ENTREPRENEURSHIP DEVELOPMENT OF STUDENTS IN TECHNICAL COLLEGES IN RIVERS STATE

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Abstract

The study focused on foundry skills need for enhancing entrepreneurship development of students in technical colleges in Rivers State. The study has four purposes, research questions and hypotheses. This study adopted a descriptive survey research design and was carried out in Rivers State. The population for the study was 45 respondents, comprising 30 mechanical craft teachers and 15 instructors in technical colleges in Rivers State. The study was a census as the entire population was studied. A structured questionnaire instrument was used to collect data for this study titled 'Foundry Skill Questionnaire (FSQ)'. The instrument was structured on four point response options of Strongly agree (SA), agree (A),disagree (D) and strongly disagree (SD) with values of 4, 3, 2, and 1 respectively for each one. The instrument was face-validated by three experts from the Department of Vocational/ technology Education, Rivers State University. The study has .70, reliability index. The study revealed that pattern making skill, core making skill, moulding process skill and melting and casting skill are needed for enhancing entrepreneurship development of students in technical colleges in Rivers State. Based on the findings of the study it was recommended that acquirable entrepreneurial skills should be imbedded in all courses of study being offered in foundry craft practice in Technical colleges. Training without relevant equipment will only lead to frustration. All stakeholders in technical colleges should spare no efforts in ensuring availability of entrepreneurial and foundry skills acquisition facilities in Technical colleges.

Keywords: Technical colleges, Foundry, Pattern making, Core making and Entrepreneurship development

Introduction

Technical Colleges in Nigeria are established to produce craftsmen at the craft level and master craftsmen at the advance craft level (Federal Ministry of Education, 2013). The courses offered at the technical colleges leads to the award of National Technical Certificate (NTC) and Advance National Technical Certificate (ANTC). The curriculum programmes of technical colleges according to Federal Government of Nigeria (2013) are grouped into related trades. These include; the computer trades, building trades, wood trades, mechanical trades, electrical installation trades and foundry trades.

A foundry is a factory that produces metal castings. Metals are cast into shapes by melting them into a liquid, pouring the metal into a mould, and removing the mould material after the metal has solidified as it cools (*Degarmo, Black & Kohser, 2003*). The most common metals processed are aluminium and cast iron. However, other metals, such as bronze, brass, steel, magnesium and zinc, are also used to produce castings in foundries. In this process, parts of desired shapes and sizes can be formed. Theses includes the following:

Pattern is a replica of the object to be cast, used to prepare the cavity into which molten material will be poured during the casting process (Bawa, 2004). The goal of this module is designed to provide the trainees with the competence and underpinning knowledge to enable them to make simple patterns using basic tools and machinery. Patterns used in sand casting may be made of wood, metal, plastics or other materials. Patterns are made to exacting standards of construction, so that they can last for a reasonable length of time, according to the quality grade of the pattern being built, and so that they will repeatably provide a dimensionally acceptable casting (Ammen, 1999).

The making of patterns, called patternmaking (sometimes styled pattern-making or pattern making), is a skilled trade that is related to the trades of tool and die making and mould making but also often incorporates elements of fine woodworking. Patternmakers (sometimes styled pattern-makers or pattern makers) learn their skills through apprenticeships and trade schools over many years of experience. Although an engineer may help to design the pattern, it is usually a pattern maker who executes the design (http://mechanicalinventions.blogspot.com/2012/12/types-of-patterns.html).

A core is a device used in casting and moulding processes to produce internal cavities and reentrant angles (an interior angle that is greater than 180°). The core is normally a disposable item that is destroyed to get it out of the piece (Degarmo, Black & Kohser, 2003). They are most commonly used in sand casting, but are also used in die casting and injection moulding. The goal of this module is intended to provide the trainee with the competence and underpinning knowledge to operate and maintain different types of core making tools and equipment and be able to produce good cores for foundry work.

