

Foundry Craft Practice: Relevant and Innovative Skills for Technical College Students' Self-Employment in COVID-19 Pandemic era in Rivers State

Abstract

The study investigated foundry craft practice skills relevant and innovative for technical college students' self-employment in covid-19 pandemic era in Rivers State. Four research questions were raised and one null hypothesis formulated which guided the study. The study adopted the descriptive survey design. The population was 219 comprised of 170 technicians and 49 teachers/instructors in six NBTE accredited Technical Colleges in Rivers State. A questionnaire structured on a 4-point rating scale was used for data collection. The instrument was validated by three specialists one from School of secondary Technical Education, FCE (T) Omoku, and the other two from faculty of education, Rivers State University, Port Harcourt. The reliability coefficient of .80 was obtained. The data collected from the respondents were analyzed using mean and standard deviation to answer the research questions and z-test was used to test the null hypothesis at 0.05 level of significance. The findings revealed that to a high extent, practical skills in pattern making, core making, moulding process, melting, molten metal handling and treatment skills were relevant and innovative for technical college students' self-employment in covid-19 pandemic era in Rivers State. Hence recommended that government should encourage non-government organizations (NGO) to sponsor and organized seminars, conferences, workshops and symposia for technical teachers and instructors in technical colleges in Rivers State to sensitize them on communicating the different relevant and innovative skills to students, as well as how these skills will lead them to be employers of labour, other than being job seekers. Administrators of technical colleges should always organize programmes to improve the quality of training given to students as these will help in addressing the issue of negative attitudes and perceptions of students towards technical education.

Keywords: Foundry Craft Practice, Practical skills, Technical colleges, Self-employment, COVID-19 pandemic

Introduction

Corona virus (COVID-19) pandemic puts the world economy in state of jeopardy in 2020, economic activities were disrupted and restrictions of movement were imposed as measures to contain the spread of the virus. Yet till date many countries, in fact, the world economies continues to battle for recovery from the dreaded effect of the pandemic. Though, before the outbreak of the pandemic the outlook of the world economy was fragile, especially developing countries like Nigeria, as global gross domestic product (GDP) growth was estimated to be only 2.5 percent in 2020. Nigeria was ranked 21st among 181 countries in the 4th quarter of 2020, with an unemployment rate of about 33.3% and youth unemployment/underemployment rate of 42.5% (National Bureau of Statistics, NBS, 2021). They further rated the country as the poverty capital of the world with an estimated 87 million people living on less than \$2 a day threshold.

This explains that the outbreak of COVID-19 pandemic widened the already existing unemployment problem in many nations, both the industrialized nations alike. In Nigeria, the scourge is assuming a colossal dimension and its very worrisome situation that the rate at which young people leaving school and seeking employment continuously out-paces the capacity of the economy to provide employment (Amaechi and Thomas, 2021). It seems that students who graduate from technical institutions acquire knowledge and practical skills without entrepreneurial skills that would enable them on graduation, practice what was learnt in school, create jobs for themselves and participate in economic development (Akpan and Etor, 2013).

Technical colleges are post primary institutions where students are giving full vocational training that will enable them acquire relevant knowledge, skills and attitude for paid or self-employment in various occupations in the world of work (NBTE, 2011 and Emmanuel and Ariyo, 2014). Foundry craft practice is among courses offered in mechanical engineering trades at the Technical Colleges in Nigeria (NBTE, 2016). Foundry practice training comprises of a blend of theory and practical skill contents that involve the use of tools, equipment and metal materials to melting the metals in furnace and moulding them into different shapes or objects (NBTE, 2011 and Park, 2012). It's also called metal casting, which involves the process of pouring molten metal into the mould to form it into a shape on cooling. The melting of metals is carried out in melting furnace of several kinds depending on the materials to be melted (Ludwig et al as cited in Medina, 2010).

