UNDERWATER FABRICATION TRAINING SKILLS NEED OF SOUTH-SOUTH NIGERIAN YOUTHS FOR EMPLOYMENT GENERATION IN THE MARINE SECTOR

BY

UKPONG, PAULINUS HAPPY-DAY
HEAD OF DEPARTMENT
DEPARTMENT OF FABRICATION AND WELDING
GOVERNMENT TECHNICAL COLLEGE, ABAK
AKWA IBOM STATE, NIGERIA.

AND

UDOFIA, ANIEFIOK EDET, PH.D.
DEPARTMENT OF VOCATIONAL EDUCATION
FACULTY OF EDUCATION
UNIVERSITY OF UYO, UYO.
AKWAIBOM STATE, NIGERIA

ABSTRACT

The study determined the underwater fabrication training skills need of youths for employment in the marine sector in South-South Nigeria. Two each of specific purposes, research questions and null hypotheses were formulated to guide the study. Descriptive survey design was used for the study. The population for the study comprised 282 fabrication instructors and underwater fabrication technicians. A sample size of 216 respondents: 72 fabrication instructors and 144 underwater fabrication technicians were selected for the study through simple random sampling technique. The researcher-developed instrument captioned, "Underwater Fabrication Training Skills Need for Employment in the Marine Sector Questionnaire" (UFTSNEMSQ) to generate data for the study. Three lecturers in the Faculty of Education, University of Uyo validated the instrument. The reliability of the instruments was done using respondents in the study area who were not part of the main study. Cronbach's Alpha reliability technique was used in determining the reliability of the instrument. The reliability coefficient of the instrument for fabrication instructors was 0.84 and 0.86 from underwater fabrication technicians. Mean and independent t-test statistics were used to analyze the data obtained. The findings from the study reveal that there are significant difference between the responses of fabrication/welding in technical colleges and underwater fabrication technicians in the marine sector on underwater cutting skills; hence, the youths need training on underwater cutting skills for employment in the marine sector. There is no significant difference with regards to structural fabrication skills; hence, the youths need little or no training on structural fabrication skills for employment in the marine sector. It is recommended among others that private entrepreneurs should establish training institutions in South-South Nigeria to include those experiences in the marine sector.

KEYWORDS: Underwater Fabrication, Training Skills, South-South Nigerian Youths, Employment Generation

Background of the Study

Underwater fabrication is a process where metals are cut, arranged and joined permanently or temporary underwater to a specific shape depending on the designer's idea or concept. Underwater fabrication came into existence as a result of underwater welding in 1939 (Khanna, 2004). A large number of techniques are available for structural fabrication in the atmosphere, but many of these techniques are not suitable in the marine sector since the presence of water is a major concern. In recent years, a number of off shore structures including oil drilling rigs, pipelines, platforms etc are being installed and maintained significantly by underwater fabricators. According to Joshi (2004), some of these structures will experience failure of their elements during normal usage and unpredicted occurrence like storms and collision. The dismantling of wreck ships from the ocean, seas and waterways are done by underwater fabricators. Hence, it is important to train more youths in underwater fabrication especially now that there is a consciousness of all obstacles under the water. Underwater fabrication can only be effective if underwater cutting and structural fabrication are taken into utmost consideration.