To produce cavities within the casting—such as for liquid cooling in engine blocks and cylinder heads—negative forms are used to produce cores. Usually sand-moulded, cores are inserted into the casting box after removal of the pattern. Whenever possible, designs are made that avoid the use of cores, due to the additional set-up time and thus greater cost. With a completed mould at the appropriate moisture content, the box containing the sand mold is then positioned for filling with molten metal

typically iron, steel, bronze, brass, aluminium, magnesium alloys, or various pot metal alloys, which often include lead, tin, and zinc. After being filled with liquid metal the box is set aside until the metal is sufficiently cool to be strong. The sand is then removed, revealing a rough casting that, in the case of iron or steel, may still be glowing red. In the case of metals that are significantly heavier than the casting sand, such as iron or lead, the casting flask is often covered with a heavy plate to prevent a problem known as floating the mold. Floating the mold occurs when the pressure of the metal pushes the sand above the mold cavity out of shape, causing the casting to fail (Degarmo, Black, & Kohser, 2003).

After casting, the cores are broken up by rods or shot and removed from the casting. The metal from the sprue and risers is cut from the rough casting. Various heat treatments may be applied to relieve stresses from the initial cooling and to add hardness—in the case of steel or iron, by quenching in water or oil. The casting may be further strengthened by surface compression treatment—like shot peening—that adds resistance to tensile cracking and smooths the rough surface. And when high precision is required, various machining operations (such as milling or boring) are made to finish critical areas of the casting. Examples of this would include the boring of cylinders and milling of the deck on a cast engine block.

Moulding is the process of manufacturing by shaping liquid or pliable raw material using a rigid frame called a mold or matrix (*Porter & Easterling, 2000*). This itself may have been made using a pattern or model of the final object. A mould is a hollowed-out block that is filled with a liquid or pliable material such as plastic, glass, metal or ceramic raw material. The liquid hardens or sets inside the mold, adopting its shape. A mold is the counterpart to a cast. The very common bi-valve molding process uses two molds, one for each half of the object. Articulated moulds have multiple pieces that come together to form the complete mold, and then disassemble to release the finished casting; they are expensive, but necessary when the casting shape has complex overhangs (*Lesko, 2007).* Piece-molding uses a number of different molds, each creating a section of a complicated object. This is generally only used for larger and more valuable objects.

A manufacturer who makes moulds is called a mould maker. A release agent is typically used to make removal of the hardened/set substance from the mold easily. Typical uses for molded plastics include moulded furniture, moulded household goods, moulded cases, and structural materials. In foundry, casting is a process in which a liquid metal is somehow delivered into a mould (it is usually delivered by a crucible) that contains a hollow shape (i.e., a 3-dimensional negative image) of the intended shape. The metal is poured into the mold through a hollow channel called a sprue. The metal and mold are then cooled, and the metal part (the casting) is extracted. Casting is most often used for making

complex shapes that would be difficult or uneconomical to make by other methods (*Porter & Easterling, 2000*). The goal of the Module is intended to provide the trainee with the knowledge and skill to melt various metals using all types of furnaces.

Casting processes have been known for thousands of years, and have been widely used for sculpture (especially in bronze), jewelry in precious metals, and weapons and tools. Traditional techniques include lost-wax casting (which may be further divided into centrifugal casting and vacuum assist direct pour casting), plaster mould casting and sand casting. The modern casting process is subdivided into two main categories: expendable and non-expendable casting. It is further broken down by the mold material, such as sand or metal, and pouring method, such as gravity, vacuum, or low pressure (*Lesko, 2007*).

