Polytechnics in Rivers State

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## *Abstract*

***The study focused on assessment of star delta starter system skills needs for employment of electrical electronics Graduates in Polytechnics in Rivers State. Two purposes, research questions and hypotheses guided the study. A descriptive survey research design was adopted for the study. The study was carried out in Rivers State. The population of this study consists of 304 students and 42 teaching staff given a total of 346 respondents. Consensus sampling technique was use based on the fact that the manageable size of the population. The study adopted a questionnaire titled star delta starter system skills questionnaire (SDSSQ). The instrument was structured on a 5- point Likert scale response of Strongly Agree (SA)=5, Agree (A)=4, Undecided (U)=3, Disagree (D)=2 and Strongly Disagree (SD)=1 respectively. The instrument was face-validated by three experts and a reliability coefficients of 0.80 using Cronbach Alpha reliability. Findings of the study indicates that the respondents agreed on the star-delta installation skills needs for employment of electrical electronics graduates in Polytechnics in Rivers State. Findings of the study indicate that the respondents agreed on the constraints in acquiring Star Delta Starter System Skills for Employment of Electrical Electronics Graduates in Polytechnics in Rivers State. Based on the findings and conclusion of the study, the following recommendations were suggested: National board for technical education should mandate the training of competent lecturers to teach star-delta installation skills as it would enable the employment of electrical electronics graduates in the industries. Polytechnic management should engage the collaboration of industries in the applications of star delta starter skills to enhance the employment of electrical electronics graduates.***

***Keyword: Star Delta Starter System, Skills, Employment, Electrical Electronics Graduates and Polytechnics.***

## Introduction

The growth of any nation's workforce can be defined by its skilled and semi-skilled labour forces more than unskilled labour force and one of the key characteristic features of Technical Education and Vocational training (TEVT) is the area of training that impart skills applicable in particular employable trade (Anup, 2015). Shreeve, Gibb and Ribeiro (2013) also identified human capital development as a driving factor for economic progress and emphasized on the need to invest in TVET to generate skilled resources. Practical training as an inclusion of TVET is a tool for Human Resource Development significant for a nation's economic competitiveness. Human resources are very important as they mobilize other resources which includes financial resources, or natural resources to enhance economic pace and skilling human resources is the first step for its true effectiveness. The skilling human resources were amongst others why polytechnics were established in Nigeria. Anderson (2021) stressed on the aim of National Policy of Education, that Nigerian youths passing through the nation's polytechnics set up are expected to be equipped on graduation with physical and intellectual skills to enable them become useful to society.

Polytechnics as one of the TVET institutions are coordinated by National Board of Technical Education (NBTE) to make an impact in the areas of technological education so as to meet the growing needs of the economy; To consolidate and develop the nation's system of higher education in response to the economy's manpower needs; To streamline and strengthen the machinery for educational development in the country. Among the programs run in Polytechnics include electrical electronics technology.

Electrical/electronic technology is one of the accredited courses of instruction aimed at developing local semi-skilled technicians and technologists in Universities, Monotechnics, Colleges of technology, and Polytechnics. Polytechnic electrical/electronic engineering students study different technical courses such as instrumentation, control system, telecommunications, data and information processing, digital signal processing, electrical machines, analogue electronics, digital electronics, power system engineering among others. These courses are offered both in theories and practice to enable students develop requisite skills for employment in the world of work upon graduation (Owo & Isaac 2020).

The Nigerian polytechnic education system therefore placed high regard on practical skills acquisition by students for the technological advancement of the nation. This is seen from the NBTE curriculum which stipulates that 40% of total score in any technical courses should be awarded to practical works while the remaining 60% is for theoretical courses in polytechnics.