Underwater cutting of steel and non-ferrous metal is carried out on the oxy-arc principles using the standard type of electrode which has a small hole down to its centre through which the pressurized oxygen flows to make the cut. If using thermal electrode, the oxygen stream causes intense oxidation of the electrode material, giving rise to increased heat temperature for cutting. In both cases, the products often cut are removed or blown away by the oxygen stream. A direct current (d.c.) generator is used with the torch negative and the special type earth connection, connected to clean, non-rusted metals in good electrical contact with the cut, in positive polarity. Alternating current (a.c.) is not suitable as there is increased danger of electric shock (Keats, 2004). The field of underwater cutting is fast becoming an important as the salvage field. More and more, metals are replacing wood in the construction of boats. In steel craft, a jagged tear or hole often can be repaired by underwater welding. In the case of bent props or shafts, the underwater cutter is employed to sever a bent section and perhaps weld on a new piece. Bridge construction companies can use underwater cutting and welding experts in many of their operations. The field of underwater cutting is a new one, just like most of the other underwater jobs done by divers. The principle of underwater cutting is approximately the same as that of surface cutting. Water of course, imposes certain limitations and these must be taken into consideration. The success of any underwater cutting operation depends upon the diving gear used, the depth of water in which the diver and gear work, the underwater current, the water's temperature and the visibility conditions. There are three known underwater cutting methods, namely; Arc-oxygen method, Oxy-hydrogen method and Metal-arc method (Kraji, 2015).

There are basically two common methods of underwater cutting namely: the arc-oxygen method and the Oxy-hydrogen method. These methods depend on the chemical reaction of oxidation of metals and are generally limited to plain carbon and low-alloy steels, that is, metal which oxidize easily (Cayford, 1992). In these techniques, heat is applied to the metal on the intended line to be cut. When the metal is at "kindling" temperature, pure oxygen is released on the immediate spot and the metal burns rapidly. By moving the heat source and oxygen supply along any intended line, the metal will fall off. The third method is the metal arc method which is simply a melting operation, steels or other non-oxidizing metals are cut by this method. Sufficient heat from an electric arc applied on a concentrated spot such that it completely melts through the spot where the heat is applied and the process is continued along any intended line of cut (Cayford, 1992).

According to Naval Sea System Command, (NSSC) (2002), there are only two underwater cutting processes currently approved for Navy use. There are: Oxygen arc cutting with exothermic electrodes, steel tubular electrodes and karie cables and shielded metal arc cutting. Of these, the oxygen-arc (oxy-arc) is preferred because of its ease of use. Two types of electrodes are equally used for oxygen-arc (oxy-arc) cutting, namely; the exothermic and the steel-tubular electrode. Of these, the exothermic is preferred because it will burn independently after an arc is strick and oxygen is flowing. The second method of underwater cutting as approved by the Naval Sea System Command (NSSC) is the shielded metal-arc process in which the metal is cut by the intense heat of the arc without the use of oxygen. This method is preferred over oxy-arc when cutting metals of 7mm or less in thickness or when cutting non-ferrous or corrosive-resistance metals of any thickness.

The principle of operation of oxygen-arc cutting is very important in underwater welding work. Oxygen-arc cutting is an oxygen cutting process in which metal is severed by means of the chemical reaction of oxygen with the base metal at elevated temperatures. The heat of the arc brings the metal to its kindling temperature, then a high velocity jet of oxygen is directed through a tubular cutting electrode at the heated spot. The metal oxidizes and is blown off. The tip of the electrode, which is exposed to both heat and oxidation, is consumed in the process and be replaced frequently (Naval Sea System Command, 2002).

The technique of using steel tubular electrode for cutting steel plates thicker than 7mm is as follows:

1. To start cutting, hold the electrodes perpendicular to the surface to be cut, place the tip of the electrode against the work, open the oxygen valve and call for "current on". Withdraw the electrode supply if necessary to start the arc.
2. To advance the cut, as soon as the cut is started for the full thickness of the plat "drag" the electrode along the desired line of the cut, maintaining it perpendicular to the work. The tip of the electrode should be pressed against the advancing tip of the cut. Pressure should be exerted in two directions, inward to compensate for electrode burn off and forward to advance the cut. Do not hold an arc as when welding in air.
3. An incomplete cut due to some fault of manipulation is evidenced by back flare. Stop the advance and go back immediately to complete the cut.
4. When the electrode has been consumed, be sure to signal "current off" before attempting to change electrode. Maintain the torch in cutting position until the tender acknowledges "current off". This safety precaution is mandatory regardless of the type of electrode being used (Cayford, 1992). According to Cayford (1992), the technique for cutting 7mm and thinner steel is slightly different from that used in thicker plates. The electrode in this case barely touches the plate surface as it advances along the line of cut. The technique for cutting steel plate employing the ceramic tubular electrode is almost the same as that used in steel tubular electrode. The electrode is held in the same position and the current is turned on at the welder's/diver's command. The ceramic electrode is held so that it is barely touches the plate, a very light touch is applied between the work and the electrode and there is no exertion for the inward pressure. Should the electrode be pushed into the cut, it will cause a flare-back, which is indicative of an incomplete cut. When the