However**,** entrepreneurship is a term used broadly in connection with the innovative modern industrial leaders. Obasan (2005) defined entrepreneurship as the practical application of enterprising qualities, such as initiative, innovation, creativity and risk taking into the work environment either in self-employment or employment in small startup firm, using the appropriate skills necessary for success in that environment and culture. Iheonunekwu (2012) refers to it as the attitude, skills and actions of individual(s) starting a new enterprise. Okpara (2000) explained that an entrepreneur is a human bulldozer, who can convert a stumbling block into a stepping stone. The entrepreneur is an aggressive innovator whose dynamic "creative response" to the economic environment makes him central to the promotion of material growth of production and industrial development (Obasan, 2005). Thus, the researcher concludes that an entrepreneur is one who starts an enterprise, puts new forms of industry on their feet, and shoulders the risk and uncertainty of using economic resources in a new sustainable way, with the right motivation, energy, and ability to build the enterprise by their efforts. The entrepreneur is a tenacious individual who have gathered enough ability to surmount difficulties created by the social milieu and combine or marshal such resources as initiative, risk taking, know-how, organizational ability, leadership and marketing skills to establish a profit-oriented enterprise. So training in technical college prepares people who could apply relevant practical skill to make positive changes within their society and afford a self-dependent life (Afeti, 2010). This implies that technical college holds the key to training the skilled and entrepreneurial workforce needed for the changing technological work environment.

Statement of the Problem

Rivers State is blessed with enormous resources and which if well managed; every citizen should be living comfortably. This is because, various categories of persons, companies and investors are in the region

transacting one form of business or the other, consequently impacting the life of the citizens in the region positively such as; infrastructure, electricity, pipe borne water, good education, well equipped hospitals, better and more modern equipment for fishing, farming and hunting. There would be good roads, linking communities and with expectation that as the oil companies begin to carry out their operations more people would have the opportunity of gainful employment.

Ordinarily, majority of graduates and school leavers from primary schools, secondary schools, colleges of education, polytechnics and universities in the state are supposed to be engaged in these companies or in the government or be self-employed to earn a living. But reverse is the case as no commensurate creation of employment opportunities are made by government. Also the companies still bring in foreigners as expatriates into the state to carry out certain operation (special skills) because of either mis-match of skills or lack of qualified skills among the indigenous people. People are unemployed either as a result of lack of employment or lack of employable skills. The latter is the need that must be met if the individuals must be employed. Provision of relevant job skill is very essential to meet employable skills that might be lacking in the unemployed. There will always be job opportunities but people remain unemployed as long as they lack employable skills. Afeti (2010) lamented that Nigeria, a rich oil producing nation, lacks sufficient skilled human capital to manage the oil industry. The experience of massive unemployment of Rivers State indigenes invariably results from the above scenario. It is however alleged that Rivers State indigenes are ill equipped for wage employment/self-employment as a result of lack of technical skills needed in various industries.

Bringing basic skills programmes to unemployed youths can help to alleviate poverty and unemployment levels, while improving economic growth. The development of relevant skills and knowledge is a major instrument for improved productivity, better working conditions, and the promotion of decent work in the informal economy. New skills and knowledge can open doors to more economically and socially rewarding jobs (Oluwole & Lateef, 2015). Hence the study looked at foundry skill needs for enhancing entrepreneurship development of students in technical colleges in Rivers State.

Purpose of the Study

The general purpose of the study is to determine the foundry skill needs for enhancing entrepreneurship development of students in technical colleges in Rivers State. Specifically, the study sought the following:

1. Pattern making skill needs for enhancing entrepreneurship development of students in technical colleges in Rivers State.

2. Core making skill needs for enhancing entrepreneurship development of students in technical colleges in Rivers State.

Research Questions

The following research questions guided the study:

1. What are the pattern making skill needs for enhancing entrepreneurship development of students in technical colleges in Rivers State?
2. What are the core making skill needs for enhancing entrepreneurship development of students in technical colleges in Rivers State?

Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance.

1. There is no significant difference between the mean responses of mechanical teachers and instructors on the pattern making skill needs for enhancing entrepreneurship development of students in technical colleges in Rivers State.

