

Welding and Fabrication Craft Practice: Innovative Skills for Technical College Graduates Self-employment in 21st Century COVID-19 Ravaged Economy in Rivers State

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Submitted: 01-03-2022

Revised: 10-03-2022

Accepted: 12-03-2022

ABSTRACT

This study adopted a descriptive survey design. The population of this study consisted of 219 respondents, comprising of 170 technicians from registered metal works industries with the Ministry of Commerce and Industry, Rivers State and 49 technical teachers/ instructors in the Six (6) Government Technical Colleges in Rivers State. The entire population was used since the population is of manageable size. Welding and fabrication skills for self-employability (WFSSE) instrument, was used for the data collection. The questionnaire is structured based on 4-point rating scale of Very High Extent (VHE-4), High Extent (HE-3), Low Extent (LE-2) and Very Low Extent (VLE-1), with a corresponding mean rating. The instrument was validated by two experts in Department of Industrial Technical Education, Ignatius Ajuru University of Education, Portharcourt Rivers State. The reliability index was established using Cronbach Alpha coefficient formula to analyze the response of 30 respondents drawn from two Government Craft Centers in Rivers state. This achieved coefficient value of .80 which represents a high reliability index for the study. A total 219 questionnaire was administered to the respondents, and 199 copies retrieved, which guaranteed 95% return rate that was used for the data analysis. The data obtained from the respondents were analyzed using mean and

standard deviation to answer the research questions. While z-test was conducted to test the null hypotheses at 0.05 level of significance. It was found that that both gas and arc welding and fabrication skills are highly relevant for mechanical engineering trades graduates self-employability in post covid-19 economy in Rivers State. Also it found no statistically significant difference between the mean ratings of both the technical teachers/instructors and metal work industry technicians on the extent to which welding and fabrication skills are relevant for mechanical engineering trades graduates self-employability in post covid-19 economy in Rivers State.

Key words: Re-skilling, COVID-19, Welding, Fabrication, Self employability, Technical colleges, Technical and Vocational Education.

I. INTRODUCTION

The world today continues to battle the global COVID-19 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 (Onyekuna, 2020). This led the Nigerian government to initiate an economic and growth recovery program, aiming at increasing social inclusion by creating jobs and providing support for the poorest and most vulnerable

members of the society through investments in social programs and providing social amenities. But the program instituted by the government in no doubts suffered some setback. Also, there was downward review of budget and contraction in public spending which were devastating on poverty and unemployment rate. According to National Bureau of Statistics (NBS, 2021), Nigeria ranks 21st among 181 countries in the 4th quarter 2020, with an unemployment rate of about 33.3% and youth unemployment/underemployment 42.5%. 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, and in Nigeria the scourge rather assumed a colossal dimension.

Re-skilling is the process of learning new skills so you can do a different job, or of training people to do a different job. Re-skilling our technical colleges graduates in light of new and relevant skills is very timely. Hence, Mr Gowin Obaseki, retreated the need for more investment in Technical Vocational Education and Training (TVET) in equipping our youths with new skills sets that will enable them function optimally in the emerging world order, than just relying on Information Communication Technology (ICT) skills that are now highly sought after by everyone to enable them work from home and minimize their chances of contracting the disease (Vanguardngr.com July, 2020). Furthermore, students who graduate from technical institutions acquire attitudes; knowledge; practical skills as well as entrepreneurial skills that would enable them on graduation to practice what was learnt in school, create jobs for themselves and participate in economic development of the nation (Akpan and Etor, 2013). The Federal Government of Nigeria (FGN), in a bid to make technical education functional, relevant and practical oriented, made entrepreneurship education a compulsory course for all technical college students (FGN, 2013). The policy aim is to ginger in the students, 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, Okwelle and Owo, 2017).

Technical colleges in Nigeria are institutions where students are trained to acquire relevant knowledge and skills in different occupations for employment in the world of work (Emmanuel and Ariyo, 2014). According to NBTE (2011) 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. The trades offered in the Technical Colleges in Nigeria according to NBTE (2016) include among others Mechanical Engineering Trades from which welding and fabrication is embedded in.