electrode has been used up, the welder/diver again commands that the current be turned off and before touching the electrode or electrode holder, he waits for the tender to report "current off".

Piercing holes in steel plates is readily accomplished by the oxygen-arc method. The process is rapid and is as follows; touch the plate lightly at the desired point, open the oxygen valve and call for "current on", hold stationary for a moment, withdrawing momentarily. It is necessary to permit melting of the steel tube back inside the covering; pushing the electrode slowly into the hole until the plate is pierced (Cayford, 1992).

Shielded metal-arc cutting is a process in which the metal is cut by the intense heat of the arc. The heat melts a localized area of metal, forming a small molten pool. The pool will not flow enough to produce a good cut due to the rapid cooling from the quenching effect of the surrounding water. Therefore, the tip of the electrode must be manipulated to push the molten metal out of the kerf (Naval Sea Systems Command, 2002). In Underwater Shielded Metal-Arc cutting techniques, the diver/welder should understand that this process merely melts the metal and does not oxidize or consume the metal as in Oxygen-arc (oxy-arc) cutting. The molten metal will not run out of the cut on its own, but must be pushed out by manipulation of the electrode tip. By paying careful attention to the molten pool, the diver/welder can master this process in a short period of time. This technique can be used effectively for cutting steel, brass, copper and other copper based alloys (Naval Sea System Command, 2002).

The oxygen-hydrogen (Oxy-hydrogen) cutting torch operates on the combined process of compressed oxygen, compressed hydrogen and compressed air. This method is approximately the same as cutting in air except the diver/welder must accustom himself to working with relatively high pressures. The compressed air is delivered to a bell-like shield or "skirt" that surrounds the cutting tip and sheathes it with an air bubble. The purpose of the skirt is to stabilize the flame and keep the water way from the metal being heated (Cayford, 1992).

The oxy-hydrogen cutting method is normally used in cutting metals. The metal to be cut is brought to ignition temperature by a preheat flame of hydrogen and oxygen. This preheat flame is kept on during cutting to maintain cutting heat. A narrow kerf is burned or cut by the action of the oxygen cutting jet along the line of cut at an even speed. The torch must be moved fast enough to cut completely through.

Underwater structural fabrication is simply a process of arranging and interrelating of strong mild steel parts to produce a simple or complex construction underwater. Underwater structural fabrication is not an easy occupation, hence preliminary estimates and preparation must be carried out on land before the actual fabrication in water. Because of the challenges in underwater structural fabrication, the engineering capabilities of the personnel at the Research and Development Department are available to all underwater welders throughout the world. Special underwater problems may be presented to the underwater welder for them to design and fabricate a specific item for the special need on land before going underwater for the operation. Today's underwater welding is accomplished in much the same manner as ordinary arc welding, the only variation being that the electrode holder and cable well-insulated to eliminate any possible current leakage and electrolysis of the surrounding water and the coated water-proof electrodes are used so that the electrode do not get wet.

Kemahiram and Manusia (2009) enumerated steps to prepare materials, perform marking on work specimen and perform cutting, filling, assembly, cleaning work and housekeeping as follows:

1. Perform marking on work specimen according to drawing
2. Perform cutting of specimen according to work piece specification
3. Perform chipping cleaning for finished work piece
4. Perform fitting and assembly on work piece
5. Assist fabricator in carrying out various fabrication work
6. Carry out housekeeping in work area.