Polytechnic education as defined by United Nations Education Scientific and Cultural Organization (UNESCO, 2001) is a segment of the general education that prepares individuals for occupational fields and for effective participation in the lifelong learning for responsible citizenship preparation, for sustainable development promotion, a best method to facilitate poverty alleviation and enable individual to develop technical and entrepreneurial skills and attitudes. Therefore, polytechnics are established to train and inculcate in learners (students) technical vocational and entrepreneurial skills necessary for self-reliance and productivity in the world of work. According to Owo & Isaac (2020), polytechnic electrical/electronic engineering students in addition to the acquisition of

technical competence in their core areas of specialization, must acquire generic soft skills to enable them become employable in the society. Therefore, to secure a sustainable employment, graduates in electrical/electronic studies are expected to acquire adequate skills, knowledge and proficiency in their respective areas of specialization such star delta starter installation skill.

National Board of Technical Education curriculum (2001) included star delta starter in Electrical Design and Drafting 1 & 11 to be taught alongside the practical sessions to be effectively carried out. The practical skills in the installation of star delta starter of electric motors is to understand and wire a wide range of components like push buttons, timer relays, contactors, thermalmagnetic overload, auxiliary contacts and their principle of operations.

The in-depth knowledge of these components in starting electric motors require a good level of practical training that will enhance self-sustainable skill. Osuala (2004), stated that most technical skills training actually present challenges to the learner by integrating practical work, theoretical knowledge, creative thinking, observation ability and encouragement in an occupation. To this end, the ability to teach and install star delta poses some challenges that relevant procedure must be followed. Okeke (2010), opined that to possess skill is to demonstrate the habit of acting, thinking and behaving in a specific activity in such a way that the process becomes natural to the individual through purposeful repetition or practice in that occupation. The complexity in the teaching and installation of star delta starter should have purposeful practical modules, repetition, and constant practical sessions. Competency Based Training (CBT) is a structured approach to training and assessment that is directed toward achieving specific outcomes. It is about assisting individuals to acquire skills and knowledge with a view to performing a task to a specified standard under certain conditions (Harris, & Hodge, 2012). Okoye, Michael, and Ofonmbuk (2015) stated that in CBT, the outcomes to be achieved are clearly stated so that learners know exactly what they have to do and able to do, trainers know what training or learning is to be provided and organizations know the skill levels required of their people.

The learners to understand clearly what they have to do and able to do, the principle of operation, design and installation of star delta electric motor starters from scratch, relevant drawing, teaching modules, qualified trainers, and availability of training materials should be provided (Krunal & Jay, 2019). Star-Delta starters are popular because of it peculiar benefits in industries, it use in operating heavy duty electric motor, it current reduction to approximately 1/3 of rated motor current and its production of high torque per ampere of line current.

During the starting time of star delta starter, Main contactor and star contactor remain in the close state and complete power circuit. During starting, the motor is connected in star mode and in that mode, voltage applied to the motor winding is reduced to $1/\sqrt{3}$ of line voltage (options-skills).When motor attains sufficient speed of full speed up to 58% of the motor's designed Revolution Per Minute (RPM), the timer connected in the circuit get activated. The circuit de-energized the star contactor mode and connects delta contactor into the circuit, this means that the delta contactor will close automatically. The $A_2$, $B_2$ and $C_2$ also represented as $W_2$, $U_2$ and $V_2$ are regarded as star terminals in fig.1 configuration below

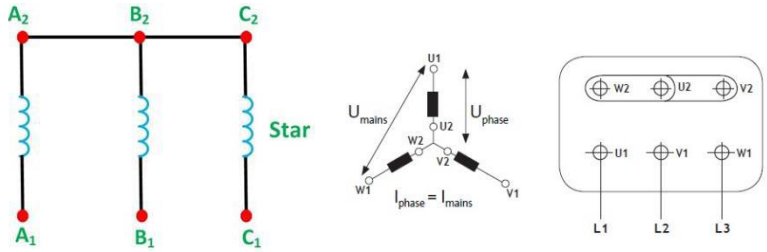


**Fig.1 Star connected motor winding (source:** options-skills**)**

**Current and voltage in Star Mode**

$$\text{Current: } I_{phase} = I_{mains} \tag{1.1}$$

$$\text{Voltage: } U_{phase} = U_{mains}/\sqrt{3} \tag{1.2}$$

The current in star state is 1/3 of the current in delta state. Hence contractor rating is one-third of motor rated current**.** When switching from star to delta, the circuit becomes open and motor neither remain in star nor in delta state. This state is called an open transition state. Within few seconds, the timer in the circuit gets activated, it opens star contractor and closed delta contractor. The switching of star state to delta state is done by using a timer, which connected in the wye-delta starter control circuit.