2. There is no significant difference between the mean responses of mechanical teachers and instructors on the core making skill needs for enhancing entrepreneurship development of students in technical colleges in Rivers State.

Methods

The study adopted descriptive research design and was carried out in Rivers State, Nigeria. The study population comprised 76 respondents, comprising 47 Metalwork Teachers and 29 Instructors in the four Government Technical Colleges in Rivers State. No sampling in the study rather the entire the population was used since the number was small and manageable. Two research questions were posed and two hypotheses formulated to guide the study. The instrument used for data collection was a 20-item structured questionnaire titled 'Welding and Fabrication Skills Questionnaire (WFSQ)', designed in the pattern of a 5-point Likert rating scale of strongly agree (SA), agree (A), undecided (UD), disagree (DA) and strongly disagree (SDA) having numerical values of 5,4,3,2 and 1 respectively. The WFSQ was face-validation by three experts; one from the Department of Mechanical Engineering, Rivers State University, Nkpolu, one from the Department of Industrial Technology Education, Ignatius Ajuru University of Education, Rumuolumini and one from Department of Mechanical Trade, Government Technical College Port Harcourt.

Twenty (20) copies of the instrument were administered to 20 metalwork technical teachers and 10 metalwork instructors in Government Technical Colleges in Bayelsa State, which is outside the area of the study but possessed similar characteristics with the area of study, in terms of

curriculum were used and a reliability coefficient of .87 was established through Cronbach alpha reliability after a test-retest method of two weeks interval. A total of 20 copies of the instrument administered to the respondents were duly completed and used for analysis. Mean and standard deviation were used in answering the research questions. So for the research questions, real limit of numbers was applied thus, it was decided that an item with a calculated mean value equal or greater than 3.50 (3.50 – 5.00) was regarded as agreed while an item was considered undecided if the mean rating was greater than or equal to 2.50 but less than 3.49 (2.50 – 3.49). Where the calculated mean of an item was less than or equal to 2.49 (0 – 2.49), such an item was regarded as disagreed. Standard deviation value close or wide apart was used to determine the homogeneity in opinion among the respondents. The hypotheses were tested at 0.05 level of significance using the t-test. Where the calculated value of (tcal) is equal or less than the critical value of (tcrit), the hypothesis is accepted otherwise, rejected.

Results

Research Question 1: What are the pattern making skill needs for enhancing entrepreneurship development of students in technical colleges in Rivers State?

Data for analysing the research question were presented in table 1.

Table 1:
Mean and Standard Deviation on pattern making skill needs for enhancing entrepreneurship development of students.

S/N	Items Ability To:	Mechanical Teachers $\bar{X}$	SD	Rmk	Mechanical Instructors $\bar{X}$	SD	Rmk
1.	Differentiate various types of patterns	3.26	0.78	A	3.57	0.67	SA
2.	Apply the working principles of common pattern making tools and apply them to make simple patterns	3.11	1.01	A	3.49	0.70	A
3.	select materials for pattern making	3.29	0.85	A	3.57	0.60	SA
4.	Apply the safety aspects of pattern making	3.21	0.79	A	3.82	0.38	SA
5.	Apply various devices used in pattern making and apply	3.39	0.79	A	3.76	0.42	SA

	them as appropriate						
6.	Determine the effect caused by incorrect pattern and mould box equipment	3.00	0.83	A	3.31	0.83	A
7.	Produce pattern to a given specification	3.15	0.84	A	3.37	0.63	A
8.	Produce different patterns using suitable tools and materials e.g. one piece flat black split pattern	2.92	0.85	A	3.29	0.80	A
9.	perform pattern arrangement and layout on plates for moulding	3.37	0.83	A	3.51	0.64	SA
10.	Carry out calculations relating to pattern and casting weights estimation and cost, contraction allowances etc., using simple mathematical symbols	3.10	0.82	A	3.45	0.70	A
	Grand Mean	**3.18**	**0.839**	**A**	**3.514**	**0.637**	**SA**