Kemahiran and Manusia (2009) stressed that a fabricator is designed to fabricate a wide variety of metal structures, repair metal surface and carryout requisition of equipments and suppliers. In particular, the fabricator will:

1. Fabricate a wide variety of metal structure from approved drawings and blueprints
2. Prepare written materials (e.g. work order, requisition, drawings, sketches etc.) for the purpose of documenting activities.
3. Repair metal surfaces to ensure that items are in proper working condition.
4. Request equipment and supplies for the purpose of maintaining inventory and ensuring availability of required items.
5. Perform drawing interpretation
6. Perform calculations for dimensional work
7. Perform marking on work piece according to complex work piece drawing.
8. Perform cutting to complex dimension according to work piece drawing.
9. Perform complex fit-up and assembly.
10. Perform tack welding on work piece according to work specification and drawing

The authors also contended that a structural fabricator is designed to fabricate a wide variety of metal structure, repair of metal surfaces, perform calculations, markings, cutting and tack welding on work pieces, fit-up and assembly of work piece and carry out housekeeping in work area. Kemahiran and Manusia (2009) enumerated the steps to structural fabrication as follow:

1. Fabricate a wide variety of metal structures according to the oral directions, sketches, drawings and blue prints.
2. Prepare written materials according to standard operating procedure
3. Repair metal surface according to product requirement.
4. Perform drawing interpretation
5. Perform calculations for dimensional work.
6. Perform marking on work piece according to complex product specification.
7. Perform cutting according to complex product specification
8. Perform fit-up and assembly for work piece.
9. Perform tack welding on work piece according to codes and standards.
10. Monitor suppliers for the purpose of maintaining inventory and ensuring availability of required items.

Purpose of the Study

1. determine the underwater cutting training skills need of youths for employment in the marine sector in South-South Nigeria.

2. determine the underwater structural fabrication training skills need of youths for employment in the marine sector in South-South Nigeria.

Research Questions

1. What are the underwater cutting skills needed by youths for employment in the marine sector in South-South Nigeria?

2. What are the underwater structural fabrication skills needed by youths for employment in the marine sector in South-South Nigeria?

Null Hypotheses

H_{01} There is no significant difference between the responses of fabrication instructors in Technical Colleges and underwater welding technicians in the marine sector on the underwater cutting skills for youths' employment in the marine sector.

H_{02} There is no significant difference between the responses of fabrication instructors in Technical Colleges and underwater welding technicians in the marine sector on the underwater structural fabrication skills for youths' employment in the marine sector.

Methodology

The study adopted the use of descriptive survey research design using questionnaire. Ndiyo (2005) emphasized that a study of this nature where large samples are involved is better carried out with a descriptive survey design. Ojo (2001), state that descriptive survey design is a design technique for obtaining data from people through the use of questionnaire, observation and interview. According to Osuala (2005), the descriptive design is the design suitable for the collection of data based on the opinion of people. The population for the study comprised 282 fabrication instructors and underwater fabrication technicians. A sample size of 216 respondents: 72 fabrication instructors and 144 underwater fabrication technicians were selected for the study through simple random sampling technique. The researcher-developed instrument captioned, "Underwater Fabrication Training Skills Need for Employment in the Marine Sector Questionnaire" (UFTSNEMSQ) to generate data for the study. Three lecturers in the Faculty of Education, University of Uyo validated the instrument. The reliability of the instruments was done using respondents in the study area who were not part of the main study. Cronbach's Alpha reliability technique was used in determining the reliability of the instrument. The reliability coefficient of the instrument for fabrication instructors was 0.84 and 0.86 from underwater fabrication technicians. The researcher ensured accurate distribution and collection of the filled questionnaire by means of personal administration of the instrument to the respondents in their various offices. The descriptive statistics of mean and standard deviation was used to answer research questions while the hypotheses raised were tested using independent t-test at 0.05 level of significance.

Data Analysis, Results and Discussion of Findings

Research Question 1

What are the underwater cutting skills needed by youths for employment in the marine sector in South-South Nigeria?

