MEASURING AND CUTTING SKILLS NEED IN FABRICATION AND WELDING TRADE OF TECHNICAL COLLEGE STUDENTS IN AKWA IBOM STATE, NIGERIA

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ABSTRACT

The study determined the measuring and cutting skills need in fabrication and welding trade of technical college students in Akwa Ibom State. Two specific objectives, two research questions and two null hypotheses were formulated to guide the study. Survey design was used for the study. The population of the study comprised 235 fabrication and welding trade students in senior technical (ST2) and 14 instructors in Technical Colleges in Akwa Ibom State. There was no sampling as the population was not large. A total of 205 copies of questionnaire were completely filled and used for data analysis. Measuring and Cutting Skills Need Questionnaire (MCSNQ) was used to collect data for the study. The instrument was validated by three experts in the Faculty of Education, University of Uyo, Uyo. The reliability of the instrument stood at .85 and was obtained using cronbach alpha formula. Mean, standard deviation and t-test statistics were used for data analysis. The findings of the study revealed that technical college students need skills on measuring and cutting to a great extent. And there is no significant difference in the mean responses of technical college students and instructors on the extent to which technical college students need measuring and cutting skills in fabrication and welding trade. It is recommended among others that government and non-governmental organisations should adequately equip technical college workshops with modern tools, machines, equipment and materials for training purposes.

Keywords: Measuring, Cutting, Skills Need, Fabrication and Welding Trade, Technical College Students, Nigeria.

INTRODUCTION

Technical college is one of the institutions established by the federal and state government of Nigeria to provide individuals with practical skills, basic scientific knowledge and attitude to enable them live successfully in the world of work. Technical college provides technical training in a number of courses which include general education, automobile repairs, trade, business trade, building and woodwork trade, computer trade, printing trade, textile trade, electrical/electronic trade, fabrication and welding trade and others (FRN, 2013). According to Effiong, Anangagbor and Abie (2013), technical education is meant to prepare learners for careers based on practical activities. Some of the goals of technical and vocational education as stipulated in the National Policy on Education shall be to provide trained manpower in the applied sciences, technology and business particularly at craft, advanced craft and technical levels; provide the technical knowledge and vocational skills necessary for agricultural, commercial and economic development; and give training and impart the necessary skills to individual who shall be self reliant economically.

Metal fabrication is a process of blueprint reading, layout cutting and preparing metallic materials for assembly by welding (Spokane, 2013). It is also described as the forming of metal, usually steel plate into various forms either by welding or other forms of light or thick metal joining processes. Metal fabrication job usually start with shop drawings including precise measurements, fabrication stage and finally to the installation of final project. The fabrication stage involves cutting, bending, assembly and joining of metal and others (Spokane Community College, 2013).

Fabrication and welding trade involves several operations such as measurement, cutting, metal surfacing, soldering among others. Measurement is the systematic assignment of numerals and symbols to objects and materials according to specified rule. Thus, measurement is a process of activities, a process of describing events, objects, things and expressing them quantitatively (Joshua, 2012). Students need to be conversant with the use of all kinds of measuring instruments and gauges, vernier caliper and others. According to Thompson (1992), many kinds of measurement are taken in everyday work in the workshop: length, width, angles, thickness and so on. Moreso, each measuring instrument is designed to do a certain job: to provide information in recognizable units for comparison with a group or set of similar units relating to the shape and size of a piece of work.

It is one thing to check the accuracy of one's work; it is another thing to indicate its size by actual measurement. A length may be expressed as the distance between two lines (line measurement) or the distance between two faces (end measurement). The most common example of line measurement is the rule with its divisions shown as lines marked on it; while end measurement employs the use of calipers, micrometer, solid length bars, etc to obtain size (Chapman, 2014). One of the most difficult problems in precision work is to transfer a dimension from its "line" to its "end" form.

Cutting entails a lot of fabrication and welding trade. Cutting is the process of breaking iron and steel into work pieces of various sizes and shapes. According to Althouse, Turnquist and Bowditch (2015), the metal arc cutting process uses an arc between a metal electrode and the base metal. The electrode is heavily covered with flux. This heats the base metal. The molten

metal glows from the base metal to form a cut (Kerf). This process is used mainly for small maintenance jobs.