After activation of timer, motor switched from star to delta state. In delta connection state, phase voltage equal to line voltage. Hence full line voltage applied to motor winding and motor runs at its rated full speed. Delta connected motor winding is shown in the fig.2 coniguration below.

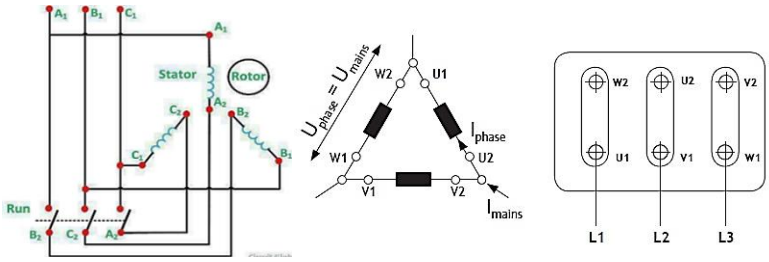


**Fig. 2. Delta connected motor winding (source; options-skills)**

**Current and voltage in Delta Mode**

$$\text{Current: } I_{phase} = I_{mains}/\sqrt{3} \tag{1.3}$$

$$\text{Voltage: } U_{phase} = U_{mains} \tag{1.4}$$

Immediately the timer is activated, the sysem automatically switche from star mode to delta state. In delta connection state, phase voltage equal to line voltage. Hence full line voltage applied to motor winding and motor runs at its rated full speed.

After some time motor attain 58% of rated speed and timer circuit switch configuration from star mode to delta mode, making 2 phases voltage are connected in series on each coil in the motor and motor continues to rotate at its full designed revolution per minute speed .During the working of the starter, two contactors remain closed. These two contactors are the main contactor and delta contactor. In Star delta starter the received starting current is about 30 percent of the starting current during direct on line (DOL) start and the starting torque is reduced to about 25 percent of the torque available at a D.O.L starter. Star delta starter only works when the application is light loaded during the start (Krunal & Jay, 2019). A star delta is used for a cage motor designed to run normally on the delta connected stator winding. The connection of a three-phase induction motor with a star delta starter.

A star delta starter is the most commonly used method for the starting of a 3 phase induction motor. In star delta starting an induction motor is connected in through a star connection throughout the starting period. Then once the motor reaches the required speed, the motor is connected in through a delta connection. A star delta starter will start a motor with a star connected stator winding (Curtis, Ingerman & Morrow, 2018). When motor reaches about 55% of its full load speed, it will begin to run in a delta connected stator winding.

**A s**tar delta starter is a type of reduced voltage starter. We use it to reduce the starting current of the motor without using any external device or apparatus. This is a big advantage of a star delta starter, as it typically has around 1/3 of the inrush current compared to a DOL starter.

The main circuit breaker serves as the main power supply switch that supplies electricity to the power circuit. The main contactor connects the reference source voltage **R**, **Y**, **B** to the primary terminal of the motor $\mathbf{U_1}$, $\mathbf{V_1}$, $\mathbf{W_1}$. In operation, the Main Contactor ($\mathbf{K_3}$) and the Star Contactor ($\mathbf{K_1}$) are closed initially, and then after a period of time, the star contactor is opened, and then the delta contactor ($\mathbf{K_2}$) is closed. The control of the contactors is by the timer ($\mathbf{K_{T1}}$) built into the starter. The Star and Delta are electrically interlocked and preferably mechanically interlocked as well (Brumbach, 2014). The star contactor serves to initially short the secondary terminal of the motor $\mathbf{U_2}$, $\mathbf{V_2}$, $\mathbf{W_2}$ for the start sequence during the initial run of the motor from standstill. This provides one third of direct online current to the motor, through which the high inrush inherent current is reduced with large capacity motors at startup. Controlling the interchanging star connection and delta connection of an AC induction motor is achieved by means of a star delta or wye delta control circuit. The control circuit consists of push button switches, auxiliary contacts and a timer.