According to American Welding Society (2013) some school workshops where little casting is done have a gas-fired furnace which can be used for melting metals such as lead, brass, aluminum and zinc at relatively low temperature. When higher temperature is needed, electric furnace called arc furnace is used. Ojio (2010) expressed that melting metal in a casting process is a systematic procedure which involves many stages and steps to be taken when

melting metals. Thus: get the mould finished ready for pouring; place the mould near the melting furnace so that the melted metal can be poured quickly; get a pyrometer ready for measuring the furnace temperature; get a metal bar at least 76mm to be used as a slagging bar and scooped the slag off the top of the melted metal before pouring.

Foundry practices provide students with practical skills that lead to production of goods and services among others (Oranu, Nwoke, Ogwo as cited in Emmanuel and Ariyo, 2014). To carry out foundry work processes and steps are involved, depending on the category of castings to be produced. This usually includes casting design, pattern making, material/alloy selection, sand preparation, moulding, melting the metal, casting, fettling, and to heat treatment and quality control processes all these form the production line in foundry operations (Abioye, 2018). Furthermore, the importance of the foundry technology in technological development and economic development of any nation cannot be underscored and the impact on the high value adding possibilities. The foundry industry is a main feeder to major manufacturing sectors that drive technological growth and most world economies usually depend on the stability of foundry and steel industries (Abioye, 2018).

Therefore, in the quest for technological development of any nation, the foundry industry should be considered as a high-value adding possibility. It produces major components for agricultural machines, machine tools, automobile, textile industries, power plants, industrial machinery, oil and gas equipment, cement manufacturing equipment, mining and quarry industry, railway equipment, construction industry and defense equipment (Jimoh & Abhulimen, 2013). Hardly can you think of any major machine or equipment which has no components that have been cast in a foundry. One can therefore rightly say that the acquisition of foundry technology skill is basic to economic development and self-reliance.

Though in Nigeria, little has been invested to the development of the foundry industry for too long. This is one of the reasons for our over dependence on imported spare parts and machine

components for such vital sectors of the economy as ship-building, railways, agriculture, cement industry, food processing, power generations (Jimoh and Abhulimen, 2013). It is an open secret that the few public foundries which are in existence such as the Nigerian Machine Tools, Ajaokuta Steel Company, Aladja Steel Company and Nigeria Railways Corporation are operating below-optimal levels, if they operate at all, because of lack of adequate working capital, trained manpower, stable power supply and infrastructure facilities. Foundry industry, like other enterprises requires adequate orientation and the right attitude towards profit making, financial controls and strategic planning. Foundries must be run-as money-making enterprises and casting must be priced competitively. Absence of strong local institutes which can provide solutions to industrial problems in such vital areas as quality control, new product development and production techniques and inadequacy of educational and training facilities for foundry engineers, technicians and craftsmen inhibits the smooth running of foundry enterprise in Nigeria.

The vitality in technical and vocational education in Nigeria is that it offers its recipients functional, relevant and practical skills that enable the graduates to stand out as employer or be employed. That is why Federal Government of Nigeria enshrined entrepreneurship education as compulsory course for all technical college students (FGN, 2013). The aim of the policy was to ginger in the students the entrepreneurial spirit that will help curb the increasing rate of unemployment, develop in the learners the entrepreneurial capacities and mindsets that will help them on graduation to recognize and exploit business opportunities and mobilize resources for self-employment (Akpan and Etor, 2013). However, for an individual to venture into a self-employed enterprise and flourish, they must acquire relevant entrepreneurship, technical and practical skills and competencies for self-employment (Barakabo and Suwari, 2016). Self-employment, entrepreneurship skills, technical and vocational job-specific skills can be acquired through the system of education

offered by technical and vocational education in Nigeria (FGN, 2013). This implies that students of technical colleges in addition to the acquisition of technical and vocational skills also receive entrepreneurship education for self-employment (Okwelle and Owo, 2017).