Table 1: Mean and standard deviation analysis of underwater cutting needed by youths for employment in the marine sector

N = 216 $n_1 = 72$ $n_2 = 144$

S/N	Item	Fabrication/ Welding Instructors		Underwater Welding Technicians		Difference in Mean	Remark
		$\overline{X}_1$	SD	$\overline{X}_2$	SD		
1	Flame-cutting metals at different positions.	2.08	0.96	3.36	0.67	-1.28	*
2	Flame-cutting metals into various shapes.	1.81	0.88	3.22	0.81	-1.41	*
3	Holding electrodes to the surface to be cut at the correct position.	1.71	0.91	3.26	0.90	-1.55	*
4	Applying pressure in forward and backward directions for electrode burn off.	1.42	.69	3.18	0.87	-1.76	*
5	Selecting appropriate electrode for cutting.	3.61	0.72	2.98	0.87	0.63	**
6	Selecting appropriate current for cutting.	3.61	0.64	2.51	0.99	0.80	**
7	Holding carbon electrode at approximately 45° to the job to be cut.	1.43	0.73	3.15	0.88	-1.72	*
8	Adjusting the current density during cutting.	2.65	0.72	2.74	0.96	-0.09	*
9	Using correct electrode since gas pressure varies with the thickness of the steel and with the size of electrode.	1.49	0.82	3.93	0.83	-2.44	*
10	Being able to strike an arc with oxygen off, the oxygen valve is released immediately and cutting	1.40	0.72	3.17	0.72	-1.77	*

begins.

* = needed; ** = not needed; N = total number of sample size; n_1 = number of fabrication/welding instructors, n_2 = number of underwater welding technicians, $\bar{x}_1$ mean for fabrication/welding teachers and $\bar{x}_2$ = mean for underwater welding experts.

Dataanalysis in Table 1 reveals that the difference in mean values between the responses of fabrication and welding instructors and underwater welding technicians in oil and gas industries for item number 1, 2, 3, 4, 7, 8, 9 and 10 are -1.28, -1.41, -1.55, -1.76, -1.72, -0.09, -2.44 and -1.77 respectively while those for item number 5 and 6 are 0.63 and 0.80 respectively. The results imply that the students are lacking in those skills with negative difference in mean and therefore training in these areas while the skills with positive differences in mean are the ones the youths need little or no training for employment in the marine sector in South-South Nigeria.

Research Question 2

What are the underwater structural fabrication skills needed by youths for employment in the marine sector in South-South Nigeria?

Table 2: Mean and standard deviation analysis of underwater structural fabrication skills needed by youths for employment in the marine sector

N = 216 $n_1 = 72$ $n_2 = 144$

S/N	Item	Fabrication/ Welding Instructors		Underwater Welding Technicians		Difference in Mean	Remark
		$\bar{X}_1$	SD	$\bar{X}_2$	SD		
1	Marking on work specimen according to drawing.	3.56	0.72	2.80	0.83	0.76	**
2	Cutting of specimen based on work piece specification.	3.64	0.66	2.95	0.94	0.69	**
3	Chipping for finished work piece.	3.49	0.80	2.94	0.75	0.55	**
4	Fabricating a wide variety of metal structure from approved drawings and blue print.	2.35	0.92	3.26	0.91	-0.91	*
5	Preparing written materials of documenting activities.	3.54	0.79	2.88	1.13	0.66	**
6	Performing drawing interpretation.	3.61	0.64	2.90	0.67	0.71	**
7	Being able to perform calculations for dimensional work.	3.54	0.73	2.96	0.78	0.58	**
8	Cutting to complex dimension based on work piece drawing.	2.06	1.02	3.29	0.92	-1.23	*
9	Being able to perform complex fit-up assembly.	2.25	1.00	3.28	0.84	-1.03	*
10	Tack-welding on work piece.	3.57	0.73	2.95	0.69	0.62	**

* = needed; ** = not needed; N = total number of sample size; n_1 = number of fabrication/welding instructors, n_2 = number of underwater welding technicians, $\overline{x}_1$ mean for fabrication/welding instructors and $\overline{x}_2$ = mean for underwater welding technicians.