The main purpose of star delta starter is to start the three phase electric motor in Star connection when running in Delta Connection. We also bear in mind that Star Delta starter can only be used for low to medium voltage and light starting torque induction motors. In case of direct on line (D.O.L) start, the receiving current at motor is about 33% while the starting torque reduced about 25-30% (von Meier, 2016). This way, Star Delta Starter can only be used for light load during starting the motor. Otherwise, the heavy load motor will not start because of low torque which need to accelerate the motor to rated speed while

converting to the Delta connection. These practical skills in star/delta are to be embedded in tertiary institutions if Nigerian graduates are to be employable in industrial sectors.

However, in Nigeria, research had shown that technology graduates at entry level of employment are not equipped with relevant employability skills needed by industries which makes it difficult for them to assess good job in the industries. Alausa, Olaiya and Olasina (2017), posited that lack of appropriate practical skill acquisition in engineering training, lack of coordination in curricula development and dissemination between the institutions, industries and students among others are responsible for denial of engineering graduates industrial employment. Thus, there is need for higher institutions to have paradigm shift in curriculum for each program offered so as to providing the graduates with technical skills relevant for job placement. Universities and other tertiary institutions need to equip students with employability skills so that they can create jobs for themselves upon graduation if paid employment is not forth-coming.

Employability skills are set of skills, knowledge and attributes which enhances the chances of an individual to gain, maintain and excel in employment. Employability skills enable one to obtain new employment; move between roles within the same organization and to get promotion (Crebert, Bates, Bell, Patrick, & Cragnolini, 2004), (Billing, 2003). Employability skills as those skills necessary for getting, keeping and being successful in a job (Hewitt, 2005).

**Statement of the Problem**

The installation and configuration of Star/Delta starter is a skill in Electrical discipline that is needed to be taught, learned and practice. Star Delta Starter is a very common type of starter and is used extensively as compared to the other type of starting methods that is used in reducing starting torque of an induction motor. The sole aim of the establishment of polytechnics is to gain effective practical skills in line with technical and vocational educational training (TVET).

Industrial sectors and other related services demand competent skills on star/delta technological applications as required by their operations and production activities. Job opportunities in these areas are always given to expatriates from other countries when needed skills are not provided by Nigerian graduates irrespective of the fact that there are many graduates in electrical/electronic technology from Nigerian polytechnics. Employers of labour in Nigeria often complain that some of the graduates of Nigerian universities, Polytechnics. Monotechnics and colleges of education lack the requisite skills or competencies needed for suitable employment.

Unfortunately, this skills are not built in the trainers (teachers) to enable them transfer the knowledge to the students. The trainers are not exposed to adequate training, modules, circuit drawing, components and other necessary equipment despite its emphasis in the curriculum. Hence the research assessment on star delta starter system skills needs for employment of electrical electronics Graduates in Polytechnics in Rivers State.

**Purpose of the Study**

The purpose of the study is to assess star delta starter system skills needs for employment of electrical electronics Graduates in Polytechnics in Rivers State. Specifically, the study sought to assess:

1. Star-Delta installation skills needs for employment of electrical electronics graduates in Polytechnics in Rivers State.
2. Constraints in acquiring Star-Delta Starter System Skills for Employment of Electrical Electronics Graduates in Polytechnics in Rivers State.