The arc cutting process requires a current source, either AC or DC. A manually operated electrode holder provides a grip for controlling the electrode. Electric current flows through the electrode holder lead and arc between the electrode and the work piece. A ground cable (work lead) between the work piece and the power source completes the circuit (Althouse, Turnquist and Bowditch, 2015). In operation, the equipment, both electrical and mechanical, is adjusted to provide the desired arc. The operator strikes the arc between the electrode and the base metal and the cutting is started. The operator moves the electrode as the cut (kerf) progresses. Althouse, Turnquist and Bowditch (2015) stressed that protection is needed from intense heat, light of the arc and some sparks. This requires wearing approved helmets, gloves and welders' clothing. The equipment must include the necessary shielding and safety devices.

Most oxygen cutting is done with machines, particularly if the cuts are long. Machine cutting has many advantages over hand cutting and results in greater accuracy and better edge finish, especially when used for making single double V edge preparation. The principles of cutting are similar to those of handwork. A wide variety of types of machines are available including stationary, general purpose or universal models, multi-burner machines, straight-line and circle cutting and joint cutting machines (Davies, 1996). The fabrication and welding students are not well equipped with measuring and cutting skills for gainful employment after graduation. It is against this background that the study was conducted to examine the measuring and cutting skills need of technical college students for job creation in Akwa Ibom State.

Statement of the Problem

It is perplexing and worrisome situation that technical college graduates lack skills for job creation and could not work confidently without further training. They lack the basic skills in fabrication and welding which include measuring and cutting skills. As such on completion of the fabrication and welding trade course in technical colleges, these students remain jobless and uneconomically self-reliant for lack of the required skills. These situations may not be easily explained unless a guiding question is raised: what are measuring and cutting skills need of technical college students for economic self reliance and job creation? Answer to the foregoing question is not easily provided because of limited or absence of research evidence on the situation. Most of the available answers to this question may be based on opinion which lack empirical support. It is the limited or absence of research evidence to indicate the measuring and cutting skills need of Akwa Ibom technical college students for employability that constitutes the focal point of the problem for investigation.

Objectives of the Study

1. To determine the extent to which technical college students need measuring skills in fabrication and welding trade.
2. To determine the extent to which technical college students need cutting skills in fabrication and welding trade.

Research Questions

The following research questions were answered in the study.

1. To what extent do technical college students need measuring skills in fabrication and welding trade?
2. To what extent do technical college students need cutting skills in fabrication and welding trade?

Null Hypotheses

H_{01}: There is no significant difference in the mean response of technical college students and instructors on the extent to which technical college students need measuring skills in fabrication and welding trade.

H_{02}: There is no significant difference in the mean response of technical college students and instructors on the extent to which technical college students need cutting skills in fabrication and welding trade.

Research Method

Design of the Study

Survey design was used for the study. The design was considered suitable because the study sought to observe the difference in the mean response of technical college students and instructors on the measuring and cutting skills need in fabrication and welding trade.

Population of the Study

The population of the study was 249. It comprised 14 instructors of fabrication and welding trade and 235 senior technical two (ST 2) students of fabrication and welding trade from six technical colleges of Akwa Ibom State.

Sample and Sampling Technique

There was no sampling. The total population was 249 but the total of 205 copies of questionnaire were completely filled and used for data analysis.

Instrumentation

The researcher-developed instrument tagged "Measuring and Cutting Skills Need Questionnaire (MCSNQ)" was used to collect data for the study. The instrument consisted of section A and B. Section A was meant to gather information on demographic data of the respondents; while section B contained 21 structured items to elicit information on measuring and cutting skills need. The instrument was rated on a five point scale of Very Great Extent (VGE), Great Extent (GE), Moderate Extent (ME), Little Extent (LE) and Very Little Extent (VLE) with the assigned score of 5, 4, 3, 2 and 1 respectively.

Validation and Reliability of the Instrument

The instrument for the study was face validated by two experts of Fabrication and Welding and one expert of educational evaluation in the Faculty of Education, University of Uyo. The correction and suggestions made by these experts were used to modify the instrument. The instrument was administered on 30 students who did not take part in the actual study. Cronbach alpha formula was used to estimate the reliability coefficient of the instrument which was .85.