Data analysis in Table 2 indicates that the differences in mean between the responses of fabrication/welding instructors and welding technicians in the marine sector for item number 1, 2, 3, 5, 6, 7 and 10 are positive values, while the differences in mean for item 4, 8 and 9 are negative values. The results reveal that youths need a lot of training in those skills with negative difference in mean and little or no training in skills with positive difference in mean to qualify them for employment in the marine sector in South-South Nigeria.

Hypothesis 1

There is no significant difference between the responses of fabrication/welding instructors in Technical Colleges and underwater welding technicians in the marine sector on the undercutting skills for youths' employment in the marine sector.

Table 3: Independent t-test analysis of difference between the responses of fabrication/ welding instructors and underwater welding technicians on underwater cutting skills

N = 216

Variable	n	$\overline{X}$	SD	df	tcal	tcri	Decision
Fabrication/welding instructors	72	17.60	7.78				
				214	-12.24*	1.96	Reject H_{01}
Underwater welding technicians	144	31.80	8.50				

* = significant at 0.05 alpha level

Data analysis in Table 3 reveals that the calculated t-value of -12.24 is greater than the critical t-value of 1.96 at df of 214 and 0.05 level of significance. Hence, the null hypothesis is rejected. The results show that a significant difference exist between the responses of fabrication/welding instructors in Technical Colleges and underwaterfabrication technicians in the marine sector on the underwater cutting skills for youths' employment in the marine sector. The negative independent t-test value indicates that a lot of training is needed on the underwater cutting skills for youths' employment in the marine sector.

Hypothesis 2

There is no significant difference between the responses of fabrication/welding instructors in Technical Colleges and underwaterwelding technicians in the in marine sector on the underwater structural fabrication for youths' employment in the marine sector in South-South Nigeria.

Table 4: Independent t-test analysis of difference between the responses of fabrication/welding instructors and underwater welding technicians on underwater structural fabrication skills

N = 216

Variable	n	$\overline{X}$	SD	df	tcal	tcri	Decision
Fabrication/welding instructors	72	31.61	8.01				
				214	1.19	1.96	NS
Underwater welding technicians	144	30.21	8.46				

NS = Not significant at 0.05 level of significant

Data analysis in Table 4 shows that the calculated t-value of 1.19 is less than the critical t-value of 1.96 at df of 214 and 0.05 level of significance. Hence, the null hypothesis is upheld. This indicates that there is no significant difference between the responses of fabrication/welding instructors in technical colleges and underwaterwelding technicians in the marine sector on the underwater structural fabrication skills for youths' employment in the marine sector. The positive independent t-test value implies that the youths need little or no training on the structural fabrication skills for their employment in the marine sector.

Discussion of Findings

The result of hypothesis one on table three showed that a significant difference exist between the responses of fabrication/welding instructors in technical colleges and underwater welding technicians in the marine sector on the underwater cutting skills for youths' employment in the marine sector. The negative t-test value indicates that a lot of training is needed on the underwater cutting skills for students' employment in the oil and gas industries. The findings of Ukah (2015) also supported the finding of this study. Ukah (2015) in his study observed no significant difference between the responses of the employees and the technical teachers on the extent of skills in arc cutting metal possessed by the graduates of technical colleges in Rivers

State. Nwokolo (2010) in collaborating the findings of the study, observed that young graduates need broad based technical skills which can be adopted to rapidly change economic requirement as well as appropriate basic skills which can enable them to be self-reliance or benefit from industrial organization by way of employment. It is clear from the findings of the study that the youths need training in the underwater cutting skills for employment in the marine sector in South-South Nigeria.