Data in Table 1 revealed that Mechanical teachers had a mean range of 3.10-3.39 and standard deviation range of 0.78-1.01. While the Mechanical Instructors had a mean range of 3.31-3.82 and standard deviation range of 0.42-0.83. The standard deviation shows the homogeneity of the respondents. The mean shows that the respondents agreed that pattern making skill are needed for enhancing entrepreneurship development of students in technical colleges in Rivers State. The findings from the table revealed that the ten (10) items are the pattern making skill needed for enhancing entrepreneurship development of students in technical colleges in Rivers State.

Research Question 2: What are the core making skill needs for enhancing entrepreneurship development of students in technical colleges in Rivers State?

Data for analysing the research question were presented in table 2.

Table 2:
Mean and Standard Deviation on core making skill needs for enhancing entrepreneurship development of students.

S/N	Items Ability To:	Mechanical Teachers $\bar{X}$	SD	Rmk	Mechanical Instructors $\bar{X}$	SD	Rmk
11.	Determine the designs for core production	3.48	0.76	A	3.57	0.57	SA
12.	Describe the types of core-making processes	3.31	0.71	A	3.59	0.53	SA
13.	Materials for core bonding	3.37	0.92	A	3.53	0.61	SA
14.	Explain general properties of sand used in core-making	3.29	0.73	A	3.63	0.66	SA
15.	Carry out simple calculations involving ingredients for mixing volumes used for moulding, test results, losses	3.15	0.90	A	3.57	0.70	SA
16.	Carry out Moisture content test	3.42	0.78	A	3.65	0.65	SA
17.	Carry out Silica and clay content test	3.29	0.83	A	3.43	0.72	A
18.	Carry out Dry strength test	3.21	0.57	A	3.86	0.40	SA
19.	Carry out Permeability test	3.11	0.94	A	3.43	0.60	A
20.	Carry out green strength test	3.34	0.72	A	3.45	0.75	A
	Grand Mean	**3.24**	**0.74**	**A**	**3.57**	**0.62**	**SA**

Data in Table 2 revealed that Mechanical teachers had a mean range of 3.11-3.48 and standard deviation range of 0.57-0.94. While the Mechanical Instructors had a mean range of 3.43-3.86 and standard deviation range of 0.40-0.75. The standard deviation shows the homogeneity of the respondents. The findings from the table revealed that the ten (10) items are the core making skill needs for enhancing entrepreneurship development of students in technical colleges in Rivers State.

HO_1: There is no significant difference between the mean responses of mechanical teachers and instructors on the pattern making skill needs for enhancing entrepreneurship development of students in technical colleges in Rivers State.

Table 3:
The t-test Analysis on the pattern making skill required by mechanical students.

Group	N	$\overline{X}$	SD	P-value	df	t-cal	t-crit	Decision
Teachers	30	3.18	0.84					
				0.05	43	2.25	1.69	Rejected
Instructors	15	3.51	0.64					

Result in table 3 revealed that t-cal (2.25) is higher than t-crit (1.69) which indicates that the hypothesis stated was rejected. Therefore there is a significant difference between the mean responses of mechanical teachers and instructors on the pattern making skill needs for enhancing entrepreneurship development of students in technical colleges in Rivers State.

HO_2: There is no significant difference between the mean responses of mechanical teachers and instructors on the core making skill needs for enhancing entrepreneurship development of students in technical colleges in Rivers State.

Table 4:
The t-test Analysis on the core making skill competencies required by mechanical students.

Group	N	$\overline{X}$	SD	P-value	df	t-cal	t-crit	Decision
Teachers	30	3.29	0.73					
				0.05	43	2.32	1.69	Rejected
Instructors	15	3.57	0.62					

Result in Table 4 revealed that t-cal (2.32) is higher than t-crit (1.69) which indicates that the hypothesis stated was rejected. Therefore there is no significant difference between the mean responses of mechanical teachers and instructors on the core making skill needs for enhancing entrepreneurship development of students in technical colleges in Rivers State.