Welding and fabrication as an engineering craft practice offered at the technical colleges had to deal with the processes of forming and bonding of metals to form a useable object or structure. It is a trade in the mechanical engineering craft practice which gives the recipient the opportunity to exploit the entrepreneurial potentials of technical college trades. Welding and fabrication involves metals and the joining actions caused by the application of heat, pressure, and with or without filter materials (American Welding Society, 2013). Welding and fabrication programmes are designed to produce skilled craftsmen with good knowledge of the application of the equipment, materials, techniques and safety practices in metal projects. Welding and fabrication skill gives the individual the ability to use their head and hands to build and construct metal structures from engineering specifications. People who enter into this trade normally develop specialized talents in structural fabrication or pressure related construction. It also instilled practical skills on individuals to be productive, high sense of self innovative, competitive, strong sense of determination, and creative in facing the challenges of the nation as well as globalization (Overtoom, as cited in Aikhionbare, 2016). Furthermore, American Welding Society (2013) classified welding process into the following: forge welding, gas welding, metal arc welding, resistance welding and underwater welding. Others are thermit welding, induction welding.

In this context we would dwell on the two most commonly practiced types of welding; gas and electric arc welding. Gas welding is a welding process that uses fuel gases and oxygen during welding operation. Arc welding is a method of welding that uses an electric power supply to create an electric arc between an electrode and the base material to melt the metals at the welding point.

Arc welding is a process whereby coalescence is produced by heating the work piece with an electric arc set up between a flux coated electrode and the work piece. The metal arc welding is one of the most types of arc welding highly versatile and can be performed with relatively inexpensive equipment. Pipeline and structural welders use this method the most because of its deep penetration (how much it digs into the base metal), and pressure handling capabilities. Also, the electric arc welding is used due to stable supply of electricity and it's feasible. The arc welding may be done using direct current (DC) or alternating current (AC) but for this purpose AC may be more preferable. The AC could be better preferred to DC because it reduces the risks of environmental pollution in the sense that more carbon oxides will be emitted to the environment while using DC.

According to Kanna as cited in American Welding Society (2013) there are some general procedural steps which can be applied during welding operations; these are as follows:

- Identification of welds, type of joint, calculation of weld area by stress analysis, preparation of drawing specifying all important features.
- Selection of appropriate welding process depending on availability of equipment, skill of personnel, metallurgical and quality requirements, time available and overall economy.
- Welding procedure, viz. welding (cutting, cleaning the plates, edge preparation, etc.) sequence, use of jigs and fixtures, fit up assembly, process planning, testing methods, etc.
- Execution of welding with proper supervision and inspection at all the stages.
- Slag removal, weld dressing.
- Stress relieving by proper treatment
- Testing, preferably by non-destructive methods for dimensional, metallurgical, crack detection, etc.
- Improvements for future based on feedback from existing systems to avoid defects.

Hence to perform the above tasks require mastery of the process which in-turn aids the acquisition of practical skill. In other words when welding and fabrication activities are done repetitively the process will enable the participant to develop and master the relevant practical skills. According to (Ogundele, Christianah & Gana, as cited in Thomas & Amaechi, 2016) possessing practical 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 repetition or practice. According to Cranmer (2014) skill is an ability and capacity acquired through deliberate, systematic and sustained effort to smoothly and adaptively carryout complex activities or job functions involving ideas (cognitive skill) things (technical skills) and/or people (interpersonal skills).

Self-employment is working for one's self rather than for another person or company. According to Ayuba as cited in Ojo and Nwosu (2015), anyone who uses his/her own resources or borrowed funds for income generation in activities other than wage or salaried employment is self-employed. In order to effectively manage one's personal business and contribute to the development of the society, self-employed people work for themselves, and are responsible for generating their source of income, supplying their own work space/place and all services, materials, equipment, sub-contracting among others (Osuala, as cited Ojo and Nwosu, 2015). According to Ukeje as cited in Ojo and Nwosu (2015) a person is considered self-employed if that person is running a business as a sole proprietorship, independent contractor, as a member of a partnership, or as a member of a limited liability company that does not elect to be treated as a corporation. Furthermore, for an individual to venture into a self-employed enterprise and flourish, they must acquire relevant technical skills and entrepreneurship competencies (Barakabo and Suwari, 2016). 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 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. Technical skills are skills expertise or technical competence related to the field of the worker, whether engineering or technical (Medina, 2011).