Entrepreneurship skills refers to the skills acquired from the type of training giving to individuals to start and nurture dynamic businesses that provide high value addition to the benefit of both the individuals and the society at large (Okwelle and Owo, 2017). Such skills when acquired, with innovations would help prospective self-employed individuals to start and grow their businesses that would not only add value to their quality of life in this present economic situation but in the future.

Innovative skills are technical skills which are different from the conventional technical skills imparted to the technical college students. According to Cranmer (2014) this is the ability and capacity acquired through deliberate, systematic and sustained effort to smoothly and adaptively carry out complex activities or job functions involving ideas (cognitive skill) things (technical skills) and/or people (interpersonal skills). In other words, innovative technical skills are skills expertise or technical competence related to the field of the worker, whether engineering or technical (Medina, 2011). Technical college graduates needed relevant innovative skills to identify symbols, to use measuring instrument, read blue print and perform competently in a given practical task among others (Ehimen and Ezeora, 2018). Young graduates need broad based relevant, innovative and technical skills that can help them adapt to the rapidly changing economic requirements as well as appropriate basic entrepreneurial skills which can enable them to benefit not just from the metal work industrial organizations and foundry industries, but also contribute their quota to the development of the Nigerian economy (Nwokolo, 2010). In other words, the changing nature of the Rivers state economy (COVID-19 ravaged) and the world of work (unemployment plagues) require that

the youth should be trained on current employable and saleable skills that are relevant for self-reliance (Thomas and Amaechi, 2020).

Therefore, for students of technical college to be trained in foundry craft practice for self-reliance, self-sufficiency and self-employment in this era of COVID-19 in Rivers state. There is need to launch an investigation to the training and identification of relevant innovative skills in this trade that are corresponding to the demands of this age, which when acquired by the youths will easily lead to self-employment.

Statement of the Problem

Federal Government of Nigeria (FGN, 2013) stated that technical education would provide training and impart the necessary skills to technical college students for self-reliance economically. Those trainees who have completed the technical college programmes should be able to become self-employed and possibly employ others.

But it is a worrisome situation, that graduates of technical colleges who are supposed to be employers of labours are now job seekers (Ehimen and Ezeora, 2018). Worse still, is the rate at which young people leaving school and seeking employment continuously out-pace the capacity of the economy to provide employment (Thomas and Amaechi, 2020). It seems that students who graduate from technical institutions acquire knowledge and practical skills without entrepreneurial skills that would enable them on graduation, practice what was learnt in school, create jobs for themselves and participate in economic development (Akpan and Etor, 2013).

For the students of technical colleges to develop the know-how and innovative skills that will qualify them as knowledgeable craftsmen, qualified technicians and professional engineers and enable them contribute to the industrial development of this country. The technical colleges must embark on the type of training of students at all levels that will guarantee self-employment and self-reliance upon graduation (Jimoh and Abhulimen, 2013).

Based on the back drop, it becomes pertinent to ask: what are the relevant and innovative skills in foundry craft practice for technical college students' self-employment in covid-19 pandemic era in Rivers state?

Purpose of the Study

The purpose of the study was to investigate the foundry craft practice skills for relevance and innovative for technical college students' self-employment in covid-19 pandemic era in Rivers state. Specifically the study sought to:

1. Find out whether pattern makingskills are relevant and innovative for technical college students' self-employment in covid-19 pandemic era in Rivers state.
2. Determine the extent to which core makingskills are relevant and innovative for technical college students' self-employment in covid-19 pandemic era in Rivers state.
3. Examine if the moulding process skills are relevant and innovative for technical college students' self-employment in covid-19 pandemic era in Rivers state.
4. Ascertain whether the melting, molten metal handling and treatment skills are relevant and innovative for technical college students' self-employment in covid-19 pandemic era in Rivers state.

Research Questions

The following research questions guided the study.