Method of Data Analysis

The data collected was analysed using mean and standard deviation to answer research questions while t-test was used to test hypotheses at .05 alpha level.

Decision Rule: Decision on the extent to which a specific measuring and cutting skills was needed by students of technical colleges was based on the real limits of the response value as follows:

Response Options	Value	Real Limits
Very Great Extent (VGE)	5	4.50 – 5.00
Great Extent (GE)	4	3.50 – 4.49
Moderate Extent (ME)	3	2.50 – 3.49
Little Extent (LE)	2	1.50 – 2.49
Very Little Extent (VLE)	1	0.50 – 1.49

In order to test the null hypotheses, if the calculated t-value is greater than the critical t-value, the null hypothesis is rejected but if the calculated t-value is less than the critical t-value, the null hypothesis is upheld.

Results and Discussion

Answering of Research Questions

Research Question 1

To what extent do technical college students need measuring skills in fabrication and welding trade?

Table 1: Mean analysis of the extent of measuring skills need in fabrication and welding trade

		$n_1 = 13$		$n_2 = 192$			
S/N	**Items**	$\bar{X}$	**SD**	$\bar{X}$	**SD**	**Combined Mean**	**Extent of Skill Needed**
1	Ability to measure length of metal with meter rule	4.38	.65	3.98	.92	4.16	Great Extent
2	Ability to mark out right angle with try square	4.46	.66	4.11	1.02	4.28	Great Extent
3	Ability to measure thickness of a metal bar using micrometer screw gauge	4.00	1.40	4.31	.94	4.15	Great Extent
4	Ability to measure up to third place of decimal in micrometer screw gauge	4.15	.90	4.27	.89	4.21	Great Extent
5	Ability to transfer measurement with Vernier caliper to work piece	4.08	1.19	4.14	.88	4.11	Great Extent
6	Ability to measure the diameter of the hole using joint caliper	3.92	1.26	4.26	.93	4.09	Great Extent

7	Ability to take inside measurement of a bearing using Vernier caliper	4.00	.91	4.08	.99	4.04	Great Extent
8	Ability to measure angle of 45^0 on work piece using a protractor and ruler	4.15	.90	3.99	.99	4.07	Great Extent

n_1 = number of instructors; n_2 = number of students

Data analysis in Table 1 indicates that the mean values of the responses of instructors and students for items 1 to 8 fall between 3.50 – 4.49. Differences also exist in the mean responses of instructors and students. This result shows that technical college students need measuring skills in fabrication and welding trade to a great extent.

Research Question 2

To what extent do technical college students need cutting skills in fabrication and welding trade?

Table 2: Mean analysis of the extent of cutting skills need in fabrication and welding trade

				$n_1 = 13$		$n_2 = 192$	
S/N	**Items**	$\bar{X}$	**SD**	$\bar{X}$	**SD**	**Combined Mean**	**Extent of Skill Needed**
9	Ability to select correct saw blade for cutting of mild steel bar	4.00	1.29	4.34	.82	4.17	Great Extent
10	Fix the saw blade on the saw frame correctly	4.08	1.19	4.19	1.93	4.13	Great Extent
11	Cut 4mm bar with hack saw	3.92	1.26	4.20	.90	4.06	Great Extent
12	Select correct cutting nozzle for a given thickness to be cut	4.08	1.04	4.29	.84	4.18	Great Extent
13	Clean the surface to be cut thoroughly	4.15	1.21	4.14	.86	4.14	Great Extent
14	Light the cutting torch with lighter	4.38	.65	4.29	.87	4.36	Great Extent
15	Adjust cutting torch to obtain carburizing flame	4.08	.86	4.16	.83	4.12	Great Extent

16	Heat the work piece to oxidize	4.15	.90	4.20	.91	4.17	Great Extent
17	Press the cutting lever to cut 8mm bar	3.85	1.21	4.18	.78	4.01	Great Extent
18	Move the cutting torch gradually along the line of cut	3.76	1.17	4.07	.86	3.91	Great Extent
19	Select correct size of electrode	3.85	.80	3.99	.90	3.92	Great Extent
20	Soak the electrode in water	3.92	.86	4.18	.91	4.05	Great Extent
21	Move the electrode gradually along the line to cut	4.00	.91	4.33	.88	4.16	Great Extent

n_1 = number of instructors; n_2 = number of students

Data analysis in Table 2 shows that the mean values of the responses of instructors and students for items 9 to 21 fall within the mean range of 3.50 – 4.49. The results also show their corresponding values of standard deviation. Differences exist in the mean values for instructors and students. The analysis of t-tests reveals that technical college students need cutting skills in fabrication and welding trade to a great extent.