However, in Nigeria Uzoagulu (2010) identified that there was lack of the needed skills and those who were certified to possess these skills were half-baked or ill-prepared which is the bane of the economy. He further stated that mechanical engineering trades students upon graduation from technical colleges are presently finding it hard to become self-employed or perform effectively in industries. This may be caused by been trained with old and obsolete equipment that have become

outdated and also resulted to skills mismatch. The skills gained from learning and training with this old and out of date equipment is no longer enough for the students to perform effectively in the modern industries or become self-employed. Similarly, Akpan (2012) retreated that the conventional skills imparted to the students of mechanical engineering trade (welding and fabrication) during training, is devoid of the required technical skills that are highly needed in this modern society.

Therefore, its timely we reemphasize the importance of metalwork technology to everyday life and the overall objective of vocational and technical education: as to offer training in skills for self-employment and for employment into the world of work (Yakubu, 2014). Undoubtedly, welding and fabrication had become an important trade to be taught to students. Because for the students to be trained in mechanical engineering trades for self-reliance, self-sufficiency and for employment in the world of work. They require the relevant welding and fabrication skills which are different from the conventional technical skills imparted to the students.

This therefore, justifies the background to which this study was undertaken to assess the welding and fabrications skills relevant for mechanical engineering trades graduates self-employability in post covid-19 economy in Rivers State.

Statement of the Problem

Technical education institutions were established to provide training and impart the necessary skills to technical college students for self-reliance economically (Federal Government of Nigeria, FGN 2013). The policy stated that trainees who have completed the technical college programmes should be able to become self-employed and possibly employ others. Hence, technical college students needed to acquire relevant practical skills in various trades offered in these institutions especially welding and fabrication skills that guarantee self-employment upon graduation.

However, research studies have shown that among other challenges facing students of technical college upon graduation is the lack of competent knowledge and practical skills that will enhance self-reliance (Yakubu, 2014). It was observed that graduates of technical colleges who are supposed to be employers of labour are now job seekers (Ehimen and Ezeora, 2018). This seems as a defect in academic curriculum that prepares

recipients with little or no jobs related skill contents. In many cases, technical college graduates compensate for insufficient academic preparation by undergoing trainings and remedial courses in different private technical workshops (Ehimen and Ezeora, 2018). Individuals that cannot afford to take the risk of undergoing this training end up not becoming self-employed thus multiply the number of unemployed graduates roaming the street of Rivers State in search for jobs. The skills, which are learnt while in school, are as a result of the skills embedded in the technical college curriculum and are used in teaching the students.

Hence, it becomes pertinent to assess the welding and fabrication skills required by technical college students. Therefore, the problem of this study was to what extent are welding and fabrication skills relevant for mechanical engineering trades graduates self-employability in post covid-19 economy in Rivers State?

Purpose of the Study

The purpose of the study is to assess the welding and fabrication skills relevant for mechanical engineering trades graduates self-employability in post covid-19 economy in Rivers State. Specifically the study sought to:

1. Determine the extent to which Gas welding and fabrication skills are relevant for mechanical engineering trades graduates self-employability in post covid-19 economy in Rivers State.
2. Determine the extent to which Arc welding and fabrication skills are relevant for mechanical engineering trades graduates self-employability in post covid-19 economy in Rivers State.

Research Questions

The following research questions guided the study.

1. To what extent are gas welding and fabrication skills relevant for mechanical engineering trades graduates self-employability in post covid-19 economy in Rivers State?
2. To what extent are arc welding and fabrication skills relevant for mechanical engineering trades graduates self-employability in post covid-19 economy in Rivers State?

Hypotheses

The following null hypotheses (Ho) tested at 0.05 level of significance guide the study.

Ho: There is no significant difference in the mean ratings of metal work industry technicians and metal work teachers/ instructors on to what extent welding and fabrication skills are relevant for mechanical engineering trades graduates self-

employability in post covid-19 economy in Rivers State.

II. METHODS AND MATERIALS

This study adopted a descriptive survey design. The population of the study was 219, comprising 170 technicians from registered metal works industries with the Ministry of Commerce and Industry, Rivers State and 49 technical teachers and instructors in the Six (6) Government Technical Colleges in Rivers State. The entire population was used as respondents since it's of a manageable size.

The welding and fabrication skills for self-employability (WFSSE) instrument, structured on a 4-point rating scale of Very High Extent (VHE-4), High Extent (HE-3), Low Extent (LE-2) and Very Low Extent (VLE-1), was used for data collection. The instrument was validated by two experts in

Department of Industrial Technical Education, Ignatius Ajuru University of Education, Portharcourt Rivers State. The Cronbach Alpha coefficient formula was used to analyze response of 30 respondents drawn from two Government Craft Centers in Rivers state to determine the internal consistency of the instrument, which yielded a reliability coefficient value of .80 which was sufficient for the study. Out of 219 instruments that was administered to the respondents, 199 copies was retrieved which account for 95% return rate that was used for the data analysis. The mean and standard deviation was used to answer the research questions with ± 2.50 set as criterion mean for high or low extent. While z-test was used to test the null hypothesis at .05 level of significance and z-crit ± 1.690 use acceptance or rejection of the stated hypothesis.