1. What are the pattern makingskills relevant and innovative for technical college students' self-employment in covid-19 pandemic era in Rivers state?
2. To what extent are core makingskills relevant and innovative for technical college students' self-employment in covid-19 pandemic era in Rivers state?
3. What are the moulding process skills relevant and innovative for technical college students' self-employment in covid-19 pandemic era in Rivers state?

4. To what extent are the melting, molten metal handling and treatment skills relevant and innovative for technical college students' self-employment in covid-19 pandemic era in Rivers state?

Hypotheses

The following null hypothesis (H_0) was formulated and tested at 0.05 level of significance in the study.

- 1: There is no significant difference in the mean ratings of metal work industry technicians and metal work teachers/ instructors on the extent to which foundry craft practice skills are relevance and innovative for technical college students' self-employment in covid-19 pandemic era in Rivers.

Methodology

The descriptive survey design was adopted for the study, the population of the study is comprised of 219 respondents, 170 technicians from registered metalwork teachers/instructors in the four NBTE accredited Government Technical Colleges in Rivers State. Assessment of Foundry Skills for Self-employment (AFSS) was the instrument used to gather data. It was structured based on 4 – point scale. The instrument was validated by two experts in Vocational and Technology Department of Rivers State University Cronbach Alpha coefficient formula was used to determine the internal consistency of the instrument and the reliability coefficient value obtained .80, which represent a high reliability index for the study. Results were analyzed with mean and standard deviation while hypothesis were tested with z-test statistics at .05 level of significance.

Results

Question 1

What are the pattern making skills relevant and innovative for technical college students' self-employment in covid-19 pandemic era in Rivers state?

Table1:innovative pattern making skills in foundry craft practice.

s/n	Description of Pattern Making Skills	Metalwork Technicians			Metalwork Teachers/Instructors		
		\bar{X}	SD	RMK	\bar{X}	SD	RMK
1	Correctly use of protective equipment in the foundry shop.	3.57	.70	HR	3.15	1.06	HR
2	Identify and demonstrate the principle hazards control in the foundry and associated areas	3.65	.65	HR	3.31	.75	HR
3	Demonstrate the use of protective equipment in the foundry shop	3.43	.72	HR	3.15	1.03	HR
4	Demonstrate the use of simple hand tools and devices to produce a simple sand mould, observing safety rules and regulations	3.86	.40	HR	3.26	.76	HR
5	Observe safety regulations	3.43	.60	HR	3.24	.86	HR
6	Recognize tools, select suitable materials and produce different types of patterns for different objects.	3.45	.75	HR	3.23	.73	HR
7	Carry out pattern arrangement and layout on plates for moulding.	3.37	.79	HR	3.31	1.00	HR
8	Carry out calculations relating to pattern and casting weights estimation and cost, contraction allowances using simple mathematical principles.	3.21	.63	HR	3.15	1.06	HR
9	Draw, and design simple and complex patterns.	3.23	.71	HR	2.61	.99	HR
10	Select correctly materials for pattern making.	2.94	1.00	HR	3.37	.92	HR

Data in table 1 showed that metal work technicians had a mean range of 2.94-3.86 and standard deviation range of .40-1.00 while the teachers/instructors also had a mean range of 2.61-3.75 and standard deviation range of .73-1.06 in pattern making. The standard deviation showed the homogeneity in the respondents' opinion. This indicated that both respondents agreed that pattern making skills are highly relevant and innovative for technical college students' self-employment in covid-19 pandemic era in Rivers state.

Question 2

To what extent are core making skills relevant and innovative for technical college students' self-employment in covid-19 pandemic era in Rivers state?