**Research Questions**

1. What are the Star-Delta installation skills needs for employment of electrical electronics graduates in Polytechnics in Rivers State?
2. What are the constraints in acquiring Star-Delta Starter System Skills for Employment of Electrical Electronics Graduates in Polytechnics in Rivers State?

**Hypotheses**

Three hypotheses were formulated and tested at 0.05 level of significance:

**$H_{O1}$**: There is no significant difference between the responses of electrical electronics lecturers and students on star-delta installation skills needs for employment of electrical electronics graduates in Polytechnics in Rivers State.

**$H_{O2}$** There is no significant difference between the responses of electrical electronics lecturers and students on constraints in acquiring Star Delta Starter System Skills for Employment of Electrical Electronics Graduates in Polytechnics in Rivers State.

**Methodology**

A descriptive survey research design was adopted for the study. The study was carried out in Rivers State. Rivers State has two NBTE approved Polytechnics sited in the two senatorial zones, these are: Kenule Beeson Saro-Wiwa Polytechnic Bori and Captain Elechi Amadi Polytechnic both are in Rivers State. These two Polytechnics in Rivers State were chosen because they are offering Electrical/Electronic technology where the students are expected to be trained in this skill.

The population of this study consists of 304 students and 42 teaching staff given a total of 346 respondents. The data were collected from field survey, 2021. The choice of electrical/electronic lecturers and students were based on the fact that they have both theoretical and practical skills experience. Consensus sampling technique was use based on the fact that the manageable size of the population.

The instrument was used to elicit responses from the respondents under the study. The instrument was star delta starter system skills questionnaire (SDSSQ). The instrument consists of five sections (A - D). The instrument was structured on a 5- point Likert scale response of Strongly Agree (SA)=5, Agree (A)=4, Undecided (U)=3, Disagree (D)=2 and Strongly Disagree (SD)=1 respectively. The instrument was face-validated by three experts and a reliability coefficients of 0.80 using Cronbach Alpha reliability. The data collected from the respondents were analyzed using mean and standard deviation to analyze responses to research questions. A mean score of 3.50 or above was adopted as a basis for acceptance while a mean below 3.50 was rejected for questions. The null hypotheses were tested using

t-test. If the calculated value of t (tcal) is less than the critical value of t (tcrit), the hypothesis was accepted but if the calculated value of t (t-cal) is greater than or equal to the critical value of t (t-crit), the hypothesis was rejected. The data were analysed with the aid of Statistical Package for Social Science (SPSS) and Microsoft excel software.

## Results and Analysis

**Research Question 1:** what are the star-delta installation skills needs for employment of electrical electronics graduates in Polytechnics in Rivers State?

**Table 1:** Mean and Standard Deviation of Star-Delta Installation Skills Needs for Employment of Graduates

| | Star-delta installation skills | Lecturers | | | Students | | |
|---|---|---|---|---|---|---|---|
| S/N | Ability to | X | SD | RMK | X | SD | RMK |
| 1 | Connect the direct online starter mode | 3.57 | .692 | SA | 3.81 | 1.03 | A |
| 2 | Connect the star mode | 3.56 | .732 | SA | 4.11 | .859 | A |
| 3 | Connect the delta mode | 4.28 | .750 | A | 4.35 | .719 | A |
| 4 | Identify components terminals | 4.93 | 1.00 | A | 3.95 | .932 | A |
| 5 | Connect the timer relay | 4.16 | .941 | A | 4.42 | .844 | A |
| 6 | Connect the electric motor | 4.95 | .875 | A | 4.09 | .860 | A |
| 7 | Connect the auxiliary contacts | 4.25 | .931 | A | 4.32 | .736 | A |
| 8 | Connect the control circuit | 4.99 | 1.08 | A | 4.31 | .790 | A |
| 9 | Connect the power circuit | 4.05 | .990 | A | 4.42 | .625 | A |
| | Grand Mean | 4.30 | 0.89 | A | 4.19 | 0.82 | A |

**Source:** Researcher's data 2021

Table 1 revealed that the lecturers had a mean range of 3.56-4.99 and standard deviation of 0.69-1.08. The students had a mean range of 3.81-4.42 and standard deviation of 0.62-1.03. The standard deviation showed the homogeneity of the respondents. The mean indicates that the respondents agreed on the star-delta installation skills needs for employment of electrical electronics graduates in Polytechnics in Rivers State.