III. RESULTS

1. To what extent are gas welding and fabrication skills relevant for mechanical engineering trades graduates self-employability in post covid-19 economy in Rivers State?

Table 1: Gas Welding and Fabrication Practical Skills

S/N	Statements on Practical Tasks in Gas Welding and fabrication	Metalwork Technicians			Metalwork Teachers/ Instructors		
		\bar{X}	SD	RMK	\bar{X}	SD	RMK
1	Carry, transport and store full and empty gas cylinders safety using appropriate equipment	3.26	.781	HE	3.57	.670	HE
2	Select, use and care for protective wears for carrying out gas welding operations	3.11	1.010	HE	3.49	.704	HE
3	Generate acetylene using calcium carbide guiding against danger of over-charge	3.29	.854	HE	3.57	.606	HE
4	Light the welding torch and adjust the flame to each of the types	3.21	.794	HE	3.82	.801	HE
5	Prepare plate surfaces and run beads: without filler rods and with filler rods	3.39	1.091	HE	3.76	.820	HE
6	Prepare plate surfaces for the welding joints and tack weld	3.00	.832	HE	3.31	1.037	HE
7	Weld metals together in down hand or flat position	3.15	.840	HE	3.37	.630	HE
8	Apply backing bars and strips according to instructions on the side of a	2.92	1.015	HE	3.29	.801	HE

9	weld to control penetration Prepare and weld non-ferrous metals using appropriate fluxes	3.37	.830	HE	3.51	.640	HE
10	Weld stainless steel using appropriate welding rods and techniques and observing safety practice	3.10	.922	HE	3.45	.704	HE
11	Apply appropriate treatment to the welded joint e.g. washing in soapy water, brushing off flux residue, etc. to avoid weld Decay	3.05	.890	HE	3.65	1.105	HE
12	Prepare and weld dissimilar metals using correct techniques and observing the correct safety practice	3.20	.730	HE	3.53	1.110	HE

Table 1: Gas Welding and Fabrication Practical Skills

Data in table 1 shows that metal work teachers and instructors had mean ranges from 3.29-3.82 and metal work technicians had a mean range of 2.92-3.37. The mean ranges of both teachers and industry technicians are above the criterion mean of 2.50. This means that the respondents agreed to high extent in all the skills items in gas welding and fabrication are relevant for mechanical engineering trades graduates self-employability in post covid-19 economy in Rivers

State. Also, the metal work teachers had standard deviation range .606 -1.110 and technicians had standard deviation range of .730-1.091. This standard deviation showed that there is homogeneity in the respondents' opinion.

2. To what extent are arc welding and fabrication skills relevant for mechanical engineering trades graduates self-employability in post covid-19 economy in Rivers State?

Table 2: Arc Welding and Fabrication Practical Skills

S/N	Statements on Practical Tasks in Arc Welding and fabrications	Metalwork Technicians			Metalwork Teachers/Instructors		
		\bar{X}	SD	RMK	\bar{X}	SD	RMK
1	Apply appropriate safety precautions while carrying out arc welding in confined spaces.	3.48	.761	HE	3.11	.944	HE
2	Set up and use the a.c. and d.c. welding machines for specified voltage/amperage operation, observing safety precautions.	3.31	.713	HE	3.34	.728	HE
3	Strike metal arc and maintain the arc	3.37	.923	HE	2.85	.768	HE
4	Carry out with proficiency in arc welding techniques/operations	3.29	.734	HE	2.76	.662	HE
5	Interpret the various arc welding symbols and conventions used in engineering working drawings	3.15	.901	HE	3.57	.572	HE
6	Weld the prepared joints in flat positions observing necessary safety precautions.	3.42	.782	HE	3.59	.532	HE
7	Prepare metal surfaces for multi-run welds And weaving welds	3.29	.839	HE	3.53	.619	HE

8	Make multi-run welds	3.21	.779	HE	3.63	.660	HE
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Table 2: Arc Welding and Fabrication Practical Skills

Data in table 2 shows that metal work teachers and instructors had mean ranges from 2.76-3.63 and metal work technicians had a mean range of 3.15-3.48. The mean ranges of both teachers and industry technicians are above the criterion mean of 2.50. This means that the respondents agreed to high extent in all the skills items in arc welding and fabrication are relevant for mechanical engineering trades graduates self-employability in post covid-19 economy in Rivers State. Also, the metal work teachers had standard

deviation range .532-.944 and technicians had standard deviation range of .713-.923. This standard deviation showed that there is homogeneity in the respondents' opinion.