Table 2: innovative core making skills in foundry craft practice.

s/n	Description of skills in Core Making	Metalwork Technicians			Metalwork Teachers/ Instructors		
		\bar{X}	SD	RMK	X	SD	RMK
11	Take precautions against Linseed oil and the fast drying agent	3.75	.62	HR	3.76	.51	HR
12	Carry out simple calculations involving ingredients for mixing volumes used for moulding, test results, losses	3.55	.54	HR	3.63	.59	HR
13	Carry out tests such as: Moisture content, Silica and clay content, Shatter index. Dry strength. Permeability. Green strength and Sieve tests for build-up of fineness.	3.43	.72	HR	3.10	.87	HR
14	Carry out core-making using any of the processes	3.59	.60	HR	3.02	1.06	HR
15	Carry out tests on finished cores in Permeability, Green and Dry compressive strength. Green and Dry hot deformation and Shatter index	3.71	.61	HR	3.53	.61	HR
16	Operate core making machines mentioned and observe safety precautions	3.75	.44	HR	3.21	1.07	HR

Data in table 2 showed that the metal work teachers also had a mean range of 3.02-3.76 and standard deviation range of .07-.06 while the metal work teachers had a mean range of 2.61-3.31 and standard deviation range .73-1.06. The standard deviations showed the homogeneity in the respondents' opinion. This indicated that both respondents agreed that to a high extent core making skills are relevant and innovative for technical college students' self-employment in covid-19 pandemic era in Rivers state.

Question 3

What are the moulding process skills relevant and innovative for technical college students' self-employment in covid-19 pandemic era in Rivers state?

Table 3: innovative moulding process skills in foundry craft practice.

s/n	Description of skills in Moulding Process	Metalwork Technicians			Metalwork Teachers/ Instructors		
		\bar{X}	SD	RMK	X	SD	RMK
17	Carry out simple calculations relating to liquid and	3.32	.80	HR	3.53	.67	HR

	metal static pressure and force						
18	Make simple sketches of essential moulding Machines	3.65	.68	HR	3.71	.54	HR
19	Carry out knock-out operations by manual and mechanical means (use of intermittent and vibrating grits).	3.34	1.02	HR	3.78	.57	HR
20	Recognize and avoid the dangers of premature knock-out	3.26	.57	HR	3.65	.71	HR
21	Observe all safety measures involved in knock-out, cleaning and fettling operations	3.27	.83	HR	3.47	.70	HR
22	Make open and closed moulds	3.15	.80	HR	3.47	.75	HR
23	Make pouring cups, bushes basins, down sprue and sumps, simple slag arrester and simple runners and gates	3.24	.71	HR	3.55	.67	HR
24	Make simple sketches of moulding Arrangement	3.26	1.03	HR	3.53	.75	HR
25	Operate moulding machines of all Types	3.34	.86	HR	3.63	.59	HR
26	Maintain and take care of all moulding equipment in use	3.55	.67	HR	3.86	.49	HR
27	Apply plumbago, blacking, lampblack, talc, refractory materials Aluminium and Telurium paint, resinous coatings and inhibitors as facing materials	3.45	.93	HR	3.60	.61	HR
28	Use tumble barrels, shot blast cabinet and hydro blasts	3.23	.71	HR	3.29	.71	HR
29	Employ cranes, hoists, skips, pallets folk-lifts and conveyors for conveying finished products	3.21	.99	HR	3.00	1.02	HR

Data in table 3 showed that metalwork technicians had a mean range of 3.15-3.65 and standard deviation range of .51-1.03. The metalwork teachers had a mean range of 3.29-3.86 and standard deviation range of .49-1.02. The standard deviations showed the homogeneity in the respondents' opinion. This indicated that both respondents agreed that moulding process skills are highly relevant and innovative for technical college students' self-employment in covid-19 pandemic era in Rivers state.

Question 4

To what extent are the melting, molten metal handling and treatment skills relevant and innovative for technical college students' self-employment in covid-19 pandemic era in Rivers state?