**Research Question 2:** what are the constraints in acquiring Star Delta Starter System Skills for Employment of Electrical Electronics Graduates in Polytechnics in Rivers State?

Table 2: Mean and Standard Deviation on Constraints in Acquiring Star Delta Starter System Skills for Employment of Graduates

| | | Lecturers | | | Students | | |
|---|---|---|---|---|---|---|---|
| S/N | Constraints in acquiring Star Delta Starter System Skills | X | SD | RMK | X | SD | RMK |
| 1 | Lack of good workshop for students to be trained | 4.23 | .881 | A | 4.34 | .797 | A |
| 2 | Lack of training modules | 4.44 | .926 | A | 4.16 | .902 | A |
| 3 | Lack of competent instructors | 4.11 | .858 | A | 3.70 | 1.05 | A |
| 4 | Lack of students' interest | 4.26 | .897 | A | 3.86 | 1.02 | A |
| 5 | Lack of adequate facilities | 4.09 | .989 | A | 4.17 | .891 | A |
| 6 | Lack of power supply | 4.18 | .889 | A | 4.25 | .830 | A |
| 7 | Lack of competent lecturers | 3.97 | .954 | A | 4.26 | .809 | A |
| 8 | Poor time allocated for practical | 4.04 | 1.01 | A | 4.32 | .827 | A |
| 9 | Lack of consumables | 3.88 | .880 | A | 4.02 | .979 | A |
| 10 | Lack of adequate tools | 3.61 | 0.99 | A | 4.02 | 1.06 | A |
| | Grand Mean | 4.08 | 0.93 | A | 4.11 | 0.92 | A |

Source: Researcher's data 2021

Table 2 revealed that the lecturers had a mean range of 3.61-4.44 and standard deviation of 0.85-1.01. The students had a mean range of 3.70-4.32 and standard deviation of 0.79-1.06. The standard deviation showed the homogeneity of the respondents. The mean indicates that the respondents agreed on the constraints in acquiring Star Delta Starter System Skills for Employment of Electrical Electronics Graduates in Polytechnics in Rivers State.

**Hypotheses**

$H_{O1}$ There is no significant difference between the responses of electrical electronics lecturers and students on star-delta installation skills needs for employment of electrical electronics graduates in Polytechnics in Rivers State.

Table 3: t-test analysis on star-delta installation skills needs for employment of electrical electronics graduates**.**

| **Respondents** | **N** | $\overline{X}$ | **SD** | **α** | **DF** | **t-Cal** | **t-Crit** | **RMK** |
|---|---|---|---|---|---|---|---|---|
| Lecturers | 42 | 4.304 | 0.898 | | | | | |
| | | | | 0.05 | 344 | 1.22 | 1.96 | No Sig |
| Students | 304 | 4.197 | 0.822 | | | | | |

**Source:** Researcher's data 2021

Result in Table 3 revealed that t-cal (1.22) is less than t-crit (1.96) which indicates that the hypothesis stated was accepted. Therefore there is no significant difference between the responses of electrical electronics lecturers and students on star-delta installation skills needs for employment of electrical electronics graduates in Polytechnics in Rivers State.

$H_{O2:}$ There is no significant difference between the responses of electrical electronics lecturers and students on constraints in acquiring Star Delta Starter System Skills for Employment of Electrical Electronics Graduates in Polytechnics in Rivers State.