The analysis of hypothesis two on table four indicates that, there is no significant difference between the responses of fabrication/welding instructors in technical colleges and underwater welding technicians in the marine sector on the underwater structural fabrication skills for youths' employment in the marine sector. The positive t-test value shows that the youths need little or no training on the structural fabrication skills for their employment in the marine sector. The findings of this study agrees with the opinion of Kemahiran and Manusia (2009) that a fabricator is designed to fabricate wide variety of metal structures, repair metal surface and carryout requisition of equipment and suppliers. Besides, the other technicians perform the task of assisting the fabricator in carrying out various fabrication work. Kemahiran and Manusia (2009) had observed that the fabricator will prepare written materials based on the standard operating procedure, perform drawing interpretation, prepare calculations for dimensional work, perform marking on the work, and perform cutting and fitting assembly for work piece among others. From the evidence of the data analysis and literature reviewed, it is obvious that youths need little or no training in the underwater structural fabrication skills in the marine sector in South-South Nigeria.

Conclusion

Based on the data analyzed and findings made, it is concluded that significant difference exist between the responses of fabrication/welding instructors in technical colleges and underwater welding technicians in the marine sector on the underwater cutting skills for youths' employment in the marine sector. The findings indicate that the youths need adequate training in the foregoing areas of underwater training. Also, there is no significant difference between the responses of fabrication and welding instructors in technical colleges and underwater welding technicians in the marine sector on the underwater structural fabrication skills for youths' employment in the marine sector. Hence, the youth need little or no training in underwater structural fabrication skills for that employment in the marine sector.

Recommendations

Based on the findings of the study, the following recommendations are made:

1. The fabrication and welding teachers should be properly trained by the Federal Government through workshops and seminars on the practical skills expected in the marine sector, since there are significant differences between their responses and those of underwater welding technicians on underwater cutting.
2. The curriculum developers, while modifying the curriculum of Technical Colleges in South-South Nigeria, should include underwater fabrication experiences in the marine sector, since this research work is targeted to the youths in South South-Nigeria.

3. The curriculum developers should modify the curriculum of mechanical engineering in all Universities and Polytechnics to include at least introductory aspect of underwater fabrication, since these technicians are supervised by mechanical engineers.
4. Private entrepreneurs should establish training institutions in South-South Nigeria that will expose the youths to underwater fabrication skills.

REFERENCES

American Welding Society, (2001).*Welding science and technology: Wielding Handbook,* Volume 1, 9th edition. Miami, Florida, USA, AWS.pp 452-482.

Cayford, J. E. (1992). *Underwater work: A manual of scuba commercial selvage and construction operations (2ndéd.).* Maryland: Cornel Maritime Press.

Joshi, A. M. (2004). *Underwater welding*.Mechanical Engineering Department, Indian Institute of Technology.

Kemahiran, J. P, and Manusia (2009).*Occupational job structures for job industry sector*.Department of skills development, Ministry of Human Resources Malaysia.

Khanna, O. P. (2004). *A textbook of welding technology*. India: DhanphatRai Publications Ltd.

Kraji, S. (2015).*Underwater welding and cutting module of doctoral study*: Advance Production Technologies Faculty of Mechanical engineering and Naval Architecture, University of Zagreb.

Naval Sea Systems Command (2002).*U.S. Navy underwater cutting and welding manual*. Washington. D.C: Department of Naval Systems Command.

Ndiyo, N. (2005). *Fundamental of research behavioural sciences and humanities*.Calabar: Wusen Publishers.

Nwokolo, J. O. (2010). Training skills relevance for employment in metal work industries in Nigeria.The way forward.*Journal of Nigeria vocational Association*, 15 (1), 28-39.

Ojo, J. E. (2001) *Research method and statistics in educational and social science*. Lagos: Jaya Press Ltd.

Osuala, E. C. (2005) *Introduction to research method*. Enugu: Chaston agency Ltd.

Uka, J. A. (2015). Fabrication and welding skills possessed by Technical College students for employment in industries in South-South Nigeria. An unpublished Thesis University of Uyo.