3. **HO₁**: There is no significant difference in the mean rating of metal work industry technicians and metal work teachers/ instructors on to what extent welding and fabrication skills are relevant for mechanical engineering trades graduates self-employability in post covid-19 economy in Rivers State.

Table 3: t-Test Analysis of Response on Welding and Fabrication Practical Skills

Respondents	Mean	SD	N	P-value	df	t-Cal	t-Crit	RMK
Teachers/ Instructors	3.23	0.82	49	0.05	217	1.25	1.69	No Sig
Technicians	3.48	0.65	150					

Table 3: t-Test Analysis of Response on Welding and Fabrication Practical Skills

Data in table 3 showed that t-cal (1.25) is less than t-crit (1.69) hence we accept the stated null hypothesis. This means that there is no significant difference between the mean ratings of both the technical teachers/instructors and that of the metal work industry technicians the extent to which welding and fabrication skills are relevant for mechanical engineering trades graduates self-employability in post covid-19 economy in Rivers State.

IV. DISCUSSION

The results in table 1 revealed that to a high extent gas welding and fabrication skills are relevant for mechanical engineering trades graduates self-employability in post covid-19 economy in Rivers State.

The results in table 2 revealed that to a high extent arc welding and fabrication skills are relevant for mechanical engineering trades graduates self-employability in post covid-19 economy in Rivers State. Furthermore, there was statistically no significant difference between the mean ratings of both the technical teachers/instructors and metal work industry technicians on the extent to which welding and fabrication skills are relevant for mechanical engineering trades graduates self-employability in post covid-19 economy in Rivers State.

The findings is that both Gas and Arc welding and fabrication skills are highly relevant for mechanical engineering trades graduates self-employability in post covid-19 economy in Rivers State. This is in agreement with Barakabo and Suwari (2016) who postulated that for an individual to venture into a self-employed enterprise and flourish, they must acquire relevant practical skills and entrepreneurship competencies. The acquisition of the relevant practical skills in welding and fabrications by the individuals enables them to be productive, have high sense of self innovation, competitive spirit, strong sense of determination, and creative in facing the challenges of the post covid-19 in the state, nation and globalization economy. The findings was also supported by the call by Mr Gowin Obaseki who emphasized the need for more investment in Technical Vocational Education and Training (TVET) in equipping our youths with new skills sets that will enable them function optimally in the emerging world order, than just relying on Information Communication Technology (ICT) skills that are now highly sought after by everyone to enable them work from home and minimize their chances of contracting the disease (Vanguardngr.com july, 2020).

V. CONCLUSION

The acquisition of the relevant practical skills in welding and fabrications by individuals

enables them to be productive, have high sense of innovation, competitive spirit, strong sense of determination, and creativity in facing the challenges of the post covid-19 pandemic in the state, nation and globalization economy. The demands for welding and fabrication skill set is a solution to the increased manpower needs in the 21st century labour market which have caused many graduates with various certificate to be unemployed.

Based on the findings of the study, welding and fabrication skills are essential ingredients relevant for technical college graduates self-employment in this post COVID-19 economy in Rivers State.

Recommendations

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

1. Government should and encourage non-government organizations (NGO) to sponsor and organized seminars, conferences, workshops and symposia for teachers and instructors in technical colleges in Rivers State to sensitize them on communicating the different welding and fabrication skills open to students, as well as how these skills will lead to employers' workplace expectations.
2. Graduates of mechanical engineering trades should be prepared to go into entrepreneurship business after graduation since they have acquired welding and fabrication skills that would enable them function in this post COVID-19 economy.
3. Technical colleges and industries should create a common platform for the development of welding skills as these will narrow down the gap between the supply of welders and demand of these skill workers in the industry.
4. Technical colleges curriculum should be constantly reviewed to include current and relevant skills and contemporary technologies where necessary that will enable graduates of mechanical engineering trades to compete favorable in the labour market.

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