**Table 4:** t-test analysis on the constraints in acquiring Star Delta Starter System Skills**.**

| **Respondents** | **N** | **X** | **SD** | **α** | **DF** | **t-Cal** | **t-Crit** | **RMK** |
|---|---|---|---|---|---|---|---|---|
| Lecturers | 42 | 4.08 | 0.93 | | | | | |
| | | | | 0.05 | 344 | 1.21 | 1.96 | No Sig |
| Students | 302 | 4.11 | 0.92 | | | | | |

**Source:** Researcher's data 2021

Result in Table 4 revealed that t-cal (1.21) is less than t-crit (1.96) which indicates that the hypothesis stated was accepted. Therefore there is no significant difference between the responses of electrical electronics lecturers and students on constraints in acquiring Star Delta Starter System Skills for Employment of Electrical Electronics Graduates in Polytechnics in Rivers State.

**Discussion of Findings of the Study**

Findings of the study indicates that the respondents agreed on the star-delta installation skills needs for employment of electrical electronics graduates in Polytechnics in Rivers State. Findings of the study is in agreement with Australian learning and Teaching Council. (2011) who submitted that employability skills are sets of skills, knowledge and

attributes which enhances the chances of an individual to gain, maintain and excel in employment. Similarly, the finding corroborates. Australian Chamber of Commerce and Industry and Business Council Australian (2002) who indicated the existence of three categories of employability skills globally known and grouped as core skills, generic skills and personal attributes which enable one to access and progress in an employment. From the items stated in the table therefore, it is evident that all employers need their employees to possess and develop these talents, attributes and skills for effective job performances in their establishments.

Accordance with Billing (2003) who stated that developing the right attitude, having right qualifications, sound technical skills and experience, flexibility and openness, sense of initiative and professionalism among others are some of the ways of enhancing your employability in the labour world. Therefore, electrical/electronic engineering students in polytechnics who want to gain employment in the oil/gas industry at the end of their academic training should take the issue of career development seriously by developing relevant employability skills such as technical skills for example, instrumentation, control, electrical power and machine, electronics, telecommunications, information and communication technology etc. and generic soft skills for instance talents, attitudes, initiatives, flexibility, adaptability, openness, team work to mention but a few. Appropriate blend of the engineering technology and generic soft skills development makes it a lot easy to secure job placements in the oil/gas industry in Nigeria.

Findings of the study indicate that the respondents agreed on the constraints in acquiring Star Delta Starter System Skills for Employment of Electrical Electronics Graduates in Polytechnics in Rivers State. Findings of the study is line with Common Wealth of Australia, (2002) who stated that Core skills are technical competencies that comprise specific knowledge and capabilities to perform related specialized tasks with the use of equipment and tools efficiently. Courses listed indicates the inclusion of knowledge of electrical technology system, contemporary issues in education, Technology, Engineering, Mathematics (STEM) and Education as a Core Skills courses of ETE curriculum. Those courses are also indicated lack of incorporation of problem solving and decision making skills, lifelong learning skills and competencies in electrical discipline because of attention has been given more on theory based courses rather than practice based courses.

## Conclusion

Since employability skills help prospective employees to attract and secure good employment in industrial sectors, electrical/electronic technology graduates from polytechnics should strive to improve on their skills through effective practical training for the development of talents, aptitudes, attitudes and other relevant traits capable of making them preferred candidates over others who may as well compete with them for similar job offers. This is very important because employability skill does not only help in securing jobs but also position recipients in industries for higher earning job roles with increased potentials for growth and development. Development of skills and competencies are yardsticks that guarantee job security and career progression in oil/gas industry in Rivers State, Nigeria. Consequently, all those who wish to work in industrial sectors are required to develop their expertise and proficiency in line with the demands of the industries.

**Recommendations**

Based on the findings and conclusion of the study, the following recommendations were suggested:

1. National board for technical education should mandate the training of competent lecturers teach star-delta installation skills as it would enable the employment of electrical electronics graduates in the industries.
2. Polytechnic management should engage the collaboration of industries in the applications of star delta starter skills to enhance the employment of electrical electronics graduates.
3. The head of department of electrical electronics should make notable request to the management of Polytechnics on the constraints in acquiring Star Delta Starter System Skills for Employment of Graduates.