Table 4: innovative melting, molten metal handling and treatment skills in foundry craft practice.

s/n	Description of Melting, Molten Metal Handling and Treatment skills	Metalwork Technicians			Metalwork Teachers/Instructors		
		\bar{X}	SD	RMK	X	SD	RMK
30	Describe the construction and function of different furnaces mentioned	3.16	.81	HR	3.55	.61	HR
31	Distinguish melting losses and gains and be able to effect them by adding and removing during charge preparations	2.71	.79	HR	3.41	.77	HR
32	Carry out basic mathematical calculations involving	2.50	.97	HR	3.57	.57	HR
33	Apply heat transfer process, temperature gradient and heat diffusibility, its application to solidification and furnaces	3.03	1.05	HR	3.67	.62	HR
34	furnace linings, fire different types of furnaces and charge different types of furnaces available	3.32	.74	HR	3.78	.50	HR
35	Operate furnaces to ensure fuel Efficiency	2.95	.77	HR	3.45	.67	HR
36	Make up charges including fluxes and Covers	3.03	.90	HR	3.49	.70	HR
37	Carry out tapping operations	3.48	.78	HR	3.39	.75	HR
38	Carry out molten metal treatment	2.94	.72	HR	3.25	.77	HR
39	Operate and maintain Thermocouples, Optical and Total Radiation Pyrometers	3.31	.73	HR	3.41	.63	HR

Data in table 4 showed that metalwork technicians had a 2.50-3.48 and standard deviation range of .72-.88 while the metalwork teachers had a mean range of 3.25-3.78 and standard deviation range of .50-0.77. The standard deviations showed the homogeneity in the respondents' opinion. This indicated that both respondents agreed that to a high extent melting, molten metal handling and treatment skills are relevant and innovative for technical college students' self-employment in covid-19 pandemic era in Rivers state.

Hypotheses

H₀: There is no significant difference in the mean ratings of metal work industry technicians and metal work teachers/ instructors on the extent to which foundry craft practice skills are relevance and innovative for technical college students' self-employment in covid-19 pandemic era in Rivers.

Table 5: t-test analysis on foundry craft practice skills for self-employment

Respondents	Mean	SD	N	P-value	df	t-Cal	t-Crit	RMK
Teachers/Instructors	3.32	.73	49	0.05	217	1.32	1.69	No Sig
Technicians	3.37	.75	150					

Data in Table 5 showed that t-cal (1.32) is less than t-crit(1.69), hence the hypothesis stated was accepted. This means that there was no significant difference in the mean ratings of

metal work industry technicians and metal work teachers/instructors on the extent to which foundry craft practice skills are relevant and innovative for technical college students' self-employment in covid-19 pandemic era in Rivers.

Discussion

The results of the study revealed that both technicians and metal work teachers agreed that to a high extent pattern making skills, core making skills, moulding process skills, melting, molten metal handling and treatment skills are highly relevant and innovative for technical college students' self-employment in covid-19 pandemic era in Rivers state. The results further revealed that there was no statistical significant difference in the mean rating of metal work industry technicians and metal work teachers on the extent to which foundry craft practice skills are relevant and innovative for technical college students' self-employment in covid-19 pandemic era in Rivers. The findings of the study is in line with Park (2012) who stated that foundry which is one of the main industries prompting the development of world economy, is a process of melting metals and moulding them into different shapes (Park 2012). The findings is also in agreement with Medina (2010) when they observed that metal casting is a means of pouring melted metal into mould to form it into a shape on cooling.

Conclusion

Based on the findings of the study, it was concluded that foundry craft practice offers relevant and innovative skills that could aid technical college students' self-employment in covid-19 pandemic era in Rivers. The manpower needs of the 21st century labour market demands that young school leavers should be equipped with rather innovative skills and technical competencies that will ginger them to start their venture than to wait for scarce employment opportunities in Rivers State.

Recommendations

Base on the findings of study, the following recommendations were made:

1. Government should encourage non-government organizations (NGO) to sponsor and organized seminars, conferences, workshops and symposia for technical teachers and instructors in technical colleges in Rivers State to sensitize them on communicating the different relevant and innovative skills to students, as well as how these skills will lead them to be employers of labour, than being job seekers.