Discussion

The findings in Table 1 revealed that the teachers had mean range of 2.92 – 3.39 and standard deviation of 0.78– 1.01 while the instructors had mean range of 3.29 – 3.82 and standard deviation of 0.42–0.83. The closeness of the standard deviation shows the homogeneity of the respondents. The findings of the revealed that pattern making skill are needed for enhancing entrepreneurship development of students in

technical colleges in Rivers State. There is a significant difference between the mean responses of mechanical teachers and instructors on the pattern making skill needs for enhancing entrepreneurship development of students in technical colleges in Rivers State. This finding is in line with Ammenr, (1999) who stated that pattern making skill gives training and impart the necessary skills leading to the production of competent craftsmen, technicians and other skilled personnel who will be enterprising and self-reliant. The quality of the education and training given to youth depends greatly on the ability of institutions to adjust their educational content to the changing skill requirements of the nation. In other words, educational institutions are expected to provide knowledge and training that satisfies the human resource demands of the nation and the nation's economy (Okoye & Okwelle, 2014). This is especially true of training in strategic occupations that are rapid with the advent of new technologies. Institutional training should aim to equip students with useful skills and to improve their knowledge and capabilities in their chosen fields.

The findings in Table 2 revealed that the teachers had mean range of 3.11 – 3.57 and standard deviation of 0.57 – 0.94 while the instructors had mean range of 3.43 – 3.86 and standard deviation of 0.40 – 0.75. The closeness of the standard deviation shows the homogeneity of the respondents. The study also indicated that core making skill are needed for enhancing entrepreneurship development of students in technical colleges in Rivers State. There is a significant difference between the mean responses of mechanical teachers and instructors on the core making skill needs for enhancing entrepreneurship development of students in technical colleges in Rivers State. This finding is in line with Degarmo, Black and Kohser, (2003) who stated that core is normally a disposable item that is destroyed to get it out of the piece. They are most commonly used in sand casting, but are also used in die casting and injection moulding. The goal of this module is intended to provide the trainee with the competence and underpinning knowledge to operate and maintain different types of core making tools and equipment and be able to produce good cores for foundry work.

The two hypotheses tested in the study revealed that t-cal in all the two cases (2.25 and 2.32) are greater than the t-crit (1.69). This implies that significant difference exists between the mean opinions of mechanical teachers and instructors on welding and fabrication skills needed for entrepreneurship development of students in technical colleges in Rivers State.

Conclusion

The study on welding and fabrication skills needed for entrepreneurship development of students in technical colleges in Rivers State is as a result of the rapid technological changes in the 21st century

that possess great challenges to education and employment sectors and has led to new labour market demands which have caused many mechanical engineering craft graduates with various certificate to be unemployed. The study determined foundry skill needs for enhancing entrepreneurship development of students in technical colleges in Rivers State. Data were collected, analyzed and interpreted. Based on the findings of the study, it was concluded that foundry skills are needed for entrepreneurship development of students in technical colleges in Rivers State.

Recommendations

From the findings of the study, the following are recommended:

1. Acquirable entrepreneurial skills should be imbedded in all courses of study being offered in foundry craft practice in Technical colleges.
2. Training without relevant equipment will only lead to frustration. All stakeholders in technical colleges should spare no efforts in ensuring availability of entrepreneurial and foundry skills acquisition facilities in Technical colleges.
3. Government should set-up entrepreneurial, technical and vocational training centres to produce the required skilled personnel to cater for the local demands of skilled personnel in Nigeria.
4. Entrepreneurial centres in our institutions in Nigeria must be equipped and utilized to assist universities and other institutions to bridge the gap created by the theoretical nature of our entrepreneurial, technical vocational education and training programme in our institution.

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