Testing of Hypotheses

Hypothesis 1

There is no significant difference is the mean responses of technical college students and instructors on the extent to which technical college students need measuring skills in fabrication and welding trade.

Table 3: t-test Analysis of Difference on the Extent to which Technical College Students Need Measuring Skills N = 205

Variable	N	$\bar{X}$	SD	df	t_{cal}	t_{cri}	Decision
Instructors	13	36.81	9.91				
				213	1.01	1.96	NS
Students	192	33.94	10.78				

NS = Not significant at .05 alpha level

Data analysis in Table 3 reveals that that calculated t-value of 1.01 is less than the critical t-value of 1.96 at degree of freedom of 213 and .05 level of significance. Hence, the null hypothesis is accepted. Therefore, there is no significant difference in the mean responses of technical college students and instructors on the extent to which technical college students need measuring skills in fabrication and welding trade.

Hypothesis 2

There is no significant difference in the mean responses of technical college students and instructors on the extent to which technical college students need cutting skills in fabrication and welding trade.

Table4: t-test Analysis of Difference on the Extent to which Technical College Students Need Cutting Skills N = 205

Variable	N	$\bar{X}$	SD	df	t_{cal}	t_{cri}	Decision
Instructors	13	61.73	12.81				
				203	1.64	1.96	NS
Students	192	55.69	13.54				

NS = Not significant at .05 alpha level

Data analysis in Table 4 indicates that the calculated t-value of 1.64 is less than the critical t-value of 1.96 at df of 203 and .05 level of significance. Hence, the null hypothesis is accepted. Therefore, there is no significant difference in the mean responses of technical college students and instructors on the extent to which technical college students need cutting skills in fabrication and welding trade.

Findings of the Study

Findings of the study are as follows:

1. Technical college students need measuring skills in fabrication and welding trade to a great extent. Besides, there is no significant difference in the mean responses of technical college students and instructors on the extent to which technical college students need measuring skills in fabrication and welding trade.
2. Technical college students need cutting skills in fabrication and welding trade to a great extent. In addition, there is no significant difference in the mean responses of technical college students and instructors on the extent to which technical college students need cutting skills in fabrication and welding trade.

Discussion of Findings

Findings of the study revealed that technical college students need measuring skills in fabrication and welding trade to a great extent. Besides, there is no significant difference in the mean responses of technical college students and instructors on the extent to which technical college students need measuring skills in fabrication and welding. The findings of the study go in line with the work of Thompson (1992) who asserted that many kinds of measurements, such as lengths, widths, angles and thickness are taken in everyday work in the workshop. Moreso, each measuring instrument is designed to do a certain job to provide information in recognizable units for comparison with a group or set of similar units relating to the shape and size of a piece of work.

Findings of the study also revealed that technical college students need cutting skills in fabrication and welding trade. In support of the findings of the study, Chapman (2014) maintained that a large portion of the training and skill of the workshop engineer is devoted to the shaping of metal and to stopping the process at the proper time. In the workshop, most of the shaping involves cutting the metals and stopping this at the correct place involves a knowledge of measurement.

Conclusions

On the bases of the findings, it is inferred that there is no significant difference in the mean responses of technical college students and instructors on the extent to which technical college students need measuring and cutting skills in fabrication and welding trade. As a result of

these skills that are needed in great extent, students should be encouraged to acquire them before leaving the school. These will expose them to gainful employment in fabrication and welding occupation.

Recommendations

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

1. The school workshops should be well equipped with modern tools, machines equipment and materials for practical activities by government and organisations.
2. The teachers and instructors should make every effort to expose students to practical work in order for students to acquire the needed measuring and cutting skills.

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