2. Administrators of technical colleges should always organize programmes to improve the quality of training given to students as these will help in addressing the issue of negative attitudes and perceptions of students towards technical education.

Reference

- Abioye, A. A. (2018). *A Review on Automotive Industries and Foundries in Nigeria*. Mac Press.
- Akpan, C. and Etor, C. (2013). University Lecturers' Perception of Entrepreneurship Education as an Empowerment Strategy for Graduate Self-employment in South- South Nigeria. *Social Science Journal*, 2(12), 233-241.
- Amaechi J.O and Thomas, C.G. (2021). Innovative Machine Practice Skills for Mechanical Engineering Trades Students Self-Reliance in A Post Covid-19 Economy In Rivers State. *International Journal of Advances in Engineering and Management (IJAEM)*, 3, (12), 14-21.
- Amaechi J.O and Thomas, C.G. (2020). Perceived Relevance of Practical Skills in Content Development of Motor Vehicle Mechanic Works Trade in Technical Colleges in Nigeria for Global Competitiveness. *Global Scientific Journal*, 8(12), 2165-2180.
- American Welding Society (2013). *Advancing the Science, Technology, and Application of Welding and Allied Joining and Cutting Processes Worldwide*. The press
- Cranmer, J.K. (2014). Career Centre, Building the Western Australian Workforce by Increasing Government of Western Australia, Department of Training and Workforce Development. *International Journal of Education and Evaluation*, 4, (6), 370- 378.
- Emmanuel, O. E. and Ariyo. S. O. (2014). Assessment of the skills possessed by the teachers of metalwork in the use of computer numerically controlled machine tools in technical colleges in Oyo State. *Journal of Education and Practice*, 5, (3), 45-52.
- Federal Government of Nigeria (2013). *National Policy on Education (6th ed.)*. Lagos: NERDC Press.
- Jimoh, I. and Abhulimen, A. (2013). Casting Technology and Developments. Nigeria as a Case Study. *International Journal of Scientific & Technology Research*, 2, (11), 231-239.
- Medina, G.R. (2011). Medina Construction Students put Skills to Work on Bind house. Retrieved from <http://www.iiardpub.org>
- National Board for Technical Education (NBTE) (2011). *THR Development of National Vocational Qualifications Framework for Nigeria: A Report of the National Steering Committee*, NBTE Press. Retrieved from <https://www.nbte.gov.ng/>

- National Board for Technical Education (NBTE) (2016) Directory of Accredited Programmes Offered in Polytechnics, Technical and Vocational Institutions in Nigeria, (18th ed.). Retrieved from <https://www.nbte.gov.ng/>
- National Bureau of Statistics (NBS,2021).Labour Force Statistics: Unemployment and Underemployment Report.<https://www.nigerianstat.gov.ng>
- Nwokolo J.O., (2010). Training Skills Relevant for Employment in Metal Work Industries in Nigeria. The way forward. *Journal of Nigerian Vocational Association*,15(1),28-39.
- Ojio, K.G. (2010). Re-evaluation Of instructional resources for teaching Metal Works in Secondary Schools in Ekiti State. Thesis submitted to Department of Teacher Education, University of Nigeria, Nsukka.
- Okwelle, P. C. and Owo, O. F. (2017). Skills Acquisition in Technical Vocational Education and Training: Tool for Sustainable Entrepreneurship Development of Electrical/Electronic Students in Polytechnics, Rivers State. *Book of proceeding for 2nd Annual Conference of the Faculty of Technical Education, Ignatius Ajuru University of education Rumuolumeni, Port Harcourt.*
- Park, R. M. (2012). Forging and Stamping, Encyclopaedia of occupational health and safety. A revision of the 3rd edition IOP Conference Series: Materials Science and Engineering Paper. *Open Access.*