**References**

Akpan, E. O. & Udoh, O.A. (2014) Wealth Creation in Nigeria: The Need for Science, Vocational Technical and Technology Education", *International Journal of Vocational and Technical Education,* 3, (3), 9-15.

Alausa, D. W. S; Olaiya, O.O. & Olasina, J.R. (2017), Panacea for Improved Engineering Education and Industrial Training in Nigeria Educational System. *International Journal of Computer Science and Information Technology Research*.,5, (2),223-233.

Anderson, U. E (2021). Unmasking the potentials of Polytechnic education in addressing technology and socio-economic deficiency in Nigeria. *Key note paper presented at 6th annual conference of Academic staff union of Polytechnics,* Captain Elechi Amadi Polytechnic, Port Harcourt.

Anup, B. (2015) Technical and Vocational Education and Training in Workforce Development. *Journal of Training and Development* 1(1):77-84

Australian Chamber of Commerce and Industry and Business Council Australian (2002). Employability Skills for the Future. Canberra: Training Reform Section, Department of Education, Science and Training Australia.

Australian learning and Teaching Council. (2011). Graduate Employability Indicators: Introduction and User Guide. Canberra: Australia.

Billing, D. (2003). Generic Cognitive Abilities in Higher Education: An International Analysis of Skills Sought by Stakeholders" *Compare,* 33, (3), 335-350.

Common Wealth of Australia, (2002). Employability Skills for Small and Medium Size Enterprises: Common Wealth of

Crebert, G.; Bates, m.; Bell, B.; Patrick, C.J. & Cragnolini V. (2004). Developing Generic Skills at University, during Work Placement and in Employment: Graduates' Perceptions", *Higher Education Research and Development,* 23, (2), 147-165.

Harris, R. & Hodge, S. (2012). Discipline, Governmentality and 25 Years of Competency-Based Training: Studies in the Education of Adults, 44(2)

Hewitt, D. (2005). Conflicts and Harmonies among Different Aspects of Mathematical Activity: In Challenging Perspectives on Mathematics Classroom Communication", In Christiansen IM (Eds). Connecticut: *Information Age Publishing*.

Jones, E. A. & Voorhees, R. A. (2002). Defining and Assessing Learning: Exploring Competency-based initiatives. *Report of the National Post-Secondary Education Cooperative Working UMUC Centre for Innovation in Learning and Student Success (CILSS) Briefing Paper 18 Groups on Competency-Based Initiatives in Post-Secondary Education. Brochure and Report*

Krunal, J & Jay, M. (2019) AUTOMATIC STAR DELTA STARTER. International *Journal of Advance Research. 6(4), 1160-1170*

Okeke, A.C. (2010). Improving students' skill acquisition through effective clothing and textile education in tertiary institutions in Anambra State. Journal of Home Economics Research, 6(1), 81.

Okoye, K.R.E. & Michael, O. I (2015) Enhancing Technical and Vocational Education and Training (TVET) in Nigeria for Sustainable Development: Competency-Based Training (CBT) Approach. *Journal of Education and Practice* 6, (29), (Paper) ISSN 2222-288X (Online) http://www.options-skills.co.uk/reviews/

Osuala, C.E. (2004). *Foundations of vocational education*. Onitsha: Cape Publishers Int. Ltd.

Owo, O. T & Isaac, U. C. N. (2020). Assessment of the employability skills of polytechnic electrical/electronic engineering graduates for employment in oil/gas industry in Niger-delta, Nigeria. *International Journal of Engineering Applied Sciences and Technology,* 5, (3) 142- 150

Shreeve, R., Gibb, J., & Ribeiro, S. (2013). From TVET to Workforce Development. Skill Development for inclusive and sustainable growthin developing Asia-Pacific. New York: Springer.pp 126 – 133

United Nations Education Scientific and Cultural Organization (2001) "*Revised Recommendation Concerning Technical and Vocational Education",* Paris, UNESCO Press, 2001.